



CITIES IN HARMONY WITH NATURE 城市与自然共生

中国城市生物多样性保护实践

CASE STUDIES OF URBAN BIODIVERSITY
CONSERVATION IN CHINA



2026



滹沱河秋景。图片由石家庄市提供
Autumn scenery of the Hutuo River. Photo provided by Shijiazhuang

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GUANGZHOU CITY, GUANGDONG PROVINCE 广东省广州市

Haizhu Wetland: Practices in Wetland Ecosystem Restoration and Multi-Stakeholder Co-governance in the Core Areas of Megacities 海珠湿地：超大城市核心区湿地生态系统修复与多元共治实践

海珠湖
Haizhu Lake

关键词

超大城市核心区湿地保护与修复；农耕湿地系统；生态价值转化；多元共治。

案例名片

海珠湿地位于广州市人口密集、经济发达的城市核心区，占地1100公顷，经十余年的系统修复，成功实现了生态系统的全面修复与生物多样性的显著提升，成为国际重要湿地，并助推万亿级产业集群发展。为解决城市化进程中的生态空间挤占问题，通过融合政策引导、科学生态修复与社会协同治理的系统化解决方案，为全球城市生物多样性保护提供了生动范例。

KEYWORDS

Wetland Conservation and Restoration in the Core Areas of Megacities; Agricultural Wetland Systems; Conversion of Ecological Value; Multi-stakeholder Co-governance.

CASE PROFILE

Located in the densely populated and economically developed urban core of Guangzhou, the Haizhu Wetland covers an area of 1,100 hectares. After more than a decade of systematic restoration, it has successfully achieved comprehensive ecosystem restoration and a significant increase in biodiversity, becoming an internationally important wetland and driving the development of a trillion-level industrial cluster. To address the encroachment on ecological spaces during the urbanization process, this initiative combines policy guidance, scientific ecological restoration, and collaborative social governance into a systematic solution, serving as a vivid example for urban biodiversity conservation worldwide.

背景与问题

海珠湿地前身为一片城市中心的万亩生态果园，随着城市工业化与城市化的发展，区域面临房地产开发的压力，广州市为保障生态空间，将其划定为永久性生态用地，亟需在高密度城市中心区开展系统修复生态、平衡发展与保护。

行动与措施

创新生态用地管理制度

首创“只征不转”政策，将万亩果园集体土地征收为国有，作为永久性生态用地，由政府统一保护管理，避免生态用地流失问题，并针对性的颁布政策法规与保障制度，建设国家湿地公园公益诉讼法治教育基地。

探索开展多目标自然-人类复合生态系统修复：

以当地百年果林经济传统为基础，将种植果林的垛基与细密的果林潮道相结合，构建“主涌—连通支涌—疏浚果林潮道”三级湿地水网系统，构建了完整的“果、稻、虫、鱼、鸟”生态链。

依据生态学原理恢复自然滩涂，营造高潮栖息地，引入本土特有物种构建完整的植物群落，搭建“昆虫旅馆”和生态塔，建成1140亩水鸟生态廊道，营造具备水鸟筑巢、觅食、栖息等功能的鸟岛，同时划定50公顷鸟类生境保护区。

水稻田取消耕作道路，增设深度0.5~1.5米的鱼道，形成生态稻田，聘请当地农民实施淤泥堆肥工艺，引入三类水净化技术，以较低维护成本持续提升湿地水质。

湿地水系保留了村民埋藏龙舟的“龙吟潭”，每年端午前挖出洗净、上龙头都是重要的民俗仪式。

搭建数字化生态监管体系

搭建无人机组网监测系统，布设无人机机站、水环境自动监测站、高清智能摄像设备、红外相机等监测设施，持续采集分析水环境、气象、生物多样性等数据，搭建数据可视化监测平台，辅助管护决策。

BACKGROUND AND CHALLENGES

Haizhu Wetland was formerly a 10,000-mu ecological orchard in the heart of the city. With the advancement of urban industrialization and urbanization, the area faced pressure from real estate development. To safeguard ecological space, the Guangzhou municipal government designated it as permanent ecological land, creating an urgent need to systematically restore the ecosystem and balance development with conservation in this high-density urban center.

ACTIONS AND MEASURES

INNOVATIVE MANAGEMENT SYSTEM FOR ECOLOGICAL LAND

The place pioneered the “expropriation without land-use conversion” policy, expropriating 10,000 mu of collective land used for orchards and converting it into state-owned land designated as permanent ecological land. This land is uniformly protected and managed by the government to prevent the loss of ecological land. It also enacted targeted policies, regulations, and safeguard mechanisms, and established a public interest litigation and legal education base at the National Wetland Park.

EXPLORING THE RESTORATION OF MULTI-OBJECTIVE NATURE-HUMAN COMPOSITE ECOSYSTEMS:

Building on the local century-old tradition of fruit orchard farming, the project combined the raised platforms used for fruit tree cultivation with a dense network of orchard tidal channels to establish a three-tiered wetland water network system comprising “main channels—connecting tributaries—dredged orchard tidal channels,” thereby creating a complete ecological chain of “fruit, rice, insects, fish, and birds.”

Following ecological principles, natural tidal flats were restored to create high-tide habitats; native species were introduced to establish a complete plant community; “insect hotels” and ecological towers were constructed; a 1,140-mu waterbird ecological corridor was built; and a bird island was created to serve as a nesting, foraging, and resting ground for waterbirds, while a 50-hectare bird habitat conservation area was designated.

Farm roads in the rice paddies were removed and fish passages with depths of 0.5 to 1.5 meters were added to create ecological rice paddies. Local farmers were hired to implement a silt composting process, and Class III water purification technology was introduced to continuously improve wetland water quality at a low maintenance cost.

The wetland water system also preserves “Longyintan”, where villagers bury dragon boats. Every year before the Dragon Boat Festival, the boats are dug up, cleaned, and fitted with dragon heads—an important folk ritual.

ESTABLISHING A DIGITAL ECOLOGICAL MONITORING SYSTEM

A drone-based network monitoring system was established by deploying monitoring facilities such as drone stations, automated water quality monitoring stations, high-definition smart cameras, and infrared cameras to continuously collect and analyze data on water quality, meteorology, and biodiversity. A data visualization monitoring platform was also built to support management and conservation decision-making.

推动生态价值转化

成立区域自然教育联盟，基于湿地生态与岭南垛基果林农业文化，开展特色旅游、研学等产业，开发200余个精品课程与常态化科普路线；推动多年生态监测数据资产化，上架广州数据交易所，让生态数据产生收益，反哺湿地保护工作。

政府引导，吸引社会力量参与

政府投入4.88亿元专项资金生态修复，建立生态产品价值转化机制，积极引导社会资本参与；成立海珠湿地科学技术协会，与高校、科研机构合作开展超100项课题研究，为湿地保护提供专业技术支撑。联合民间公益机构，组织开展公民科学、志愿者活动，引导全民参与。

成效与价值

项目成功保留城市核心区超大规模的生态空间，效避免生态用地流失，核心区水质从昔日V类大幅提升至Ⅲ类，部分区域达Ⅱ类，水清

PROMOTING THE CONVERSION OF ECOLOGICAL VALUE

A regional nature education alliance was established to develop distinctive tourism and educational travel programs based on wetland ecosystems and the agricultural culture of Lingnan's terraced orchards, and more than 200 high-quality courses and regular science outreach routes were created. The monetization of multi-year ecological monitoring data was promoted by listing it on the Guangzhou Data Exchange, thereby generating revenue from ecological data to support wetland conservation efforts.

GOVERNMENT GUIDANCE TO ATTRACT PARTICIPATION FROM CIVIL SOCIETY

The government allocated 488 million yuan in special funds for ecological restoration, established a mechanism for converting the value of ecological products, and actively encouraged the participation of private capital. It also established the Haizhu Wetland Science and Technology Association, which collaborated with universities and research institutions to conduct over 100 research projects, providing professional technical support for wetland conservation. In partnership with private nonprofit organizations, the government organized citizen science and volunteer activities to encourage public participation.

ACHIEVEMENTS AND VALUE

The project has successfully preserved a vast ecological space in the city's core area, effectively preventing the loss of ecological land. Water quality in the core area has improved significantly from the former Class V to Class III, with some areas reaching Class II; clear waters and green shores have become

鸟岛
Bird Island





自然教育课程与宣传图册
Nature Education Courses and Outreach Brochures

岸绿成为常态。截至2026年7月，海珠湿地记录鸟类种数从72种增加到207种，维管束植物从294种增加到835种，昆虫种类从66种增加到903种，近年来连续发现3个以“海珠”命名的全球昆虫新物种及1个全球菌类新物种。有效缓解热岛效应，净化空气，提高城市韧性，湿地平均气温比周边城区低0.5-1°C，可吸纳约200万立方米雨水，为周边50平方公里区域缓解内涝。

每年吸引近千万游客，显著提升了城市宜居品质与公众的生态保护意识。吸引带动周边高科技产业集群和GDP增长，实现生态保护自主可持续运营、良性循环发展。2022年入选世界自然保护联盟（IUCN）“绿色名录”，成为我国首个入选绿色名录的国家湿地公园；2023年，入选国际重要湿地，被授予“世界最佳自然保护地”。

经验与启示

为避免生态用地流失，广州市将土地转变为国有土地，通过针对性的颁布管控措施，实现永久保护。

在生态修复过程中，将传统农耕智慧、民俗文化与生态科学结合，并通过长期科研监测动态评估修复成效，适应性调整管理策略。

推动生物多样性监测数据资产化，实现生态资源、生态数据的市场化变现，反哺保护工作，形成“生态保护—资源增值—反哺保护”的自主可持续运营模式。

组建社会参与合作平台，在湿地保护、公民科学与志愿活动中引入科研团队、民间公益机构和企业力量，共同构建多元共治、责任共担的长效协作机制。

the norm. As of July 2026, the number of bird species recorded at Haizhu Wetland has increased from 72 to 207, vascular plant species from 294 to 835, and insect species from 66 to 903. In recent years, three new global insect species and one new global fungal species, all named after "Haizhu," have been discovered. Effectively mitigating the urban heat island effect, purifying the air, and enhancing urban resilience, the wetland maintains an average temperature 0.5-1°C lower than that of surrounding urban areas. It can absorb approximately 2 million cubic meters of rainwater, alleviating urban flooding across a 50-square-kilometer area.

The place attracts nearly 10 million visitors annually, significantly enhancing the city's livability and raising public awareness of ecological conservation. It has stimulated the growth of surrounding high-tech industrial clusters and boosted GDP, achieving self-sustaining operations in ecological conservation and fostering a virtuous cycle of development. In 2022, it was included in the International Union for Conservation of Nature (IUCN) "Green List," becoming China's first national wetland park to be listed; in 2023, it was designated as an Internationally Important Wetland and awarded the title of "World's Best Nature Reserve."

EXPERIENCES AND INSIGHTS

To prevent the loss of ecological land, Guangzhou City has reclassified the land as state-owned and implemented targeted control measures to ensure its permanent protection.

During the ecological restoration process, traditional agricultural wisdom and folk culture are integrated with ecological science, and the effectiveness of restoration is dynamically assessed through long-term scientific monitoring, allowing for adaptive adjustments to management strategies.

The project has promoted the transformation of biodiversity monitoring data into an asset, enabled the market-based monetization of ecological resources and data, reinvested the proceeds into conservation efforts, and established a self-sustaining operational model of "ecological conservation—resource appreciation—reinvestment in conservation."

A platform for public participation and collaboration has been established, bringing together research teams, nonprofit organizations, and businesses to engage in wetland conservation, citizen science, and volunteer activities, thereby jointly building a long-term collaborative mechanism based on diverse governance and shared responsibility.

