遗产研究国际动态

THE HERITAGE SPECTATOR

总第30期 No. 30
2026.11（内刊）



中国-葡萄牙文化遗产保护科学“一带一路”联合实验室

CHINA-PORTUGAL BELT AND ROAD JOINT LABORATORY ON CULTURAL HERITAGE CONSERVATION SCIENCE

《遗产研究国际动态》(内刊)
中国 - 葡萄牙文化遗产保护科学“一带一路”联合实验室
2026.11 总第 30 期

The Heritage Spectator
(Newsletter)
China-Portugal Belt and Road Joint Laboratory on Cultural Heritage Conservation Science
2026.11 No.30

封面图像:
悉尼歌剧院
图像来源:
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Cover Image:
Sydney Opera House
Source:
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China-Portugal Belt and Road Joint Laboratory on Cultural Heritage Conservation Science *The Heritage Spectator* Editorial

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2026 亚太地区世界遗产青年营造师国际交流活动在苏州举行 | 2026 Asia-Pacific Young Heritage Builders International Exchange Event Held in Suzhou | Evento Internacional de Intercâmbio dos Jovens Construtores do Património da Ásia-Pacífico 2026 Realizado em Suzhou

第 22 届国际古迹遗址理事会大会（ICOMOS GA2026）在马来西亚古晋召开 | The 22nd ICOMOS General Assembly (ICOMOS GA2026) Convened in Kuching, Malaysia | A 22.ª Assembleia Geral do ICOMOS (ICOMOS GA2026) Realizada em Kuching, Malásia

前沿研究 Research Fronts

文化遗产作为气候行动的重要资源

Heritage as a Climate Action Asset

资料来源：
国际古迹遗址理事会 . 我们的过去之未来：让文化遗产参与气候行动 [R]. 巴黎：国际古迹遗址理事会，2019.
Source:
ICOMOS. The future of our pasts: engaging cultural heritage in climate action[R]. Paris: ICOMOS, 2019.

遗产与气候变化之间的鸿沟

国际古迹遗址理事会 (ICOMOS) 认为，文化遗产在定性与定量两个层面上都能够为“变革性转型”作出贡献。这一观点得到了环境史、人类学、地理学、人类生态学和社会学等多个学科研究的支持。尽管如此，遗产与气候行动之间的关系在现有气候变化研究中仍未得到充分讨论。对此，人们提出了多种解释，其中之一是，文化研究的方法往往以叙事性和质性研究为主，通常包括民族志和参与式观察，而这些方法所产生的数据，与气候变化研究中其他社会科学和自然科学领域普遍采用的量化方法之间并不容易衔接。

同样，气候行动的方法体系、政策框架、融资机制和行动网络有时也没有充分纳入文化遗产，或者只是通过间接方式涉及文化遗产。这些方法往往把采取变革性行动的必要性视为一个社会与技术问题，并认为解决方案主要在于个体行为改变和创新。这类路径倾向于忽视文化和政治因素，甚至经常完全忽略文化与遗产。

文化遗产总体上缺席于气候变化话语之中，这一现象在实践层面也有相应表现：尽管文化和遗产部门是大多数社区中的重要机构，但它们往往没有直接参与气候行动（当然也存在一些值得注意的例外）。尽管气候变化与自然遗产、文化遗产之间存在深刻联系，但如今仍有数以千计的考古学家、建筑师、历史学家

The gap between heritage and climate change

ICOMOS believes that cultural heritage contributes both qualitatively and quantitatively to Transformative Change. This view is supported by analysis from a range of disciplines, including environmental history, anthropology, geography, human ecology, and sociology. Even so, the relationship of heritage to climate action is not well developed in climate literature. Various explanations have been advanced for this, including that the methods for studying culture tend to be narrative-based and qualitative, often including ethnography and participant observation, and data from these methods do not sit comfortably with the quantitative approaches prevalent in other social and natural science on climate change.

Climate action methodologies, policy frameworks, financing mechanisms and networks have similarly sometimes not engaged cultural heritage, or have done so indirectly through proxies. These methodologies often characterize the need for transformative action as a social and technological problem whose solutions lie in individual behavioural change and innovation. Such approaches tend to ignore cultural or political considerations and often omit culture and heritage entirely.

