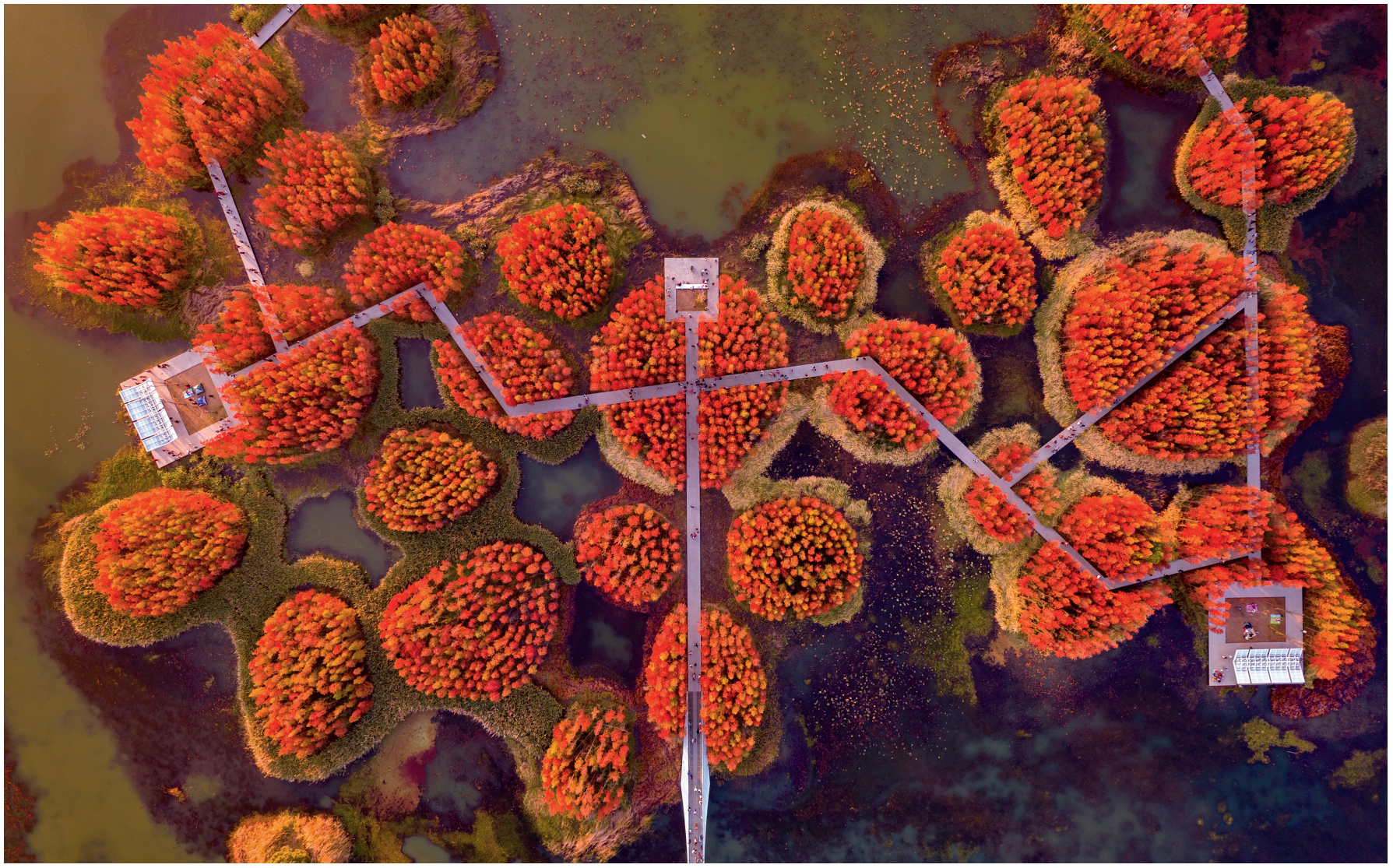

时间 2021年12月5日
地点 江西省南昌鱼尾洲公园
拍摄 土人设计

在位于长江中下游洪涝频发的南昌市，一个55hm^{2}的粉煤灰堆放地和遭受污染的渔塘一同被改造为一座具有洪涝调节功能的海绵公园——一片能调节雨洪100万方，同时净化面源污染、修复鸟类栖息地，并提供多种休憩功能的美丽绿洲。该项目为城市如何应对季风性气候以及全球气候变化影响下的洪涝问题提供了一个可复制的模式。这个项目也是设计者试图在建成环境中引入自然，以此适应诸如季风降雨等自然过程，同时满足人们对开放空间的使用需求的一次探索。