YUEXIU DISTRICT, GUANGZHOU
广州市越秀区

Integrating the Conservation of Native Species with the Preservation of Ecological Culture Through the Kapok Tree

以木棉为载体的乡土物种保护 与生态文化传承融合实践



中山纪念堂：百年古木棉
Zhongshan Memorial Hall: The Centennial Kapok Tree

关键词

乡土旗舰树种；古树保护

案例名片

木棉是广州市的市花，是广州越秀区千年文化的载体，作为乡土旗舰树种，也是高密度老城区物种重要的栖息地。越秀区采取政策引领、古树建档、生境优化等措施，保护以木棉为代表的古树遗传资源和乡土植物，实现城市生物多样性保护、历史文化传承与民生惠益共享，为历史老城区古树保护提供参考。

背景与问题

越秀区是广州市最早种植木棉的区域，是越秀区独特的文化符号，随着城市高密度发展，古木棉面临城市硬化建设长期影响树木根系，单一种植方式导致生态功能降低、生境破碎化，以及市民与木棉的情感淡化等问题。

行动与措施

开展树木全域普查建立数据库

依托三维点云、无人机航测等空间测绘技术，对全区34.56万株公共树木坐标点位数据采集，建立树木资源信息数据库，绘制越秀区树木分布地图，为古木棉单株逐一划定保护管控红线。

实施古树分株管护

运用树木雷达检测仪、弹性波断层成像诊断仪等检测设备，结合花期物候等数据，开展以古木棉为代表的古树健康评估，为236株古树名木建立“健康档案”，制定“一树一策”精细化养护方案。针对城市中轴线和350岁“木棉王”等关键保护单元，编制中国首部公园级古树名木保护专项规划——《广州中山纪念堂古树名木保护规划（2022-2031）》，围绕微生境改良、有害生物天敌防控、枝干仿生支撑、土壤理化性质改良等维度制定保护修复方案，构建古木棉原生微生态群落，定期开展古树生长状况评估、水土环境监测、根系发育检测、树干空洞探测，实现精准管护。

KEYWORDS

Flagship Native Tree Species; Ancient Tree Conservation

CASE PROFILE

The kapok tree (*Bombax ceiba* L.) is the municipal flower of Guangzhou and a symbol of the millennia-old culture of Guangzhou's Yuexiu District. As a flagship native tree species, it also serves as a vital habitat for species in the district's high-density, historic urban areas. Yuexiu District has implemented measures such as policy guidance, ancient trees documentation, and habitat optimization to protect the genetic resources of ancient trees—represented by the kapok tree—and native plant species. These efforts aim to achieve the conservation of urban biodiversity, the preservation of historical and cultural heritage, and the sharing of benefits with the public, thereby providing a model for the protection of ancient trees in historic urban areas.

BACKGROUND AND CHALLENGES

Yuexiu District was the first area in Guangzhou where kapok trees were planted, and they have become a unique cultural symbol of the district. However, with the city's high-density development, these ancient kapok trees face challenges such as the long-term impact of urban paving on their root systems. The practice of planting them in isolation has led to a decline in their ecological functions and habitat fragmentation; as well as a waning emotional connection between residents and the kapok trees.

ACTIONS AND MEASURES

CONDUCTING A DISTRICT-WIDE TREE CENSUS TO ESTABLISH A DATABASE

Using spatial surveying technologies such as 3D point clouds and UAV aerial surveying, coordinate data for 345,600 public trees across the district were collected to establish a tree resource information database. A tree distribution map of Yuexiu District was created, and protection and management boundaries were delineated for each individual ancient kapok tree.

IMPLEMENTING DIVISION AND MANAGEMENT OF ANCIENT TREES

Using detection equipment such as tree radar scanners and elastic wave tomography diagnostic instruments, combined with data on phenology during the flowering season, health assessments of ancient trees—represented by the ancient kapok trees—were conducted to establish "health records" for 236 ancient and notable trees and formulate "one tree, one plan" precision maintenance schemes. Focusing on key conservation areas such as the city's central axis and the 350-year-old "Kapok King," the first park-level specialized conservation plan for ancient and notable trees in China—the Guangzhou Sun Yat-sen Memorial Hall Ancient and Notable Trees Conservation Plan (2022-2031)—was compiled. This plan outlined conservation and restoration strategies focused on improving microhabitats, controlling pests through natural predators, implementing bionic support systems for branches and trunks, and enhancing the physical and chemical properties of the soil. It aimed to restore the native microecosystem of the ancient kapok trees and ensures precise management through regular assessments of tree growth, monitoring of water and soil conditions, root system development checks, and detection of trunk cavities.

古树种质资源保育扩繁与应用

收集古树等优良乡土植物种质遗传资源，并将木棉等乡土常绿阔叶植物列为绿化建设优选树种，引导在道路绿化、公园建设、城市更新中优先使用。

构建木棉特色科普宣教体系

深入挖掘木棉承载的地域历史与生态人文内涵，规划生态文化特色线路，开发木棉主题科普课程，举办文化宣传活动，组建青少年志愿解说团队，在木棉集中分布区设置科普标识与树木电子身份二维码，市民扫码即可了解古树故事与管护信息。

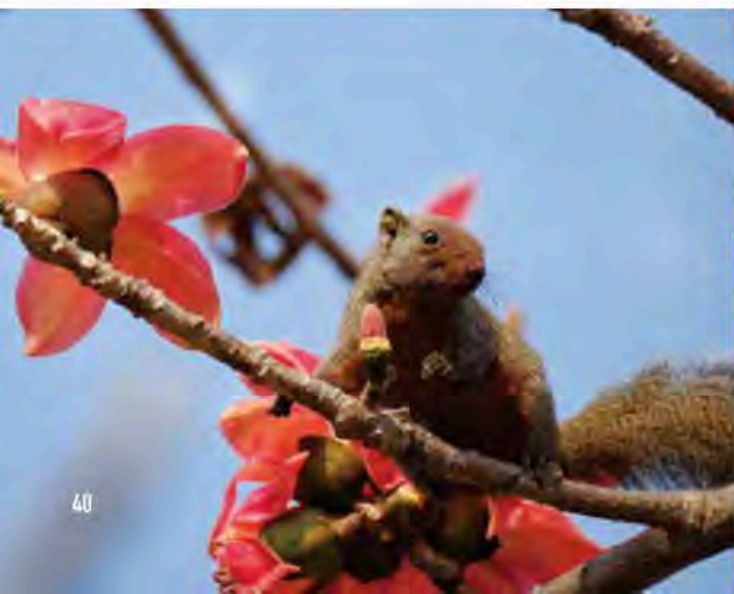
搭建古树保护公益捐赠平台

联合社会企业建立“古树保护”公益平台，面向公众推出古树保护主题文创纪念卡，纪念卡所得款项捐献给“绿美广州基金”，用于古树的日常养护、复壮措施和生态环境保护，吸引公众力量参与古树保护。

成效与价值

通过系列保护举措，区域古树资源保育状况持续改善，依托木棉古树承载的城市人文脉络得以延续留存，树龄逾350年的“木棉王”获评“中国最美木棉”。

▼ 赤腹松鼠“上蹿下跳”，摄影：陈秋明
The red-bellied squirrel (*Callosciurus erythraeus*) darts up and down, photo by Chen Qiuming.



CONSERVATION, PROPAGATION, AND APPLICATION OF GENETIC RESOURCES FROM ANCIENT TREES

The project collected high-quality genetic resources from ancient trees, and designated native evergreen broad-leaved plants, such as the kapok tree, as preferred tree species for landscaping projects; with encouraging their priority use in roadside greening, park development, and urban renewal.

BUILDING A KAPOK-THEMED SCIENCE EDUCATION AND OUTREACH SYSTEM

Exploring the regional history and ecological and cultural significance embodied by the kapok tree thoroughly, the project planned ecocultural themed trails, developed kapok-themed science education courses, regularly organized cultural outreach events, and established a youth volunteer guide team. In areas where kapok trees are densely distributed, educational signs and electronic QR codes identifying each tree were installed, allowing citizens to scan the codes to learn about the stories behind these ancient trees and access information on their care and management.

ESTABLISHING A CHARITABLE DONATION PLATFORM FOR ANCIENT TREE CONSERVATION

Partnering with social enterprises, the district established an "Ancient Tree Conservation" charitable platform and launched ancient tree conservation-themed cultural and creative commemorative cards for the public. Proceeds from the sale of these cards were donated to the "Green and Beautiful Guangzhou Fund" to support the daily maintenance of ancient trees, revitalization efforts, and ecological conservation, thereby engaging the public in ancient tree conservation.

ACHIEVEMENTS AND VALUE

Through a series of conservation measures, the preservation of the region's ancient tree resources has continued to improve. The city's cultural heritage, embodied by these ancient kapok trees, has been preserved and carried forward, and the "Kapok King", over 350 years old, has been named "China's Most Beautiful Kapok Tree."

▼ 大山雀灵动穿梭，摄影：陈秋明
Japanese Tit (*Parus minor*) darting nimbly among kapok blossoms, photo by Chen Qiuming.



以木棉为主的乡土植物群落及伴生生物群落不断丰富，在城市高密度建成区内形成生物多样性热点区域，为鸟类、昆虫和小型兽类等提供稳定栖息环境，2023年观测记录到鸟类163种，2025年增至225种，近三年新记录物种数量增幅近40%。

经验与启示

借助现代测绘与树木检测技术，开展全域树木普查建档，落实“一树一策”精细化管护，有效解决传统古树粗放管护、针对性不足的问题。

设立古树保护公益项目基金，拓宽公众参与渠道，引导社会力量主动参与古树保育，形成全民共建共治的古树保护模式。

The native plant communities—dominated by kapok trees—and their associated biological communities have continued to diversify, forming biodiversity hotspots within the city's high-density built-up areas and providing stable habitats for birds, insects, and small mammals. In 2023, 163 bird species were recorded; by 2025, this number has increased to 225, representing a nearly 40% rise in the number of newly recorded species over the past three years.

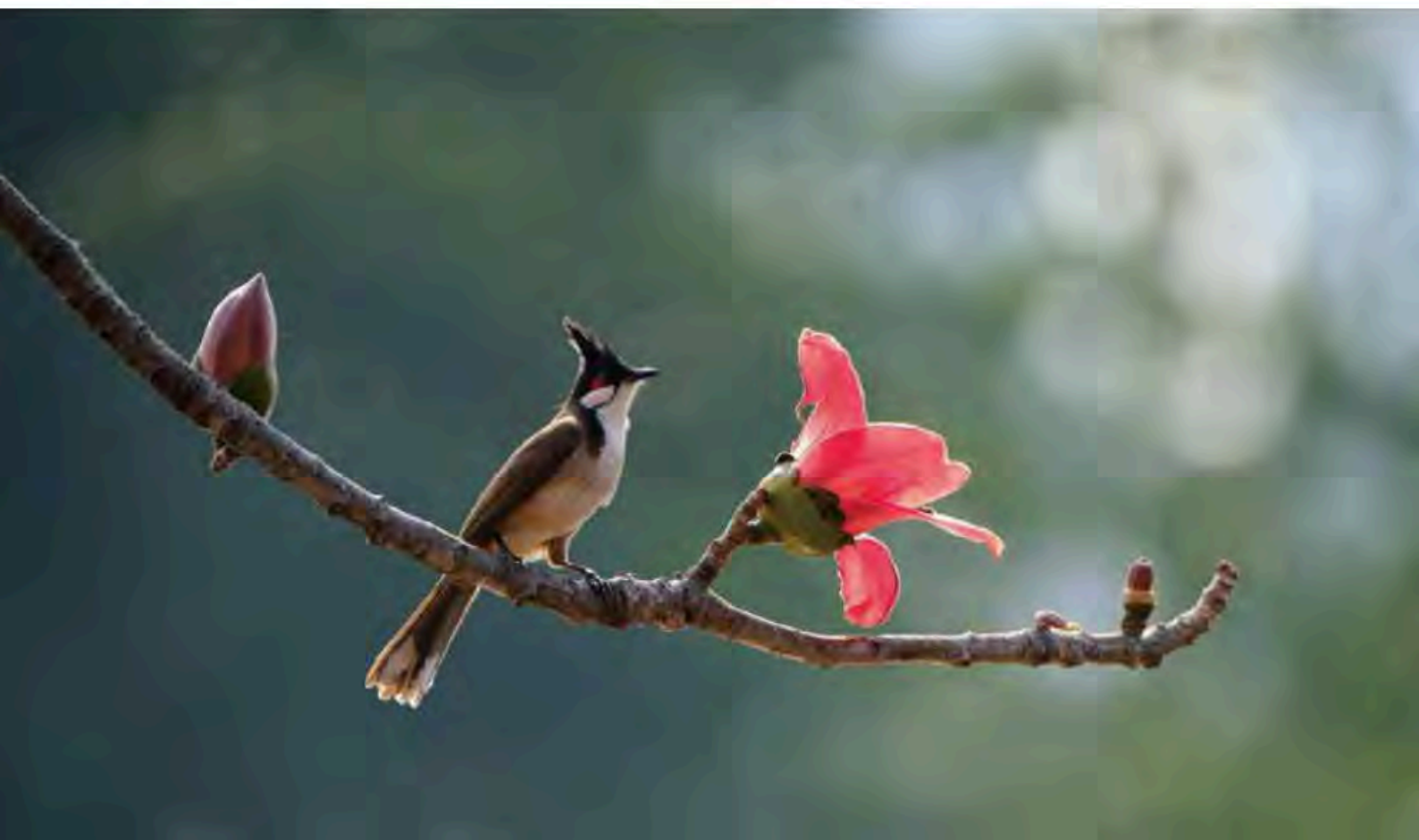
EXPERIENCES AND INSIGHTS

Using modern surveying and tree assessment technologies, the district has conducted a comprehensive tree census and established records for the entire region, implementing a "one tree, one plan" approach to precise management and care, and effectively addressing the traissues of extensive, unsystematic management and a lack of targeted care that had long plagued ancient trees conservation.