The general absence of cultural heritage from the climate discourse has a practical, correlative reality: while the culture and heritage sectors are important institutions in most communities, they often are not directly engaged in the work of climate action (although there are notable exceptions). Despite the profound connections between climate change and

和工程师，以及科学家、研究人员、教师和学者，还有原住民知识和地方知识的传承者以及遗产倡导者，他们的专业能力和知识尚未被充分调动起来参与气候变化议题。具有讽刺意味的是，这种尚未被利用的机会，往往恰恰存在于那些已经制定了雄心勃勃气候行动目标的城市和地区。

文化遗产不仅受到气候变化的威胁，同时也是我们应对其影响、开展气候适应与减缓行动的重要资源。尽管气候变化对文化遗产造成的影响已经十分明显，但文化遗产作为应对气候变化的资源所具有的价值，却尚未得到充分认识。本文将从三个方面探讨这一价值：文化遗产如何被用于强化对气候变化紧迫性的认识；我们能够从文化遗产中学习哪些适应与减缓策略；以及文化遗产在增强社区应对气候变化的韧性方面所发挥的作用。

强调紧迫性

《巴黎协定》强调了强化气候变化紧迫性认识的必要性，而文化遗产可以在这一过程中发挥核心作用。文化遗产深深嵌入社会生活的各个方面，是地方、国家乃至国际层面人们生活与身份认同的重要组成部分，因此具有独特的优势，能够传达气候变化所带来的多方面影响。作为具有“突出普遍价值”的标志性场所，世界遗产以及其他具有代表性的遗产地，可以面向全球公众强化对气候行动紧迫性的认识。在一些情况下，这些遗产地还可以用于展示有效的气候适应与减缓措施。近年来，许多此类遗产地和文化景观已经成为媒体报道的对象。

这些报道是吸引公众关注气候变化问题的有效工具；然而，地方性遗产的价值同样不应被忽视。在世界各地，气候变化正在影响地方文化遗产和具有文化意义的场所，而这些影响正被当地社区切身感受到。气候变化引发的迁移正在导致整个社区被迫迁离，使人们与其有形遗产和文化景观相分离，并面临失去场所感的风险。这些影响既是当下正在发生的现实问题，也是真实而切身的，因此需要采取紧迫的

natural and cultural heritage, today there are thousands of archaeologists, architects, historians, and engineers; scientists, researchers, teachers and scholars; carriers of Indigenous Knowledge and Local Knowledge, and heritage advocates, whose talents have not yet been mobilized on climate change issues. Perversely, this lost opportunity is often greatest in cities and regions with ambitious climate action.

Cultural heritage is both under threat from climate change, and an asset in our attempts to adapt to and mitigate its impacts. While the impacts of climate change on heritage are all too clear, the value of cultural heritage as an asset in the response is not. This short essay will explore this value under three headings: how cultural heritage can be utilised to stress urgency about climate change; what we can learn about adaptation and mitigation strategies from cultural heritage; and the role of cultural heritage to build community resilience to climate change.

Stressing urgency

The Paris Agreement emphasises the need to stress urgency about climate change, and cultural heritage can play a central role in this exercise. Cultural heritage is embedded in nearly all aspects of our society. It is part of people's lives and identities at local, national and international levels and so is uniquely situated to communicate the myriad impacts of climate change. As iconic places of 'outstanding universal value', World Heritage and other iconic heritage sites can stress this urgency of climate action to a global audience. In some cases, they can also be used to showcase effective adaptation and mitigation responses. Many of these sites and landscapes have been the subject of numerous recent media reports.

These are a very effective tool to focus attention on the issue; however, the value of local heritage must not be overlooked. All over the world, climate change is impacting local cultural heritage and places of cultural significance, and these impacts are being acutely felt. Climate-induced migration is leading to the displacement of entire communities who are divorced from their tangible heritage and landscapes and at risk of losing their sense of place. These impacts are both current and real, and require an urgent response. Cultural heritage can be utilised to stress urgency about the immediate and future impacts of climate change, and to emphasise the

应对行动。文化遗产可以被用于强调气候变化当前及未来影响的紧迫性，并凸显在地方、国家和国际层面采取行动的重要性。

适应与减缓策略

世界各地不同的文化，通过场所和人们所受到的实际影响，影响并塑造着我们应对气候变化的方式。然而，当代许多气候适应与减缓实践在很大程度上仍受到自然科学的主导。自然科学在识别和量化气候变化问题方面具有很强的能力，但这些应对方式往往忽视了文化遗产所承载的大量信息与知识，以及这些遗产对于寻找解决方案所具有的价值。当前政府间气候变化专门委员会（IPCC）的报告对文化在气候行动中的作用体现得仍然不足。然而，那些随着时间积累而形成的历史经验与知识储备，实际上是制定气候适应路径和减缓路径的一项尚未得到充分利用的资源。对过去人类社会应对古环境、气候以及景观变化的文化适应经验开展跨学科研究，可以依据历史证据构建的情景，为当代气候变化研究建立基准，并识别可能出现的临界点。

内生性知识方式以及过去农业生产中的适应实践，例如利用不同类型的环境条件或采用更具韧性的作物，都可以为气候智慧型农业政策提供借鉴。文化遗产是面向未来的一项资源。长期以来，社区不断形成应对地方环境条件和景观变化的策略，其中包括建筑适应、农业适应以及聚落形态与布局等。这些内生性知识方式能够支持当代的减缓行动，例如采用低碳且适应地方条件的方法推动建筑和文化景观的脱碳，同时也能够为城郊地区的发展提供低碳模式。生活在沿海边缘地区和河流沿岸地区的社区所积累的经验，也可以直接为当前的洪涝适应策略提供参考。通过认识并重视内生性知识方式，吸收和借鉴过去人类社会的经验，可以使解决问题的方向根植于社区自身的价值观和经验，并使社区价值真正进入决策和政策制定的核心。由此，文化与文化遗产能够成为制定当代气候适应与减缓策略的重要资源和有力支撑。

importance of action at local, national and international levels.