Date December 5, 2021
Location Nanchang Fish Tail Park, Jiangxi Province
Photographer Turenscape

In the city of Nanchang, within the Yangtze River floodplain in east-central China, the designers transformed a 55 hm^2 heavily-abused landscape into a sponge park that regulates stormwater, purifies non-point source pollution, provides habitats for birds, and offers an array of recreational opportunities. Fish Tail Park offers a replicable model of designed urban nature for regions with monsoon climates that can address multiple challenges in flood regulation, habitat restoration, and recreational demands. The project attempts to open up new space in cities not just for people, but also for nature and for powerful forces such like monsoon storms that drive critical natural processes.

气候适应和韧性
Climate Adaptation and Resilience

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摘要

为应对全球气候变化，过去数十年间，国际社会做出了巨大的努力。据《巴黎协定》所设定的目标，为了避免造成严重后果，全球气温升幅较工业化前水平必须控制在2℃以内。然而，全世界的目光大多聚焦于减排或碳中和途径，而忽略了适应，这“应对气候不能被忽略的另一半”。一系列研究证实，基于自然、适应自然的建设途径在应对气候变化方面具备巨大潜力。近年来，基于自然的绿色基础设施和气候适应的海绵城市得到了空前的关注。如何基于自然、利用自然、适应自然，并通过跨越地理、农业、水利、市政等各个专业的协同设计，创建适应气候变化且富有韧性的绿色基础设施，也成为了当前景观设计师所面临的重大挑战和机遇。

关键词

气候变化；气候适应；韧性；海绵城市；绿色基础设施；首届气候适应峰会

ABSTRACT

The international community has made great efforts over the past decades to cope with global climate change. The Paris Agreement highlighted the exigency of “holding the increase in the global average temperature to well below 2 °C above pre-industrial levels.” At present, however, the world’s most effort is devoted to the means of carbon emission reduction, while neglecting adaptation, the other half that “cannot be neglected” in the climate equation. A series of studies have proven the huge potential of nature-based and nature-adapted approaches in building a climate-resilient living environment. In recent years, nature-based green infrastructures and climate-adaptive sponge cities are receiving unprecedented attention. This also poses great challenges and opportunities for landscape architects to develop resilient climate-adaptive green infrastructures by leveraging the power of nature through collaborative design with experts from the fields of Geography, Agriculture, Hydraulic Engineering, and Civil Engineering.

KEYWORDS

Climate Change; Climate Adaptation; Resilience; Sponge City; Green Infrastructure; Climate Adaptation Summit 2021

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为应对全球气候变化，数十年来，国际社会做出了巨大的努力，无非两条途径：一是减排，二是适应。然而，全世界的目光似乎大多聚焦于减排或碳中和。直到最近，更凶猛的洪水淹没了街道并冲毁了房屋，更猛烈的火灾吞噬了山林，更干旱的天气让农民颗粒无收，更严酷的城市热浪威胁着人的生命……人们似乎才强烈地意识到，阔谈减排来实现气候的回归已经成为遥不可及的梦想。我们迫切需要摆脱眼前的困境，于是，2021年1月25~26日，联合国首届气候适应峰会（以下简称“峰会”）在线上召开，全球的目光投向了适应，这“应对气候不能被忽略的另一半”[1]。

据《巴黎协定》所设定的目标，为了避免造成严重后果，全球气温升幅较工业化前水平必须控制在2℃以内，并向将升幅控制在1.5℃以内的目标努力。[2]为此，必须在2050年前实现碳中和[3]。然而，根据大自然保护协会（The Nature Conservancy）的测算，即使全球政府和企业已经采取了加快向清洁能源转型、提高能源利用效率的相关减排行动，我们也难以实现2℃的温控目标，更无从奢谈1.5℃[4]。但具有讽刺意义的是，近年来，全世界在气候领域的绝大部分投资都投向了此类节能减排技术[5]，却几乎忽视了基于自然的减排途径——如果动员及时，那么经济的、基于自然的减排途径（保护、恢复和改良全球森林，湿地和农业用地的土地管理行动）有望在2017~2030年间贡献37%的减排量，将全球气温升幅保持在2℃以下[6]。