The public welfare fund for ancient tree conservation has been established to expand channels for public participation and encourage social forces to actively engage in ancient tree conservation, fostering a model of ancient tree conservation based on collective participation and governance by all citizens.

红耳鹎在古木棉枝头 ▼

A Red-whiskered Bulbul (*Pycnonotus jocosus*) perched on the branch of an ancient kapok tree



NANSHA DISTRICT, GUANGZHOU CITY
广州市南沙区

The Ecological Restoration of the Coastal Wetlands on the North Bank of the Jiaomen Waterway

蕉门水道北岸滨海湿地生态修复

坦尾桥段滨海湿地生态修复后航拍图 ▲

Aerial view of the Tanwei Bridge section coastal wetlands after ecological restoration

关键词

滨海湿地生态修复；红树林营造；生物多样性提升

案例名片

蕉门水道北岸滨海湿地生态修复工程位于粤港澳黄金内湾地理中心，是珠江入海口咸淡水交汇的关键生态节点。项目通过荒滩硬质地生态化改造、红树林立体营造、湿地植物群落重建等措施，营造红树林约2.5公顷，修复滨海湿地约4公顷，探索出生态功能提升与滨海景观耦合的海洋生态修复新路径，有效抵御了岸线退化，显著提升了区域生物多样性，为高度城市化地区人与红树林和谐共生提供了实践范例。

KEYWORDS

Coastal wetland ecological restoration; mangrove planting; biodiversity enhancement.

CASE PROFILE

The Jiaomen Waterway North Bank Coastal Wetland Ecological Restoration Project is located at the geographical center of the Guangdong-Hong Kong-Macao Golden Inner Bay and serves as a critical ecological node where freshwater and saltwater converge in the Pearl River estuary. Through measures such as the ecological rehabilitation of barren, hardened coastal areas, the three-dimensional cultivation of mangroves, and the restoration of wetland plant communities, the project has established approximately 2.5 hectares of mangrove forest, restoring approximately 4 hectares of coastal wetlands. It has pioneered a new approach to marine ecological restoration that integrates enhanced ecological functions with coastal landscape enhancement, effectively combating shoreline degradation and significantly enhancing regional biodiversity, thereby providing a practical model for the harmonious coexistence of humans and mangroves in highly urbanized areas.

背景与问题

广州南沙是广州市红树林核心分布区,现有红树林198.18公顷,形成以南沙湿地为核心,蕉门水道、万顷沙河口及海岛点状斑块为辅的红树林空间格局,依托省市多级专项法规与国土空间规划,将全域红树林纳入生态保护红线管控,构建起科学完善的保护规划与管理体系。

蕉门水道位于粤港澳黄金内湾地理中心,是珠江入海水道之一,地处咸淡水交汇地带,水文条件复杂,潮位波动显著。受土地开发、港口建设、航运等人为活动长期影响,污水与工业废水排放导致水体污染,富营养化加剧,区域生态平衡受到严重威胁。该区域面临三大核心生态问题:一是植被结构杂乱,生境质量脆弱,生态系统服务功能低下;二是荒滩裸土广布,岸线持续退化,防灾减灾能力不足;三是驳岸采用硬质化边界设计,亲水空间匮乏,人与自然互动渠道受阻。为系统性解决上述生态问题,地方政府积极筹措资金,对广州南沙区南沙体育馆南侧蕉门水道区域实施总长度1.1公里、总面积7公顷的生态保护修复工程。

行动与措施

基于水动力模拟的立体生态堤岸构建

搭建水动力数值模型,系统分析潮位、流速、剪应力及坡度等关键水文参数,开展地形微调。依据潮上带、潮间带、潮下带垂直潮位梯度,依次配置景观植物、伴生种、半红树及真红树物种,构建多层次立体生态堤岸系统,完成红树林种植约2.5公顷。针对高苗采用辅植技术,保障幼苗存活率。

水鸟友好型生境系统构建

构建引鸟防浪驳岸系统,铺设软质种植土层并设置防浪桩及停鸟柱,补种半红树,形成防干扰隔离带。通过降低驳岸坡度、营造开阔浅滩、补充饵料生物、设置停鸟柱及种植挺水植物等措施,系统构建水鸟栖息觅食网络,营造安全静谧的栖息环境。

BACKGROUND AND CHALLENGES

Nansha, Guangzhou, is the core distribution area for mangroves in Guangzhou, with 198.18 hectares of mangroves currently in existence. This has formed a spatial pattern centered on the Nansha Wetlands, supplemented by scattered patches in the Jiaomen Waterway, the Wanqing Sha Estuary, and various islands. Relying on multi-level specialized regulations and territorial spatial plans at the provincial, municipal, and district levels, the entire mangrove area has been incorporated into the management framework of the ecological conservation red line, establishing a scientific and comprehensive conservation planning and management system.

The Jiaomen Waterway is located at the geographical center of the Guangdong-Hong Kong-Macao Golden Inner Bay and serves as one of the Pearl River's estuarine channels. Situated at the confluence of freshwater and saltwater, it features complex hydrological conditions and significant tidal fluctuations. Long-term human activities such as land development, port construction, and shipping, along with the discharge of sewage and industrial wastewater, have caused water pollution and exacerbated eutrophication, severely threatening the region's ecological balance. The area faces three major ecological challenges: First, the vegetation structure is disorganized, resulting in fragile habitat quality and impaired ecosystem services; second, extensive barren beaches and exposed soil accelerate shoreline degradation, compromising coastal disaster prevention and mitigation capabilities; third, the revetments feature hard-edged designs, resulting in a lack of waterfront spaces and obstructing channels for human-nature interaction. To systematically address these ecological issues, local authorities proactively secured funding to implement an ecological conservation and restoration project in the Jiaomen Waterway area south of the Nansha Gymnasium in Nansha District, Guangzhou, covering a shoreline length of 1.1 kilometers and an area of 7 hectares.

ACTIONS AND MEASURES

CONSTRUCTION OF A THREE-DIMENSIONAL ECOLOGICAL SEAWALL BASED ON HYDRODYNAMIC SIMULATION

A numerical hydrodynamic model was developed to systematically analyze key hydrological parameters, including tide levels, flow velocity, shear stress, and slope gradients, and to conduct minor adjustments to the topography. Based on the vertical tidal level gradients of the supratidal, intertidal, and subtidal zones, landscape plants, companion species, semi-mangrove, and true mangrove species were sequentially planted to construct a multi-layered, three-dimensional ecological embankment system, resulting in the planting of approximately 2.5 hectares of mangroves. For taller seedlings, a supplementary planting technique was employed to ensure seedling survival rates.

CONSTRUCTION OF WATERBIRD-FRIENDLY HABITATS

A bird-attracting, wave-breaking revetment system was constructed to form a disturbance-free buffer zone by laying a layer of soft, plant-friendly soil and installing wave-breaking piles, perching posts, as well as replanting semi-mangrove plants. Through measures such as reducing the slope of the revetment, creating open shallows, supplementing food sources, installing perching posts, and planting emergent vegetation, a systematic network of habitats and foraging areas for waterbirds was established, fostering a safe and tranquil habitat.

红树植物群落美学配置与景观营造

采用近自然配置模式，依据潮位梯度进行色彩层次设计，形成协调统一的生态风貌。在确保行洪安全前提下预留植物生长空间，实现生态功能与景观美学的有机融合。

AESTHETIC ARRANGEMENT AND LANDSCAPE DESIGN OF MANGROVE COMMUNITIES

A near-natural arrangement model was adopted, with color gradients designed according to tidal elevation gradients to create a harmonious and unified ecological landscape. While ensuring flood control safety, sufficient space was reserved for plant growth, thereby achieving an organic integration of ecological functions and landscape aesthetics.

▼ 红树林多元生境景观风貌

Diverse Habitat Landscapes of the Mangrove Ecosystem



成效与价值

项目修复岸线720米，营造红树林约2.5公顷，修复滨海湿地约4公顷，有效提升南沙体育馆南侧岸线生态环境，成功抵御岸线退化趋势。通过布置枯木、营造浅滩、投放饵料生物及种植桐花树、秋茄、茳芏等乡土物种构建鸟类栖息觅食网络，为鸟类提供适宜的栖息繁殖场所。项目科学配置堤岸与植物群落，构建陆地鸟类与海洋生物之间的生态链接，有效提升了滨海

ACHIEVEMENTS AND VALUE

The project restored 720 meters of shoreline, established approximately 2.5 hectares of mangrove forests, and restored about 4 hectares of coastal wetlands. These efforts effectively improved the ecological environment along the shoreline south of the Nansha Gymnasium and successfully halted the trend of shoreline degradation. By placing deadwood, creating shallow shoals, introducing bait organisms, and planting native species such as *Aegiceras corniculatum*, *Kandelia obovata*, saltwater grass (*Cyperus malaccensis*), the project established a network of habitats and foraging areas for birds, providing them with suitable habitats for nesting and breeding. Through the scientific arrangement of embankments and plant communities, the project established ecological connections between terrestrial birds and

湿地生态系统的完整性与服务功能，区域生物多样性水平得到显著提升。

构建了兼具生态功能与亲海体验的景观带，提升了第十五届全国运动会竞赛场馆周边环境品质，丰富了居民休闲游赏选择。2024年南沙区接待旅游人数近6000万人次，同比增长105%，实现了生态效益向经济社会效益的有效转化。

经验与启示

以水动力模型驱动生态修复决策，实现从“经验驱动”向“数据驱动”的技术跨越。针对蕉门水道北岸复杂水文条件，项目搭建水动力数值模型，量化解析潮位、流速、剪应力等关键参数，科学确定地形调整策略与物种配置方案，突破了传统修复依赖经验判断的局限，显著提升了修复工程的科学性与精准性。

将动物生境需求前置融入工程设计，实现从“人类中心”向“生命共同体”的设计理念转变。项目系统构建水鸟栖息觅食网络，通过地形微改造、食源培育与栖息设施配置等措施，将生物多样性保护目标嵌入工程全周期，为城市滨海湿地的生物多样性友好型设计提供了可推广的实践范式。

marine life, effectively enhancing the integrity and ecosystem services of the coastal wetland ecosystem, and significantly improving the regional biodiversity.

A landscape corridor combining ecological functions with a seaside experience was created, enhancing the environmental quality surrounding the competition venues of the 15th National Games and enriching residents' choices for leisure and sightseeing. In 2024, Nansha District received nearly 60 million tourist visits, a year-on-year increase of 105%, effectively transforming ecological benefits into economic and social benefits.

EXPERIENCES AND INSIGHTS

By using hydrodynamic models to guide ecological restoration decisions, the project has achieved a technological leap from an "experience-driven" to a "data-driven" approach. In response to the complex hydrological conditions along the north bank of the Jiaomen Waterway, the project has developed a numerical hydrodynamic model to quantitatively analyze key parameters such as tidal levels, flow velocity, and shear stress. These analyses have enabled the scientific determination of topographic adjustment strategies and species allocation plans, overcoming the limitations of traditional restoration approaches that relies on empirical judgment and significantly enhancing the scientific rigor and precision of the restoration project.

By integrating animal habitat requirements into the early stages of engineering design, the project achieves a shift in design philosophy from a "human-centered" approach to one that embraces the "community of life." The project systematically establishes a network for waterbirds to inhabit and forage, embedding biodiversity conservation goals throughout the entire project lifecycle through measures such as micro-topographic modifications, the cultivation of food sources, and the installation of habitat structures. It thus provides a replicable practical model for biodiversity-friendly design in urban coastal wetlands.

鸟类在滩涂觅食
Birds foraging on the mudflats



SHENZHEN CITY, GUANGDONG PROVINCE
广东省深圳市

“The Linking Plan”: Micro-ecological Restoration and Collaborative Biodiversity Conservation in a High-Density Megacity

“万桥计划”：高密度超大城市微观生态修复与生物多样性的协同保护

关键词

山海连城；微观生态修复；全民参与；城市生物多样性；协同保护；生物友善设施

KEYWORDS

Mountains and Seas Connecting the City; Micro-ecological Restoration; Public Participation; Urban Biodiversity; Collaborative Conservation; Bio-friendly Infrastructure

▼ 全民参与：为小动物回家铺路架桥
Community Participation; Paving the Way for Small Wildlife to Find Homes



案例名片

深圳“万桥计划”是高密度超大城市微观生态修复与生物多样性协同保护的创新实践，聚焦城市生态断点与微型生境保护，号召全民关注野生动物的生存环境，为它们搭建生命之桥。目前已建成各类生态“桥”100余处、微型生态保护点10处，有效打通城市生态微循环，为全球超大城市平衡发展与生物多样性保护提供了可借鉴的中国方案。

背景与问题

随着城市高速发展，部分城市基础设施形成的“生态陷阱”——如透明的玻璃幕墙导致鸟类撞击伤亡、高陡的人工驳岸阻碍动物们的生命活动、硬质化护坡切断小型动物通行路径，有时甚至直接导致其被困或死亡。如何在微观尺度上连接生态断点、保障非人类生命在城市中的空间生存权利，成为所有大城市亟待破解的难题。

行动与措施

搭建微观生态修复平台

项目依托生物多样性本底调查成果，针对识别出的生态断点与关键薄弱环节，因地制宜布设生态浮岛、防鸟撞贴、昆虫屋、本杰士堆、绳网坡道等生物友善设施，最大限度降低人工构筑物对野生动物的不利影响。截至2025年，已建成各类生态连通设施100余处，形成10处微型生态保护节点，并配套设置科普解说牌。

CASE PROFILE

Shenzhen's "The Linking Plan" is an innovative practice in micro-ecological restoration and collaborative biodiversity conservation within a high-density megacity. It focuses on addressing urban ecological disconnections and protecting microhabitats, engaging the public to care for wildlife habitats and build life-sustaining passages for them. To date, more than 100 ecological "bridges" of various types and 10 micro-ecological conservation sites have been constructed, effectively connecting the city's micro-ecological circulation and providing a Chinese model for balanced development and biodiversity conservation in megacities worldwide.

BACKGROUND AND CHALLENGES

With rapid urban development, certain urban infrastructure elements have created "ecological traps"—such as transparent glass curtain walls causing bird collisions and fatalities, steep artificial embankments blocking animal's vital activities, and hardened slope protections cutting off passageways for small animals sometimes can even directly lead to their entrapment or death. How to bridge these ecological gaps at the micro-scale and safeguard the spatial right to survival of non-human life in cities has become an urgent challenge that all major cities must address.

ACTIONS AND MEASURES

ESTABLISHING A MICRO-ECOLOGICAL RESTORATION PLATFORM

Drawing on the findings of biodiversity surveys and using data from ecological traps and ecological disconnections as a foundation, the project deployed biodiversity-friendly facilities, such as ecological floating islands, bird-collision prevention stickers, insect houses, Benjes Hedge, and rope-net ramps, tailored to local conditions to minimize the impact of man-made structures on wildlife. By 2025, more than 100 "bridges" of various types have been constructed, forming 10 micro-ecological conservation sites, each equipped with educational interpretive signs.

“万桥计划”主形象与衍生品
Main Visual and Merchandise for the “The Linking Plan”



打造深圳特色“万桥计划”品牌

通过构建特色视觉体系，增强公众对生态保护的认同感和参与感。打造“万桥计划”品牌logo及其延展设计，包括科普图册、文创、户外装备等。

强化科普教育， 推动成果转化

将自然博物与生物多样性保护结合，打破空间边界，在“坪山全域自然博物”小程序增加“万桥计划”专属板块，打造全民参与的科普平台；制作《深圳市蝴蝶生态图鉴》等科普读物；联动权威媒体发布推文及视频，扩大影响力。

成就与价值

品牌引领示范价值

“万桥计划”入选深圳生态文明建设优秀案例及美丽中国建设实践案例，荣获深圳自然教育两项优秀奖，衍生词条收录于三联人文城市“光谱词典”，成

DEVELOPING THE SHENZHEN-SPECIFIC “THE LINKING PLAN” BRAND

By establishing a distinctive visual identity system, the project enhanced public identification with and participation in ecological conservation. It created the “The Linking Plan” brand logo and its extended designs, including educational brochures, cultural and creative products, and outdoor gear.

STRENGTHEN SCIENCE EDUCATION AND PROMOTE THE APPLICATION OF RESEARCH FINDINGS

The initiative integrated the natural history with biodiversity conservation to break down spatial barriers, added a dedicated “The Linking Plan” section to the “Walking Pingshan” mini-program to create a science education platform for public participation, produced science outreach publications such as the *Shenzhen Butterfly Ecological Atlas*, and collaborated with authoritative media outlets to publish articles and videos to expand the initiative's reach.

ACHIEVEMENTS AND VALUE

BRAND LEADERSHIP AND EXEMPLARY VALUE

The “The Linking Plan” was selected as an outstanding case study in Shenzhen's ecological civilization construction and a practical case study in the “Beautiful China” initiative. It won two Excellence Awards in Shenzhen's Nature Education Awards, related terms were included

▼ 万桥计划活动照片
Photos from the “The Linking Plan”



果亮相第五届世界生物圈保护区大会文创联展。小程序“万桥计划”专属板块，上线以来，累计访问量达39万人次，截至2025年，总阅读量超10万，有效扩大“万桥计划”知晓度和影响力。

微观生态修复价值

项目坚持由点及面、因地制宜的建设思路，以万物筑“万桥”为理念，针对传统宏观生态建设普遍存在的微观生境缺失、生态节点不足等问题，开展精细化小微生态修复，有效填补宏观生态工程在微观尺度的建设空白。

全民参与

项目创新科普形式、丰富实践活动、搭建交流平台，推动公众由生态保护的旁观者转变为参与者与受益者。从政企协同联动到市民主动参与，多元主体共同推动生态理念深入城市肌理，营造“人人为生态”的文化氛围，持续汇聚生态保护合力。

互联万物、和谐共生

项目通过布设生物友好设施打通野生动物回归栖息地的“最后一公里”，切实提升野生动物存活概率。并依托“1+1+1+N”模式（1个IP、1套科普读本、1个科普小程序、N场共建活动及微型生态保护点）打造沉浸式自然课堂。

经验与启示

深圳市率先将生态保护延伸至微观尺度，通过化“断点”为“接点”的系统干预，切实提升野生动物生存繁衍概率；以科普创新与平台搭建激发全民共建共治共享活力，依托品牌化运营及在地视觉表达推动生态理念转化为广泛的公众行动实践。深圳借助数据驱动管理体系构建长效治理机制，形成了适配超大城市的生态保护解决方案，为超大城市生态保护工作提供了可复制、可推广的实践典范。

in Sanlian City for Humanity's Spectrum Dictionary, and its achievements were showcased at the Cultural and Creative Joint Exhibition of the 5th World Conference of Biosphere Reserves. Since its launch, the dedicated section for the "The Linking Plan" on the mini-program has attracted a cumulative total of 390,000 visits. As of 2025, the total number of page views has exceeded 100,000, effectively expanding the initiative's visibility and influence.

VALUE OF MICRO-SCALE ECOLOGICAL RESTORATION

The project adheres to a construction approach that progresses from individual sites to a boarder landscape and is tailored to local conditions. Guided by the concept of "Building Ten Thousand Bridges with All Wildlife," it addresses issues commonly found in traditional macro-scale ecological construction—such as the lack of microhabitats and insufficient ecological nodes—by carrying out precise, small-scale ecological restoration, thereby effectively filling the gaps left by macro-scale ecological projects at the micro-scale.

PUBLIC PARTICIPATION

Through innovative science communication, diverse activities, and platform-building, the initiative transforms the public from bystanders in ecological conservation into active participants and beneficiaries. From government-business collaboration to citizen-led initiatives, the participation of diverse stakeholders has allowed ecological concepts to permeate the urban fabric, fostering a cultural atmosphere where "everyone contributes to the ecosystem" and uniting efforts for conservation.

INTERCONNECTING ALL THINGS, HARMONIOUS COEXISTENCE

By establishing wildlife-friendly infrastructure, the "last mile" for wildlife returning home is bridged, effectively increasing their chances of survival. Leveraging the "1+1+1+N" model (1 exclusive IP, 1 set of popular science readers, 1 popular science mini-program, and N co-construction activities as well as micro ecological conservation sites), the project builds an immersive nature classroom.

EXPERIENCES AND INSIGHTS

Shenzhen has taken the lead in extending ecological conservation to the micro-level, effectively increasing the chances of wildlife survival and reproduction through systematic interventions that transform "disconnections" into "connections". By fostering the vitality of public co-construction, governance and sharing through innovative science communication and platform development, and by leveraging branded operations and locally relevant visual expressions to translate ecological concepts into widespread public action, Shenzhen has established a long-term governance mechanism through a data-driven management system. This has resulted in an ecological conservation solution tailored to megacities, providing a replicable and scalable model for ecological conservation efforts in such urban centers.

YANTIAN DISTRICT, SHENZHEN 深圳盐田区



Xiaomeisha : The EOD Model Leads the Way in the Synergistic Development of Biodiversity Conservation and the Green Economy

小梅沙：EOD模式引领生物多样性保护与绿色经济协同发展

关键词

生态环境导向开发(EOD)；生物多样性保护；陆海统筹

案例名片

小梅沙EOD项目以生态环境导向开发模式(EOD)统筹生物多样性保护与城市高质量发展，通过陆海统筹的系统修复，恢复本土物种栖息地、保育珊瑚礁生态系统，构建连通自然的“山—城—海”生态廊道；创新生态产品价值转化路径，实现城市生物多样性保护对绿色经济的引领，为面临类似“开发与保护”矛盾的滨海城市提供借鉴参考。

KEYWORDS

Eco-environment Oriented Development (EOD), Biodiversity Conservation, Integrated Land-Sea Coordination

CASE PROFILE

The Xiaomeisha EOD project integrates biodiversity conservation with high-quality urban development through the Eco-environment Oriented Development (EOD) model. By implementing systematic land-sea integrated restoration, it restores habitats for native species, conserves coral reef ecosystems, and establishes an ecological corridor connecting the mountains, the city, and the sea. It pioneers innovative pathways for realizing the value transformation of ecological products, enabling urban biodiversity conservation to drive the green economy, and serves as a reference for coastal cities facing similar "development versus conservation" dilemmas.

背景与问题

小梅沙片区地处深圳市盐田区梅沙街道，拥有稀缺的山海沙滩与珊瑚礁生态，是珠三角知名滨海旅游地，也是深圳全球海洋中心城市重点承载片区。伴随城市开发与旅游活动增强，片区多重发展矛盾凸显：流域及近海水质难以稳定达标、岸线侵蚀退化、珊瑚礁与生物多样性承压；生态资源转化路径不足；同时治理体系不完善，陆海统筹、多要素协同管控缺位，生态保护与开发建设难以良性统筹，制约区域可持续发展。

行动与措施

构建政企协同治理框架

成立EOD项目领导小组，建立跨部门多方协同管理制度，组建深圳市特发小梅沙投资发展有限公司作为项目实施主体，统筹全域项目整体投资建设、生态保护、片区开发、运维管理与产业培育全流程工作。

开展陆海生态要素系统修复

结合现状基底划分2个生态保育单元、1个旅游发展单元实施精细化管理，构建1条陆海生态廊道，对生态廊道两侧进行生态保育与修复，实现山、海、城的有效连通；针对潮汐带、珊瑚礁、海藻场、红树林等关键栖息地划定严格保护区与缓冲区，种植和保育珊瑚约2000平方米，在珊瑚礁群落分布区布设海洋野生动物监测点。在严格保护风水林古树群落的基础上，补植2400余株蜜源植物，针对性提升传粉昆虫多样性；实施3.3万平方米砂质沙滩100%修复，排查治理滨海旅游单元周边入海污染源，小梅沙河流域补充沉水植物、净藻生物与水生动物，营造完整的水生生态群落，持续改善区域水环境质量。

BACKGROUND AND ISSUES

The Xiaomeisha area is located in Meisha Subdistrict, Yantian District, Shenzhen. Boasting a rare combination of mountains, sea, beaches, and coral reef ecosystems, it is a renowned coastal tourist destination in the Pearl River Delta and a core area for Shenzhen's status as a Global Marine Center City. As urban development and tourism activities intensified, multiple development conflicts became increasingly apparent: water quality in river basins and nearshore waters struggled to consistently meet standards; shoreline erosion and degradation occurred; and coral reefs and biodiversity were under pressure. Furthermore, pathways for converting ecological resources were insufficient. At the same time, the governance system remained inadequate, lacking integrated land-sea management and coordinated control of multiple factors, which makes it difficult to balance ecological protection and exploitation and construction, thereby constraining the region's sustainable development.