根据峰会报告，气候相关的灾难在过去三年中给全球造成了6 500亿美元的损失，超过了此间全球GDP的0.25%；而且预计到2100年时，如果全球气温上升2℃，将可能带来高达69万亿美元的损失[7]~[9]。地球的气候韧性投资每提高1美元，便可以为其他方面节省6美元[1]。联合国环境规划署（UNEP）2021年发布的《气候适应差距报告》指出，2019年，仅发展中国家每年的气候适应成本就高达约796亿美元；2030年时，这一数字将升至1 400~3 000亿美元，2050年将达到2 800~5 000亿美元[10]。这些天文数字告诉我们，建设具有气候韧性的人居环境需要付出多大的努力；也告诉我们，基于自然、适应自然的建设途径具有多大的潜力！

正是在此背景下，基于自然的绿色基础设施和气候适应的海绵城市得到了空前的关注。UNEP、世界各地政府、各大银行也开始把注意力转向气候适应的对策和行动。尤其值得注意的是，近几年来，带有强烈中国特色的“海绵城市”概念和相关实践成为热点。Google搜索中“sponge city”的检索结果竟多达1亿条，几乎是“孔子”（Confucius）的两倍。而世界各大银行——包括世界银行、亚洲基础设施投资银行、欧洲复兴开发银行——都开始将目光转向基于自然的气候适应基础设施的投资，包括建设海绵城市和生态基础设施。仅仅在过去的两年时间中，我本人应邀为上述三大银行做了八场关于基于自然的气候适应、海绵城市和海绵星球的专题报告。

https://doi.org/10.15302/J-LAF-1-010021
收稿时间 RECEIVED DATE | 2021-12-23
中图分类号 | TU984
文献标识码 | C

而当到了具体实施层面，我们又不得不需要对一些习以为常、甚至被认为是“先进”的理念和行动提出质问。比如，当科学告诉我们，森林和湿地在应对气候变化方面非常有效，我们却遇到了“河道管理范围内禁止种树”的规范，原因竟是树木会阻碍行洪，河道必须裁弯取直以保证高效的过洪断面；又比如，科学告诉我们，农林间作有利于促进农业生产，特别是生态农业需要有多样化的生境同时存在，我们却遇到了“永久基本农田禁止种树、挖塘”的规定，如此等等。于是，河流廊道失去了能适应气候和调节流量的湿地和河漫滩森林，田园失去了自我调节旱涝、截留和净化面源污染的湿地，维持生态平衡的生物栖息地和生物多样性也随之消失。第二次全国湿地资源调查结果显示，2009~2013年，中国自然湿地面积减少了337.62万公顷，减少率近10%[11]。而根据本人主持的北京大学研究团队在安徽、重庆和云南的实际调查，中国广大乡村和农田景观中的陂塘和坑塘湿地消失了约30%。这意味着季风气候下，中国大地的气候适应能力相应下降，由此造成的损失不言而喻。

因此，如何基于自然、利用自然、适应自然，用科学的精神和系统的途径设计适应气候变化且富有韧性的绿色基础设施，有赖于跨越地理、农业、水利、市政等各个专业界面的协同设计。而这也正是景观设计所面临的重大挑战和机遇。**LAF**

The international community has made great efforts over the past decades to cope with global climate change via two major countermeasures: carbon emission reduction and adaptation. At present, the world's most attention is attached to carbon emission reduction or carbon neutrality. As more violent floods engulf roads and houses, stronger fire disasters rage across forests, more droughty weather steals harvests from farmers, and harsher urban heat waves threaten lives, we come to realize that carbon emission reduction helps little stop climate change. We are in urgent need to address climate change from a new perspective. As Climate Adaptation Summit 2021 (the Summit hereafter), the first of its kind hosted by the United Nations, held online on January 25 and 26, the international community shifted to the approaches of adaptation, since “adaptation cannot be the neglected half of the climate equation”[1].