ACTIONS AND MEASURES

ESTABLISHING A FRAMEWORK FOR COLLABORATIVE GOVERNANCE BETWEEN GOVERNMENT AND THE PRIVATE SECTOR:

Shenzhen established an EOD project leadership group, developed a cross-departmental, multi-stakeholder collaborative management system, and set up Shenzhen SDG Xiaomeisha Investment and Development Co., Ltd. as the project implementation entity to coordinate the entire process—including overall investment and construction, ecological conservation, area development, operations and maintenance, and industrial cultivation—across the entire project area.

CARRYING OUT SYSTEMATIC RESTORATION OF TERRESTRIAL AND MARINE ECOLOGICAL ELEMENTS

Based on the current landscape, two ecological conservation units and one tourism development unit were designated for refined management; a terrestrial-marine ecological corridor was established, with conservation and restoration being conducted along both sides to achieve effective connectivity between mountains, the sea, and the city. Strict protection zones and buffer zones were designated for key habitats such as intertidal zones, coral reefs, seaweed beds, and mangroves; approximately 2,000 square meters of coral were planted and conserved; and marine wildlife monitoring stations were established in coral reef distribution areas. Building upon the strict protection of ancient tree groves in the fengshui forest, over 2,400 nectar-producing plants were replanted to specifically enhance pollinator diversity. The place also carried out 100% ecological restoration across 33,000 square meters of sandy beaches, identified and remediated pollution sources discharging into the sea around the coastal tourism areas, as well as introducing submerged plants, algae-consuming organisms, and aquatic animals into the Xiaomeisha River basin to build a complete aquatic ecosystem and continuously improve regional water quality.



▲ 小梅沙·国际都市亲海度假区航拍
Aerial View of Xiaomeisha International Coastal Resort

提升生态基础设施

新建环境教育平台、叠翠湖郊野公园生态科普展示中心，以及1.8公里贯通海滨与山地的森林步道，连接北部山体、叠翠湖、南部城区、沙滩及海域。通过环湖森林步道、溪谷碧道等，将叠翠湖打造为集运动、休闲、文化于一体的郊野公园。

建立产业收益反哺机制

发展海洋研学、自然教育等生态友好产业，破除单一海岸旅游模式，建立产业收益反哺生态环境投入的良性机制，实现项目收支平衡，确保生物多样性保护的可持续资金来源。

成效与价值

片区陆海生态环境质量全面提升，叠翠湖及小梅沙河水质稳定达到地表水Ⅱ类标准，近岸海域达Ⅰ类海水标准；沙滩实现100%生态修复，珊瑚礁覆盖率提升，传粉昆虫显著增加，水生动植物群落结构持续优化，生态系统连通性与稳定性大幅提升，生物多样性显著增强。

ENHANCING ECOLOGICAL INFRASTRUCTURE

A new environmental education platform and an ecological science exhibition center were constructed at Diecui Lake Country Park. A 1.8-kilometer forest trail connecting the seaside to the mountains was built, linking the northern hills, Diecui Lake, the southern urban area, the beach, and the coastal waters. Through the lakeside forest trail, stream valley greenways, and other features, Diecui Lake was developed into a country park that integrates sports, recreation, and culture.

ESTABLISHING A MECHANISM FOR REINVESTING INDUSTRY PROFITS

Eco-friendly industries such as marine study tours and nature education were developed, moving beyond a single-dimensional coastal tourism model. The project also established a virtuous cycle in which industry profits were reinvested in ecological conservation efforts, achieving project financial balance and expenditures and ensuring a sustainable funding source for biodiversity conservation.

ACHIEVEMENTS AND VALUE

The quality of the land and marine ecosystems in the area has improved across the board. Water quality in Diecui Lake and the Xiaomeisha River has consistently met Class II surface water standards, while nearshore waters have reached Class I seawater standards. Beaches have achieved 100% ecological restoration, coral reef coverage has increased, pollinator populations have grown significantly, and the structure of aquatic plant and animal communities continues to optimize. Ecosystem connectivity and stability have significantly improved, leading to a marked increase in biodiversity.



报喜斑粉蝶 三洲田
Red-base Jezebel (*Delias pasithoe*
Linnaeus, 1767) photographed at
Sanzhoutian

优美生态成功转化为发展动能，2025年实现营收约2.15亿元，生态科普展示中心及环境教育基地累计接待研学团队数万人次，全民参与保护氛围浓厚。项目作为深圳市首个入选国家生态环保金融支持项目储备库的EOD项目，带动区域就业与社区发展，实现了城市生物多样性保护与经济高质量发展的双赢。

The beautiful ecosystem has successfully been transformed into a driver of development. In 2025, revenue reached approximately 215 million yuan, and the Ecological Science Exhibition Center and Environmental Education Base collectively welcomed tens of thousands of study tour participants, fostering a strong atmosphere of public engagement in conservation. As Shenzhen's first EOD project selected for the National Reserve Pool for Ecological and Environmental Protection Financial Support Projects, the project has stimulated regional employment and community development, achieving a win-win outcome for both urban biodiversity conservation and high-quality economic development.

经验与启示

成立专项EOD项目领导小组

搭建跨部门协同管理制度与规范化治理架构，形成政企联动、权责清晰、全域统筹的协同治理模式。

统筹全生态要素系统修复

立足山、城、海全域生态格局，统筹陆域植被、流域水系、海洋生境、沙滩岸线等全生态要素系统修复，全面提升片区生物多样性与生态连通性。

创新生态产品价值实现路径

依托优质滨海生态资源，创新突破传统旅游模式，把生态环境治理项目和关联性产业开发项目统筹实施，引导发展海洋研学、自然教育等生态友好型产业，建立产业收益反哺生态保护的良性机制，实现生态保护与片区可持续发展动态平衡。

EXPERIENCE AND INSIGHTS

ESTABLISHING A DEDICATED EOD PROJECT LEADERSHIP GROUP

The project has built a cross-departmental collaborative management system and a standardized governance framework to form a collaborative governance model characterized by government-enterprise coordination, clearly defining responsibilities, and comprehensive, region-wide planning.

COORDINATING SYSTEMATIC RESTORATION ACROSS ALL ECOLOGICAL ELEMENTS

Grounded in the holistic ecological framework of mountains, city, and sea, The district has coordinated the systematic restoration of all ecological elements—including terrestrial vegetation, river basins, marine habitats, sandy beaches, and coastlines—to comprehensively enhance regional biodiversity and ecological connectivity.

PIONEERING INNOVATIVE PATHWAYS FOR ECOLOGICAL PRODUCT VALUE REALIZATION

Leveraging high-quality coastal ecological resources, the project has innovated and broken away from traditional tourism models by coordinating the implementation of ecological restoration projects alongside related industrial development. It has promoted eco-friendly industries such as marine study tours and nature education, established a virtuous cycle where industrial profits feed back into ecological conservation, and achieved a dynamic balance between conservation and sustainable regional development.

GUANGMING DISTRICT, SHENZHEN 深圳市光明区

Hongqiao Park : A Pathway for the Ecologically Integrated Development of Urban Parks Based on Low-Impact Development

虹桥公园：基于低影响开发的城市公园 生态融合发展路径

关键词

城市公园；低影响生态营建；自然教育融合发展

案例名片

虹桥公园位于深圳光明科学城核心区，是豹猫、金毛狗、黄胸鹀等23种国家重点保护物种的栖息地，通过“政府主导+企业运营”的模式，践行“最小干预自然”原则，实现生态、科普、文旅融合发展，为高密度城区城市公园建设及生物多样性保护探索路径。

背景与问题

虹桥公园位于深圳光明科学城核心区，是超大城市中承担生物多样性保护功能的关键生态空间。在快速城市化与高层次人才集聚背景下，如何在高度城市化的空间约束下协同优化生态保育、满足科学城市民对高品质生态体验、沉浸式自然教育的多元需求，是本案例面临的核心问题。

KEYWORDS

Urban Parks; Low-Impact Ecological Construction; Integrated Development of Nature Education

CASE PROFILE

Located in the core area of Shenzhen's Guangming Science City, Hongqiao Park serves as a habitat for 23 nationally protected species, including the leopard cat (*Prionailurus bengalensis*), Golden Chicken Fern (*Cibotium barometz* (L.) J. Sm.), and Yellow-breasted Bunting (*Emberiza aureola*). Through a "government-led, enterprise-operated" model, the park adheres to the principle of "minimal intervention in nature," fostering the integrated development of ecology, science education, and cultural tourism, and exploring new approaches to urban park development and biodiversity conservation in high-density urban areas.

BACKGROUND AND CHALLENGES

Hongqiao Park, situated in the core area of Shenzhen's Guangming Science City, is a key ecological space that fulfils the function of biodiversity conservation within a megacity. Against a backdrop of rapid urbanization and the concentration of high-caliber talent, the central challenge addressed in this case study is how to synergistically optimize ecological conservation whilst meeting the diverse needs of citizens in the science city for high-quality ecological experiences and immersive nature education—all within the constraints of a highly urbanized environment.



虹桥公园全景
Panoramic View of Hongqiao Park

行动与措施

低影响建设

虹桥公园遵循低干预原则，核心景观“虹桥”采用4公里长架空栈桥设计，最大程度减少对地表生态的直接干扰，保障动植物自由穿行。同时，公园实施海绵城市实践，通过透水铺装、雨水花园及下凹地形，收集净化雨水，实现水资源循环利用，缓解城市内涝。

开展生物多样性本底调查与监测

开展系统性生物多样性本底调查工作，实现生物多样性调查网格100%全覆盖。围绕黄胸鹀、豹猫、金毛狗等珍稀濒危物种建立公园进行常态化监测。

开展珍稀物种保护与栖息地修复

基于生物多样性调查结果，针对性优化栖息环境，依托现有溪流改善动物、鸟类饮水及觅食条件，提升虎纹蛙、金毛狗等国家重点保护物种的原生栖息地质量，营造适宜本土蝶类繁衍栖息的近原生境。

ACTIONS AND MEASURES

LOW-IMPACT CONSTRUCTION

Hongqiao Park adheres to the principle of minimal intervention. Its central landmark, the "Hongqiao," features a 4-kilometer-long elevated boardwalk designed to minimize direct disruption to the surface ecosystem and ensure that flora and fauna can move freely through the area. At the same time, the park implements "sponge city" practices, using permeable paving, rain gardens, and sunken terrain to efficiently collect and purify rainwater, thereby enabling the recycling of water resources and alleviating urban flooding.

BIODIVERSITY BASELINE SURVEYS AND MONITORING

Systematic biodiversity baseline surveys were carried out to achieve 100% coverage of the biodiversity survey grid. Routine monitoring programs were established for rare and endangered species such as the Yellow-breasted Bunting, leopard cat, and Golden Chicken Fern.

CONSERVATION OF RARE SPECIES AND HABITAT RESTORATION

Based on the results of biodiversity surveys, The city optimized habitats in a targeted manner, leveraging existing streams to improve drinking and foraging conditions for animals and birds. The quality of natural habitats for nationally protected species such as the Chinese Tiger Frog (*Hoplobatrachus chinensis*) and the Golden Chicken Fern was enhanced, and near-natural habitats suitable for the reproduction and habitation of native butterfly species were created.



▲ “虹光森友会”自然教育志愿者服务
“Hongguang Nature Friends” Nature Education Volunteer Service

自然教育与公众参与

打造虹桥公园自然教育中心，建设全长约1公里的“光明区生物多样性科普廊道”，结合户外科普小径，构建“室内教学+户外实践”的自然教育空间体系。研发符合本土生态特色的自然教育课程体系，组建自然教育解说团队，常态化开展自然教育课程与户外活动，拍摄《一切万物皆放光明》纪录片，推动形成社会参与保护合力。

成效与价值

通过低干扰生态保护与原生境优化营造，虹桥公园本土物种栖息环境持续改善。虹桥公园森林覆盖率达91.8%，园内记录植物202种、鸟类46种，并获国际蝴蝶脉络认证“蝴蝶园”，成为都市型生态廊道与生物多样性保护的典范。红外相机多次记录到豹猫携三只幼崽活动画面，单次观测到40余只国家一级保护动物黄胸鹀，分布面积约200平方米的金毛狗种群得到有效保护。

NATURE EDUCATION AND PUBLIC PARTICIPATION

The Hongqiao Park Nature Education Center was established, and the “Guangming District Biodiversity Science Education Corridor,” approximately 1 kilometer in length, was constructed. By integrating this with outdoor science education trails, a nature education system combining “indoor instruction with outdoor practice” was built. The place developed a nature education curriculum system tailored to local ecological characteristics, established a team of nature education interpreters, regularly conducted nature education courses and outdoor activities, and produced the documentary *All Things Shine with Light* to foster a collective effort for conservation through public participation.

ACHIEVEMENTS AND VALUE

Through low-impact ecological conservation and habitat optimization, the living environment for native species in Hongqiao Park has continued to improve. With a forest coverage rate of 91.8%, the park is home to 202 recorded plant species and 46 bird species. It has been certified as a “Butterfly Garden” by the International Butterfly Network and has become a model for urban ecological corridors and biodiversity conservation. Infrared cameras have repeatedly captured images of leopard cats moving about with three cubs. In a single observation, more than 40 Yellow-breasted Bunting—a Class I nationally protected species—were spotted. A population of Golden Chicken Fern covering an area of approximately 200 square meters has been effectively protected.

构建多层次自然教育体系，2025年开展活动84场覆盖超6万人次，并获多项国内外设计大奖；2025年接待游客超120万人次，带动商户营收达千万元级别，助力光明区旅游收入达到88.5亿元，文体娱乐业、住宿业增速均居全市首位，实现生态、社会、经济效益协同跃升。

经验与启示

虹桥公园以生物多样性本底调查数据为依据，精准识别珍稀物种分布与关键栖息环境，在规划建设中有机关融合低影响开发理念与栖息地质量提升，通过架空栈桥等低干扰设施避让重要生态空间，同步依托常态化监测数据编制本土化自然教育课程，形成了“调查监测—精准修复—低扰建设—科普转化”的闭环管理模式。

By establishing a multi-tiered nature education system, the district organized 84 events in 2025, reaching over 60,000 participants, and won numerous domestic and international design awards. In 2025, it welcomed more than 1.2 million visitors, driving business revenue to the tens of millions of yuan level and contributing revenue reach 8.85 billion yuan to Guangming District's tourism revenue. The growth rates of both the culture, sports, and entertainment sector and the lodging sector ranked first in the city, achieving a synergistic leap in ecological, social, and economic benefits.

EXPERIENCES AND INSIGHTS

Based on baseline biodiversity survey data, Hongqiao Park has accurately identified the distribution of rare species and their key habitats. During planning and construction, the park has organically integrated the principles of low-impact development with habitat quality improvement. It has used low-impact facilities, such as elevated boardwalks, to avoid important ecological areas, while simultaneously developing localized nature education curricula based on routine monitoring data. This has resulted in a closed-loop management model comprising "survey and monitoring—precise restoration—low-impact construction—science outreach."

虹桥公园发现濒危植物——福建观音座莲

Endangered Plant Discovered in Hongqiao Park—*Angiopteris fokiensis* Hieron



SHENZHEN DAPENG NEW AREA
深圳市大鹏新区

Rebuilding Habitats for the Return of Common Birdwing Butterflies

重建栖息家园，裳凤蝶保育回归

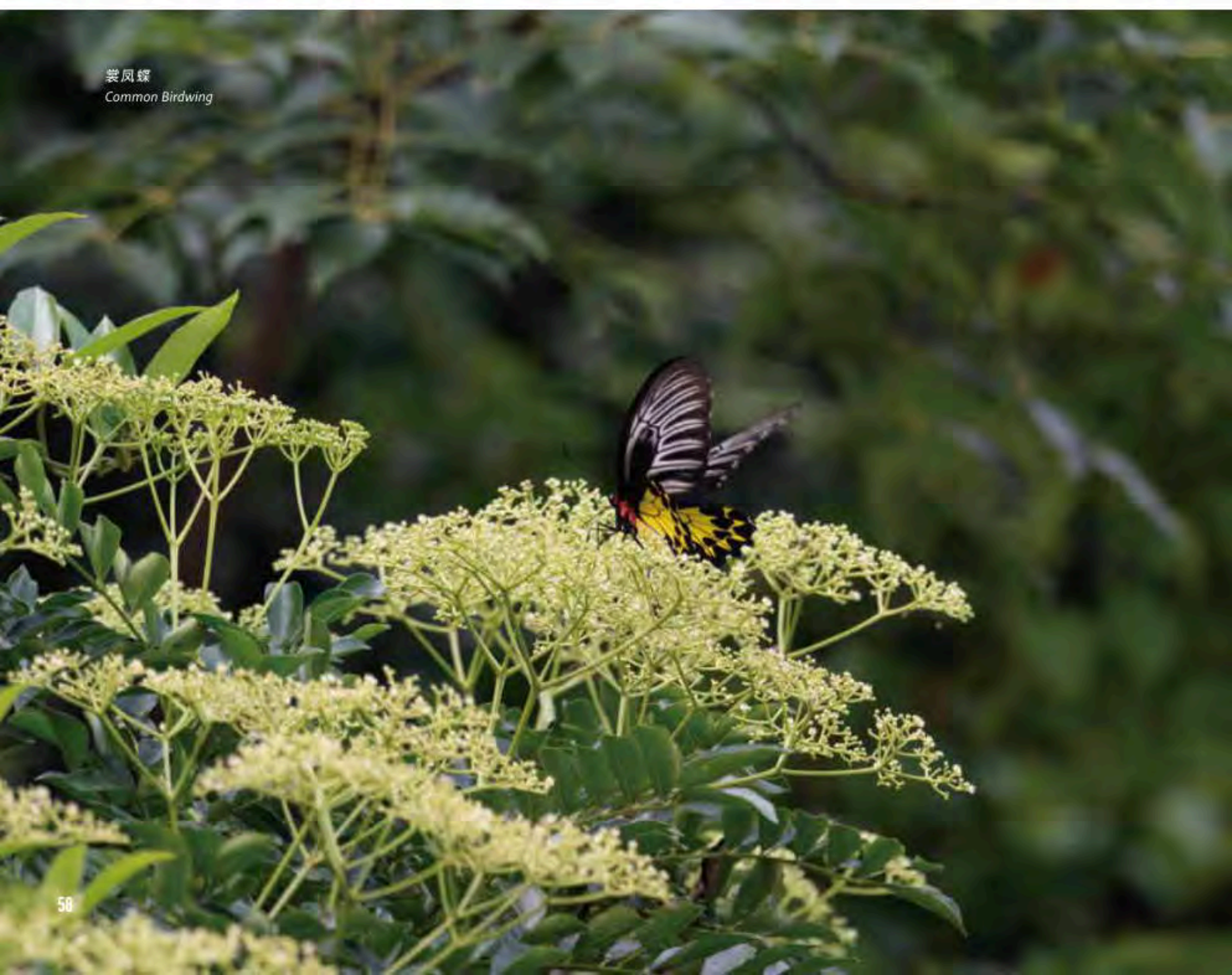
关键词

就地保护；栖息地修复；动态监测；寄主植物；
全民参与；裳凤蝶；保育

KEYWORDS

In-situ conservation; habitat restoration; dynamic monitoring; host
plants; public participation; Common Birdwing; conservation

裳凤蝶
Common Birdwing



案例名片

深圳市大鹏新区连续3年开展蝴蝶多样性调查监测，掌握了包括裳凤蝶在内的珍稀物种分布与种群动态。通过种植寄主植物修复栖息地，仅2个月后就成功助力裳凤蝶野外自然繁殖，从而构建起“调查监测、精准修复、动态评估”的珍稀蝶类保育模式和“政府+科研机构+公众”保育裳凤蝶行动体系，为大湾区人口密集城市的珍稀昆虫保护提供了实践参考。

背景与问题

受城市化、生境破碎化及人为干扰叠加影响，裳凤蝶生存形势严峻，该物种野外分布狭窄，仅两处点位保有规模微小且稳定性较差的种群，另有三处点位仅偶见单只个体，种群抗风险能力不足，并且局部灭绝的风险；叠加栖息地严重退化及寄主植物耳叶马兜铃资源匮乏等问题，幼虫繁育链条濒临断裂。

行动与措施

实施精准栖息地修复

依托裳凤蝶幼虫核心寄主耳叶马兜铃开展植被重建。前期勘察林缘、河谷、次生林等成虫活动区域，匹配繁殖周期确定种植时序；栽植时严把苗木质量，参照自然群落布设植株密度并配套种植蜜源植物，构筑复合型核心微栖息地。

CASE PROFILE

For three consecutive years, Dapeng New District of Shenzhen has carried out surveys and monitoring of butterfly diversity, gaining an understanding of the distribution and population dynamics of rare species including the Common Birdwing. By planting host plants, a 50-square-metre habitat was restored, and merely two months later, the natural breeding of Common Birdwings in the wild was successfully facilitated. On this basis, a conservation model for rare butterflies featuring "survey and monitoring, targeted restoration, dynamic assessment" and a Common Birdwing conservation action system of "Government + Research Institutions + Public" have been established, which offers practical references for the conservation of rare insects in densely populated cities within the Greater Bay Area.

BACKGROUND AND CHALLENGES

Affected by urbanization, habitat fragmentation, and human disturbance, the Common Birdwing population faces a severe crisis: its wild distribution is limited, with extremely small and unstable populations at only two sites, and isolated individuals occasionally observed at three other sites. The species has low resilience and is at risk of local extinction. At the same time, severe habitat degradation and a shortage of its host plant (*Aristolochia auriculata*) have disrupted the larval breeding chain, pushing it to the brink of collapse.

ACTIONS AND MEASURES

IMPLEMENT TARGETED HABITAT RESTORATION

Aristolochia auriculata is the primary host plant for the butterfly's larvae and serves as the core component of habitat restoration. Prior to planting, field surveys were conducted to identify areas of concentrated adult activity (forest edges, river valleys, secondary forests, etc.), and the planting schedule was determined based on the breeding season; during planting, seedling quality was strictly controlled, and the plant spacing and density were set to simulate natural communities, and nectar-producing plants were incorporated to form a composite vegetation structure, thereby creating core microhabitats.

裳凤蝶幼虫啃食野化的耳叶马兜

The larvae of *Troides helena* feed on wild *Aristolochia tagala*



建立栖息地动态监测机制

栖息地修复完成后，建立种群动态监测机制，每月开展1-2次调查，系统记录裳凤蝶产卵、孵化、取食、化蛹、羽化及交配等关键生活史数据，并同步监测寄主植物与蜜源植物的生长状况。修复仅两个月即观测到卵至成虫的完整繁殖周期，充分验证了精准修复方案的有效。

构建“政府+科研机构+公众参与” 保育裳凤蝶行动体系

联动科研机构与社会力量，通过科普讲座、拼图等普及裳凤蝶保护知识。组织亲子家庭走进保育区，在科研人员指导下亲手种植寄主植物，体验完整种植流程。“科普+体验”模式将专业保育转化为公众可参与的实践。

ESTABLISHING A MECHANISM FOR DYNAMIC HABITAT MONITORING

Following habitat restoration, surveys were conducted 1-2 times per month to systematically record key data on the Common Birdwing's egg-laying, hatching, feeding, pupation, wing-fluttering and mating behaviors. Simultaneously, the status of host plants and nectar sources was monitored to establish a mechanism for tracking population dynamics. Just two months later, the complete reproductive cycle—from egg to larva to pupa to adult—was documented, validating the scientific soundness of the targeted and precise restoration plan.

ESTABLISHING A “GOVERNMENT + RESEARCH INSTITUTIONS + PUBLIC PARTICIPATION” ACTION FRAMEWORK FOR THE CONSERVATION OF THE COMMON BIRDWING

By coordinating research institutions with social forces, the initiative disseminated knowledge about the conservation of the Common Birdwing through science outreach lectures and jigsaw puzzles. Families were organized to visit the conservation area, where, under the guidance of researchers, they planted host plants themselves and experienced the entire planting process firsthand. This “science outreach + hands-on experience” model transformed specialized conservation efforts into practical activities accessible to the public.