The Paris Agreement highlighted the exigency of “holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels” to significantly reduce the risks and impacts of climate change.[2] To this end, humans need to take efforts for the goal of carbon neutrality by 2050[3]. However, predicted by The Nature Conservancy, governments and enterprises across the globe to date have been focused on accelerating the transition to clean energy and improving energy efficiency, yet the corresponding action “still lags far behind what is necessary to keep the planet below 2 °C threshold of warming, and nowhere near what is required to stay below the 1.5 °C target”[4]. Ironically, such mitigation projects have made up the vast majority of global total climate finance in last decades[5], while nature-based mitigation approached have been neglected. If mobilized in time, the research points out that cost-effective natural climate solutions—conservation, restoration, and improved land management actions across global forests, wetlands, grasslands, and agricultural lands—can offer 37% of mitigation needed between 2017 and 2030 to keep global temperature rise below 2 °C.[6]

The Summit reported that over the past three years, climate-related disasters have cost the world USD 650 billion, more than 0.25 percent of global GDP for those years, and the costs of damages from warming in 2100 for 2 °C will be USD 69 trillion[7]~[9]. An assessment figures out that “for every dollar invested in climate resilient infrastructure, six dollars can be saved”[1]. Adaptation Gap Report 2021 by United Nations Environment Programme (UNEP) notes that climate finance flows to developing countries (for both mitigation and adaptation) reached USD 79.6 billion in 2019. It is estimated that the annual costs of adaptation in developing countries could be USD 140 ~ 300 billion by 2030 and 280 ~ 500 billion by 2050[10]. These astonishing figures signify the huge potential of and enormous efforts required in building a climate-resilient living environment through nature-based and nature-adapted approaches!

Against this background, nature-based green infrastructures and climate-adaptive sponge cities are receiving unprecedented attention. UNEP, governments, and major banks across the globe start to put forward climate

adaptation measures and actions. The concept of Sponge City that has distinctive Chinese characteristics become particularly a widely-discussed interest among international researchers and practitioners over the past few years. There are over 10 million pieces of Google search results of "sponge city," almost twice that of "Confucius." Major banks, including World Bank, Asian Infrastructure Investment Bank, and European Bank for Reconstruction and Development, have set about investing in nature-based climate adaptation infrastructures such as sponge cities and ecological infrastructures. Over the past two years, I have delivered eight lectures on nature-based climate adaptation, sponge city, and sponge planet upon the invitation from above banks.

When it comes to implementation, we have to question the ideas or actions that are widely accepted or even "advanced" as so called. For instance, scientific knowledge proves that forests and wetlands are effective for mitigation of climate change, but existing regulations forbid to plant trees within the management areas of river courses (as trees could hinder flood drainage); It evidences that the combination of forest- and field-crops helps boost agricultural production (which is particularly true for eco-agriculture sites suffering from the loss of habitat diversity), which is also illegal under regulations such as tree planting and pond digging are not allowed in the permanent prime farmland. As a result, wetlands or floodplain forests that can contribute to climate adaptation and runoff regulation are being erased from river courses. Also, wetlands that help regulate droughts and floods and intercept and purify non-point-source polluted water bodies are being eliminated in farmlands, along with the disappear of wildlife habitats and biodiversity that are key to keeping ecological equilibrium. According to the Second Survey on National Wetlands[11], in China, the area of natural wetland reduced by 3,376,200 hectares, a nearly 10% dropping from 2009 to 2013. The field investigation in Anhui, Chongqing, and Yunnan made by researchers from Peking University, led by the author, showed that ponds and pond wetlands in China's rural areas and farmlands reduced by approximately 30%. Consequently, China's climate adaptation capacity is dwindling, causing huge losses.

Therefore, collaborative design with experts from the fields of Geography, Agriculture, Hydraulic Engineering, and Civil Engineering is required to develop resilient climate-adaptive green infrastructures by scientifically and systematically leveraging the power of nature. This poses great challenges and opportunities for landscape architects. **LAF**

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