▼ 裳凤蝶公益科普活动中讲解员科普相关知识
A docent explains scientific knowledge during a public outreach event on the Common Birdwing



成效与价值

种群恢复成效突出

2025年9-12月连续监测证实保育区已初步形成裳凤蝶繁殖种群，并观测到完整繁殖生活史，累计记录婚飞2次、虫卵10枚、幼虫1头、蛹1个、成虫12只，种群出现频次相较2022年增长110%。以马兜铃属植物为寄主的红珠凤蝶种群同步扩增，保育地块显现珍稀蝶类聚集效果。

实证“寄主植物先行”的就地保育路径，区别于成本高昂的人工繁育野放模式，探明裳凤蝶种群存续限制因子，积累了超大城市边缘区珍稀物种与人居环境共存的实践经验。

多方协同机制成熟

项目构建起“政府引领、科研赋能、社会参与、公众践行”的良性保育机制，科研机构扮演“技术核心”角色，公众通过志愿服务、亲子种植、监测协助等方式深度参与，实现技术资源与社会资源的高效整合，破解了珍稀物种保育破碎化推进的困境。

可推广的保育模式

项目整合调查监测、精准修复、动态评估等核心环节，构建起“监测-保护-修复-评估”的完整闭环。前期通过全面调查掌握种群分布与核心需求，中期基于监测结果聚焦寄主植物种植、微环境优化等关键需求精准施策，后期持续跟踪种群数量变化与栖息地适配度动态优化。标准化流程设计大幅提升保护精准度与有效性。

经验与启示

极小种群保护须以精准调查为前提，坚持以科学摸底、精准实施和动态优化为原则，确保每项举措有据可依；栖息地修复须抓住物种生存核心需求，寄主植物是专性蝶类繁育根本，定向修复可快速见效；珍稀物种保育专业性强、涉及面广，需多方联动整合资源；公众参与是将专业保育转化为社会共识的关键。本项目为大湾区人口密集城市的珍稀昆虫保护提供了实践参考，为建设人与自然和谐共生的生物多样性友好城市树立了样板。

ACHIEVEMENTS AND VALUE

SIGNIFICANT POPULATION RECOVERY

Continuous monitoring from September to December 2025 have shown that a breeding population has begun to take shape in the conservation area. Breeding traces of the Common Birdwing were discovered at one site, with records of two nuptial flights, 10 eggs, one larva, one pupa, and 12 adults—forming a complete reproductive life cycle. This represents a 110% increase in recorded population frequency compared to 2022. At the same time, the breeding population of the Red-spotted Swallowtail—which also uses *Aristolochia* plants as hosts—has significantly increased, creating a clustering effect for these rare butterfly species.

This project has demonstrated an in-situ conservation approach based on the "host plant first" principle, which differs from the costly model of artificial propagation and reintroduction. It identified the factors limiting the persistence of the Common Birdwing population and accumulated practical experience in the coexistence of rare species and human settlements on the outskirts of megacities.

A MATURE MULTI-STAKEHOLDER COLLABORATION MECHANISM

The project has established a virtuous conservation mechanism characterized by "government leadership, scientific empowerment, social participation, and public engagement." Research institutions serve as the "technical core," while the public participates deeply through volunteer work, parent-child planting activities, and monitoring assistance. This approach achieves the efficient integration of technical and social resources, resolving the dilemma of fragmented and disjointed progress in rare species conservation.

A SCALABLE CONSERVATION MODEL

The project has integrated core components such as survey and monitoring, targeted restoration, and dynamic assessment to establish a complete closed-loop cycle of "monitoring—conservation—restoration—assessment." In the initial phase, comprehensive surveys were conducted to understand population distribution and core needs; in the intermediate phase, based on monitoring results, targeted measures were implemented to address key needs such as host plant cultivation and microenvironment optimization; and in the final phase, population changes and habitat suitability were continuously tracked and dynamically optimized. The standardized process design has significantly enhanced the precision and effectiveness of conservation efforts.

EXPERIENCES AND INSIGHTS

The conservation of extremely small populations must be premised on precise surveys, and follow the principle of conducting scientific baseline surveys, implementing targeted measures and carrying out dynamic optimization to ensure that every action is evidence-based; habitat restoration must address the core survival needs of the species—host plants are fundamental to the reproduction of obligate butterflies, and targeted restoration can yield rapid results; the conservation of rare species is highly specialized and wide-ranging, requiring multi-stakeholder collaboration to integrate resources; public participation is key to transforming professional conservation efforts into a social consensus. This project provides a practical reference for the conservation of rare insects in the densely populated cities of the Greater Bay Area and sets an example for building biodiversity-friendly cities where humans and nature coexist in harmony.

JIANGMEN CITY, GUANGDONG PROVINCE 广东省江门市

Leveraging the Cultural Heritage of Xiaoniaotiantang (Bird Paradise) to Advance Urban Biodiversity Conservation

“小鸟天堂”实景
On-site View of “Bird Paradise”

小鸟天堂文脉传承赋能城市生物多样性保护

关键词

文脉传承；生态影响减缓措施；智能监测；公众参与；基于自然的解决方案（NbS）

案例名片

小鸟天堂因巴金先生一篇美文而蜚声中外。江门市以古榕树生态核心为基石，赓续天马村世代“不伐榕、不捕鸟”的朴素生态伦理，将文学地标转化为系统保护与公众教育的鲜活载体。通过栖息地系统修复、生态影响减缓措施、智能监测网络构建及自然教育体系开发，形成了“社区共管—科技支撑—生态保护理念传播”的保护模式，实现了从地方保护地到国际范例的跃升，为城市密集区生物多样性保护提供了创新样本。

KEYWORDS

Cultural heritage continuity; ecological impact mitigation measures; intelligent monitoring; public participation; Nature-based Solutions (NbS)

CASE PROFILE

The “Bird Paradise” in Jiangmen City gained worldwide recognition due to a renowned literary work by the writer Ba Jin. Building upon the ecological foundation of the ancient banyan tree ecosystem, Jiangmen City has inherited the generations-old local ecological ethic of Tianma Village, which advocates “protecting banyan trees and refraining from catching birds.” By transforming a literary landmark into a dynamic platform for systematic conservation and public education, the city has developed an integrated conservation model featuring habitat restoration, ecological impact mitigation measures, intelligent monitoring networks, and nature education systems. This approach has established a conservation framework of “community co-management—technological support—dissemination of ecological conservation concepts,” achieving a transition from a locally protected site to an internationally recognized example and providing an innovative model for biodiversity conservation in densely populated urban areas.

背景与问题

小鸟天堂国家湿地公园位于江门市新会区城市边缘，拥有“独木成林、万鸟栖居”的湿地—森林复合生态系统。随着城市化推进，公园面临生态空间保护压力、基础设施建设干扰、公众生态认知不足和社会参与渠道有限等挑战，亟需探索城市发展与生物多样性保护协同推进路径。

行动与措施

传承传统生态伦理， 推动社区共治

保护工作遵循天马村“不伐榕、不捕鸟”的传统生态伦理，充分尊重当地社区的文化价值及其对土地、领地、资源的权利与传统知识。湿地公园建立后，成立社区共管委员会，保障社区居民充分、有效、包容地参与保护管理决策，将乡土智慧与现代治理结合，形成共建共治共享的长效保护机制。

实施系统生态修复， 恢复关键栖息地功能

开展天马河等区域生态修复，恢复自然岸线15.77公里，重建水生植被群落，优化生态空间格局。通过恢复关键栖息地功能、提升水系连通性，累计恢复鸟类栖息地约27万平方米，构建有利于物种繁殖迁徙的区域生态网络。

创新生态友好型工程， 减缓生态影响

2017年，为降低江湛铁路建设与运营通车噪声对鸟类栖息的影响，项目投入约1.8亿元，针对铁路干扰区段建设长2公里的全球首例高速铁路拱形全封闭声屏障，有效降低列车噪声约20分贝，并通过优化照明设计减少生态干扰。

强化科技支撑， 构建智能监测管理体系

公园建立“人工监测+智能感知”综合监测网络，开展鸟类长期调查，并布设60台4G红外相机和环境传感设备，实现重点区域生态数据实时监测，为精准保护提供支撑。

BACKGROUND AND CHALLENGES

The Bird Paradise National Wetland Park is located on the urban fringe of Xinhui District, Jiangmen City, and features a wetland-forest composite ecosystem characterized by “a single tree forming a forest and thousands of birds inhabiting the area.” With the advancement of urbanization, the park faces challenges including pressure on ecological space conservation, disturbances from infrastructure construction, insufficient public awareness of ecological protection, and limited channels for social participation. There is an urgent need to explore pathways for promoting coordinated development between urban growth and biodiversity conservation.

ACTIONS AND MEASURES

INHERITING TRADITIONAL ECOLOGICAL ETHICS AND PROMOTING COMMUNITY CO-GOVERNANCE

Conservation efforts have followed the traditional ecological ethic of Tianma Village, which advocates “not cutting down banyan trees and not catching birds,” fully respecting the cultural values of local communities, as well as their rights to land, territories, resources, and traditional knowledge. After the establishment of the wetland park, a community co-management committee was established to ensure that local residents could participate fully, effectively, and inclusively in conservation management decisions. By integrating local wisdom with modern governance, the park has developed a long-term conservation mechanism based on joint development, co-governance, and shared benefits.

IMPLEMENTING SYSTEMATIC ECOLOGICAL RESTORATION AND RESTORING KEY HABITAT FUNCTIONS

Ecological restoration was carried out in areas such as the Tianma River, restoring 15.77 kilometers of natural riverbanks, rebuilding aquatic vegetation communities, and optimizing the ecological spatial pattern. By restoring key habitat functions and improving water system connectivity, approximately 270,000 square meters of bird habitats were restored, creating a regional ecological network conducive to species reproduction and migration.

DEVELOPING INNOVATIVE ECO-FRIENDLY ENGINEERING SOLUTIONS TO MITIGATE ECOLOGICAL IMPACTS

In 2017, to reduce the impact of noise generated during the construction and operation of the Jiangmen-Zhanjiang Railway on bird habitats, the project invested approximately RMB 180 million to construct the world's first fully enclosed arched noise barrier for a high-speed railway along a 2-kilometer section affected by railway disturbances. The facility effectively reduced train noise by approximately 20 decibels and reduced ecological disturbances through optimized lighting design.

STRENGTHENING TECHNOLOGICAL SUPPORT AND ESTABLISHING AN INTELLIGENT MONITORING AND MANAGEMENT SYSTEM

The park established an integrated monitoring network combining “manual monitoring and intelligent sensing.” Long-term bird surveys were conducted, and 60 4G infrared cameras and environmental sensing devices were deployed to achieve real-time monitoring of ecological data in key areas, providing support for precise conservation.

以文化为纽带推动生物多样性保护主流化

深入挖掘本土生态文化内涵，以巴金文化为线索打造沉浸式生态研学路线，联合高校开发涵盖鸟类、植物、昆虫、湿地功能等内容的12门自然教育课程，推动保护理念从景观欣赏向文化认同与可持续行为转变。同时，积极拓展国际传播渠道，向世界分享湿地保护、社区共管等融合传统文化智慧的中国生态文明实践经验。

成效与价值

经过持续治理，小鸟天堂生态质量显著提升。截至2025年，公园记录野生鸟类由建设前的105种增加至131种，其中包含黄胸鹀等国家重点珍稀保护鸟类23种。

自然教育体系累计服务公众超百万人次，志愿者超过300人，2010年，小鸟天堂亮相上海世

PROMOTING BIODIVERSITY CONSERVATION MAINSTREAMING THROUGH CULTURAL CONNECTIONS

By deeply exploring the local ecological and cultural heritage, the park developed immersive ecological study tours centered around Ba Jin's cultural legacy. In collaboration with universities, the park developed 12 nature education courses covering birds, plants, insects, wetland functions, and other topics, promoting a transition of conservation concepts from landscape appreciation to cultural identity and sustainable behaviors. Meanwhile, the park actively expanded international communication channels to share China's ecological civilization practices with the world, including integrated approaches to wetland conservation and community co-management that incorporate traditional cultural wisdom.

ACHIEVEMENTS AND VALUE

Through continuous management and conservation efforts, the ecological quality of the "Bird Paradise" has been significantly improved. By 2025, the number of wild bird species recorded in the park has increased from 105 species before the construction of the park to 131 species, including 23 species of nationally protected rare birds such as the Yellow-breasted Bunting.

The nature education system has cumulatively served more than one million members of the public, with over 300 volunteers participating in related activities. In 2010, the "Bird Paradise" was presented at the Shanghai World

▼ 江湛铁路全球首例高速铁路拱形全封闭声屏障
The World's First Fully Enclosed Arch-Shaped Sound Barrier for High-Speed Railways on the Jiangmen-Zhanjiang Railway



博会，2025年入选大阪世博会中国馆展示，以“独木成林，万物共生”为主题，生态传播覆盖全球多个国家和地区。小鸟天堂实现了文化价值、生态价值和社会价值协同提升，成为城市生物多样性保护与生态文明传播的重要案例。

经验与启示

项目立足本土文化根基，将传统生态伦理融入现代保护体系，凝聚社区保护共识，以巴金文化为脉络打造生态研学路线、开发自然教育课程，将传统生态伦理转化为社会公众广泛认同的价值理念，推动保护意识从社区传承向全社会普及，为生物多样性保护奠定了深厚的社会文化基础。

对重大基础设施建设与生物多样性保护的矛盾，将生物多样性保护要求前置到工程规划与建设全过程，以技术创新和增量投入实现生态影响的有效规避。

Expo, and in 2025, it was selected for display at the China Pavilion of the Osaka Expo. Under the theme of "One Tree Forms a Forest, All Life Coexists," its ecological communication efforts have reached multiple countries and regions worldwide. The "Bird Paradise" has achieved coordinated enhancement of cultural, ecological, and social values, becoming an important case for urban biodiversity conservation and the dissemination of ecological civilization.

EXPERIENCES AND INSIGHTS

The project is rooted in local cultural heritage and integrates traditional ecological ethics into modern conservation systems. By building community consensus for conservation, developing ecological study tour routes centered around Ba Jin's cultural heritage, and creating nature education courses, the project has transformed traditional ecological ethics into values widely recognized by the public. It has promoted the expansion of conservation awareness from community-based inheritance to society-wide engagement, laying a strong social and cultural foundation for biodiversity conservation.

To address the conflicts between major infrastructure development and biodiversity conservation, biodiversity conservation requirements have been incorporated into the entire process of engineering planning and construction. Through technological innovation and additional investment, the project has effectively avoided ecological impacts.

榕树丛中的鹭鸟群
Egrets Among Banyan Trees



THE HONG KONG SPECIAL ADMINISTRATIVE REGION
OF THE PEOPLE'S REPUBLIC OF CHINA
香港特别行政区

Hong Kong's Country Parks Network: A City-scale Protected Area System Delivering Social Values, Conservation and Climate Resilience

香港郊野公园网络：一个提供社会 福祉、保育功能及气候韧性的城市级 保护区体系

关键词

保护区；生态连通性；集水区；植林优化；跨境保护；基于自然的解决方案

案例名片

香港郊野公园网络是位于国际大都市内全球规模最大的保护区体系之一。现由25个郊野公园和22个特别地区组成，总面积约44,842公顷，占香港陆地面积40%以上。早期旨在为人口稠密、快速扩张的城市保护集水区以保障供水，其后逐步发展成为兼具自然保育、户外康乐、自然教育及科学研究四大功能的保护区体系。如今这一网络已成为城市尺度基于自然的解决方案（NbS）的实践范例：保护了横跨山地、林地、湿地和海岸的栖息地及生态廊道；稳定了土壤和集水区；调节了微气候；并通过城市边缘密集步道起点网络，为居民提供快速便捷的自然景观通道。

KEYWORDS

Protected areas; ecological connectivity; water catchments; plantation enrichment; cross-boundary conservation; nature-based solutions

CASE PROFILE

The Hong Kong Country Parks Network is one of the world's largest systems of protected areas located within an international metropolis. It currently comprises 25 country parks and 22 special areas, covering a total area of approximately 44,842 hectares—more than 40% of Hong Kong's land area. The network initially aimed to protect water catchments and secure water supplies for a densely populated and rapidly expanding city at its early establishment stage. Over time, it evolved into a protected area system fulfilling four core functions: nature conservation, outdoor recreation, nature education and scientific research. Today, the network has become a city-scale nature-based solution (NbS): it safeguards habitats and ecological corridors across mountains, woodlands, wetlands and coasts; stabilises soils and catchments; buffers microclimates; and provides quick, convenient access to natural landscapes for residents via a dense network of trailheads along the urban fringe.



背景与问题

二战后香港郊野地带生态与社会压力交织：大规模的伐木与发展造成山坡荒秃、水土流失加剧，集水区供水稳定性受到威胁，生态功能亦严重退化。与此同时，人口激增推高休闲需求，城市快速扩张挤压绿色空间，“城进绿退”趋势明显，移居到香港的居民亦缺乏共享自然空间以凝聚归属感。

BACKGROUND AND CHALLENGES

In post-WWII Hong Kong, ecological and social pressures intertwined in rural areas: extensive logging and development led to barren hillsides and accelerated soil erosion, threatening the stability of water supply in catchment areas and causing severe degradation of ecological functions. At the same time, a surge in population fuelled demand for recreational spaces, while rapid urban expansion squeezed green spaces, creating a stark tension between "urban expansion and retreat of green spaces". Furthermore, as a city shaped by successive waves of immigrants, there was a lack of shared natural spaces to foster a sense of belonging.

香港郊野公园网络与建成区
Hong Kong's Network of Country Parks and Built-up Areas

行动与措施

法定框架与治理

《郊野公园条例》（第208章）奠定了香港郊野公园体系的法律基础：授权郊野及海岸公园管理局总监指定与管制郊野公园，并设立咨询委员会汇集专业意见。同时，按现行规划及环境影响评估制度，可能影响郊野公园及其生态价值的重大发展项目须先经过严格审视及法定程序。上述法定框架确保有效的管理，并为郊野公园的长远保育提供重要保障。

栖息地与景观管理

早年种植的外来树种成功稳定了山坡与集水区，但为提升生态价值与生物多样性，自九十年代起，植林工作逐步加入原生树种，2009年启动“

ACTIONS AND MEASURES

ACTIONS AND MEASURES: LEGAL FRAMEWORK AND GOVERNANCE

The Country Parks Ordinance (Chapter 208) establishes the legal foundation for Hong Kong's country parks system: it authorises the Country and Marine Parks Authority to designate and regulate country parks, and establishes an advisory board to gather expert input. Under the existing planning and environmental impact assessment framework, major development proposals that may affect country parks and their ecological values will first undergo rigorous review and statutory procedures. Together, these statutory mechanisms ensure effective management and provide important safeguards for the long-term conservation of country parks.

HABITAT AND LANDSCAPE MANAGEMENT

Exotic tree species planted in earlier years successfully stabilised slopes and water catchments; however, to enhance ecological value and biodiversity, native tree species have been gradually incorporated into afforestation work since the 1990s and the "Plantation Enrichment

植林优化计划”，通过疏伐老化外来树种以改善光照与生长空间，补种原生树苗并持续植后养护，逐步实现向原生混交林转型，同步降低虫害风险并改善景观质量及提高生物多样性。过去10年，郊野公园种植了约290万株树苗，当中原生树种占超过80%，涵盖近140个原生种。

游客管理系统与公众参与

为平衡公众使用与保育，渔农自然护理署（渔护署）运用远足径网络及环境友善的设施调控客流，每年接待访客约1100万人次。渔护署全年提供各类导赏、户外活动及自然学习体验，帮助各年龄段的游客了解香港郊野公园的生态及保育价值。渔护署亦提供户外学习资源教材及多语言教育资料，使不同社群都能接触到相关知识。该署还组织公众参与的山径维修工作坊，让公众在资深工作人员的指导下，运用传统手工艺和就地取材的天然材料亲手参与修复受损的远足径，减少对生态环境的影响，并增强社区对郊野公园的归属感。渔护署在红花岭郊野公园增设步道及解说设施，并活化旧矿场改造为开放式博物馆，融合文化与生态教育。

跨境生态廊道

为促进深港两地就生态廊道的规划及合作，渔护署与深圳市规划和自然资源局于2024年8月签订《深圳梧桐山—香港红花岭生态廊道建设合作框架协议》。协议内容包括设立生态资料交换平台、进行生物多样性同步监测、清理入侵外来物种、研究改良生态连通性，以及在自然教育方面进行交流等。

Programme" (PEP) was launched in 2009. By thinning aging exotic trees to improve light penetration and growing space, replanting native seedlings, and providing post-planting maintenance, the programme is gradually transitioning the areas into native mixed woodland. This approach replaces aging exotic trees with native saplings, simultaneously reducing the risk of pest-outbreak, improving landscape quality and increasing biodiversity. Over the past decade, approximately 2.9 million seedlings have been planted in country parks, of which over 80% are native tree seedlings covering nearly 140 native species.

VISITOR MANAGEMENT SYSTEM AND PUBLIC PARTICIPATION

To balance public access with conservation, the Agriculture, Fisheries and Conservation Department (AFCD) regulates visitor use through the hiking trail network and environmentally friendly facilities, welcoming around 11 million visitors annually. It offers a variety of guided walks, outdoor activities, and nature learning experiences throughout the year to help visitors of all ages understand the ecology and conservation value of Hong Kong's country parks. The AFCD also provides outdoor learning resource packages and multilingual educational materials to ensure that diverse communities have access to knowledge about the countryside. It organises public participation workshops on trail maintenance, allowing the public to restore degraded/eroded hiking trails under the guidance of experienced staff using traditional craftsmanship and natural materials found on-site. This initiative not only minimises ecological impact but also strengthens the community's sense of belonging to the country parks. The AFCD has added trails and interpretive facilities in Robin's Nest Country Park (RNCP) and revitalised an old mine into an open-air museum, integrating cultural heritage and ecological education.

CROSS-BOUNDARY ECOLOGICAL CORRIDOR

In August 2024, the AFCD and the Planning and Natural Resources Bureau of Shenzhen signed the "Cooperative Framework Agreement for the Enhancement of Shenzhen Wutong Mountain - Hong Kong Robin's Nest Ecological Corridor" to foster collaborative planning and construction of an ecological corridor between the Wutong Mountain Scenic Area in Shenzhen and RNCP in Hong Kong. The agreement aims to establish an ecological data exchange platform, conduct synchronised biodiversity monitoring, control invasive alien species, explore ways to enhance ecological connectivity, and share experiences in nature education.

红花岭郊野公园
Robin's Nest Country Park



成效与价值

生态系统服务价值

香港郊野公园网络涵盖林地、灌木丛、高地草地、水库、河流、湿地及海岸线，兼顾栖息地与景观保护功能，并为公众提供普惠的自然休憩空间。除保护集水区及维持水质外，植被覆盖的山坡在暴雨中发挥固土防蚀与减灾功能；大面积绿地亦增强气候韧性，缓解极端高温与暴雨冲击，在全球人口密度最高的城市之一，持续维系良好的环境质量。

跨境合作价值

与深圳开展跨境联合保护工作，在香港红花岭郊野公园与深圳梧桐山之间建立跨境生态廊道。既能加强生态连通性，又能提升公众对自然保育的意识，令两地共同受惠。

基于自然的解决方案

香港郊野公园在固碳、调节气温、保护水源及防洪减灾中发挥关键作用，其植被系统有效稳固坡面、防范侵蚀。此外，广阔的绿色空间显著改善空气质量、缓解城市热岛效应，并为公众休闲、自然教育和生态旅游提供宝贵机会，每年惠及的访客约1100万人次，彰显人与自然和谐共生的综合效益。

经验与启示

香港郊野公园的经验是“立法先行、功能复合、跨境协同”。1976年《郊野公园条例》在高速城市化中为自然划界，将保护水源、减灾、休闲、教育融为一体，赢得广泛民意。如今更与深圳共建生态廊道，融入区域格局。这充分证明，保护区不是城市负担，而是支撑城市韧性的绿色基础设施与治理典范。

ACHIEVEMENTS AND VALUE

VALUE OF ECOSYSTEM SERVICES

Hong Kong's Country Park network encompasses woodlands, shrublands, upland grasslands, reservoirs, rivers, wetlands, and coastlines, balancing habitat and landscape conservation while providing equitable recreational opportunities for the public. In addition to conserving water catchments and maintaining water quality, vegetated slopes help prevent soil erosion and mitigate the impact of heavy rains; extensive green spaces also enhance climate resilience, alleviating the impacts of extreme heat and torrential rains, and maintaining environmental quality in one of the world's most densely populated cities.

VALUE OF CROSS-BOUNDARY COOPERATION

The cross-boundary cooperation on the ecological corridor between Robin's Nest Country Park and Shenzhen's Wutong Mountain demonstrates a joint cross-city conservation initiative that enhances ecological connectivity and promotes public awareness of nature conservation, benefiting communities on both sides.

NATURE-BASED SOLUTIONS

Hong Kong's country parks sequester carbon and regulate temperature, protect water catchments, reduce flooding risks and enhance resilience to natural disasters. Their vegetation stabilises slopes and prevents erosion, while extensive green spaces improve air quality, alleviate the urban heat island effect, and provide recreation, education, and eco-tourism opportunities, benefiting about 11 million visitors annually, demonstrating the comprehensive benefits of harmonious coexistence between humans and nature.

EXPERIENCES AND INSIGHTS

The experience of Hong Kong's country parks is characterised by its legal foundation, multifunctional integration, and cross-boundary collaboration. Enacted in 1976, the Country Parks Ordinance set aside natural areas amid rapid urbanisation, integrating water quality protection, disaster risk reduction, recreation, and education into a single framework that garnered broad public support. The joint development of ecological corridors with Shenzhen has integrated country parks into a wider regional landscape. This demonstrates that protected areas are not a burden on cities, but rather a governance model for green infrastructure that underpins urban resilience.

八仙岭郊野公园内的流水响水塘
Lau Shui Heung Reservoir inside Pat Sin Leng Country Park





南沙滨海红树林修复。图片由广州市南沙区提供
Mangrove Restoration in Nansha Coastal Zone. Photo Provided by Nansha District, Guangzhou



红花寨 viewpoint 远眺沙头角海。图片由香港提供
Overlooking Sha Tau Kok Sea from Hung Fa Chi Viewing Point. Photo Provided by Hong Kong