Adaptation and mitigation strategies

Through physical impacts on places and people, the world's diverse cultures mediate our responses to climate change. Yet, much of contemporary adaptation and mitigation practice is most strongly influenced by the natural sciences. While very effective at identifying and quantifying the problem, these responses ignore the wealth of information and knowledge afforded to us by cultural heritage, and its value to help find solutions. Current IPCC reports underrepresent the role of culture in climate action, yet these reservoirs of past experience and knowledge, which have accumulated over time, are an untapped asset in developing both adaptation pathways and mitigation pathways. Interdisciplinary studies of past cultural adaptation to paleoenvironmental, climatic and landscape changes can be used to set baselines and identify tipping points based on past evidence-based scenarios. Endogenous Ways of Knowing and past agricultural adaptations such as the utilisation of alternate environments or the adoption of more resilient crops feed into climate-smart agriculture policy. Cultural heritage is a resource for the future. Communities over time have developed strategies to respond to local conditions and landscape change including architectural and agricultural adaptations and settlement patterns. These Endogenous Ways of Knowing support contemporary mitigation options, from low-carbon, locally adapted approaches to decarbonizing buildings and cultural landscapes to pointing the way to low-carbon models for developing peri-urban areas. The experience of communities living in marginal coastal and riverine areas feeds directly into current flooding adaptation strategies. Through recognition of Endogenous Ways of Knowing and by embracing past human experience, the direction of solution-making can be rooted in the value of communities, and bring it to the heart of decision and policy-making. Through this, culture and heritage become a powerful asset in developing contemporary adaptation and mitigation strategies.

Cultural heritage and social resilience

As a tangible and intangible asset, cultural heritage offers climate services and can build resilience in the face of climate change. Community and societal responses

文化遗产与社会韧性

作为一种兼具有形和无形属性的资源，文化遗产能够提供应对气候变化所需的多种支持，并有助于增强社会面对气候变化的韧性。不同社区和社会应对气候变化的方式各不相同，但都可以从文化遗产领域形成的参与式治理模式中获益。在一些情况下，公民科学方法借助技术手段，使公众能够参与对濒危遗产的监测与记录。文化遗产清单以及参与式文化制图活动，既是一个知识收集过程，也是一个动员公众参与的平台。在这一过程中，既可以采用口述史等传统方法，也可以利用摄影测量、移动 GIS 等低成本、非侵入式和非破坏性的工具与技术，共同开展遗产监测与记录工作。

在另一些情况下，通过开展社区参与、公众参与和社区赋权，并促进内生性知识方式在社区内部及社区之间的传递，可以改变传统的自上而下的制度能力建设模式，通过将社区置于自身决策过程的核心位置，进而改善气候治理。在这种情况下，必须承认并尊重传统权利，并取得自由、事先和知情同意（Free, Prior and Informed Consent, FPIC）。在上述两种情况下，将社区价值置于气候行动的核心位置，将文化遗产视为一种资源，并鼓励社区参与，都有助于形成更加持久的应对成果，从而增强社会韧性。

to climate change vary widely, but all can benefit from the participatory governance models found in the cultural heritage field. In some cases, citizen science approaches utilise technology to deputise the public in the monitoring and recording of heritage at risk. Cultural heritage inventories and participatory cultural mapping initiatives serve as a knowledge-gathering process as well as a platform for citizen mobilisation. Both traditional approaches like oral histories and new technologies such as low cost non-invasive and non-destructive tools and technologies like photogrammetry and mobile GIS assist in this task.

In other cases, community engagement, participation and empowerment involving the transfer of Endogenous Ways of Knowing within and outside communities can invert traditional top-down institutional capacity-building models and improve climate governance by placing communities at the heart of their own decision-making processes. In such cases, it is essential to acknowledge and respect traditional rights and to obtain free, prior and informed consent. In both cases, putting the values of communities at the core of the response, and fostering community engagement help deliver more enduring responses and thereby strengthen social resilience.

实践案例 Case Study

悉尼歌剧院——现代遗产地应对气候变化的实践

The Sydney Opera House – A Modern Heritage Site's Response to Climate Change

资料来源：
马塔雷塞 L, 邦博纳托 E. 悉尼歌剧院——现代遗产地应对气候变化 [J]. 建成遗产，2025, 9: 13.
Source:
Matarese, L., Bombonato, E. The Sydney Opera House – a modern heritage site's response to climate change. Built Heritage 9, 13 (2025). https://doi.org/10.1186/s43238-025-00185-0

引言

气候变化已成为建筑遗产保护与管理面临的重要挑战。如何协调遗产保护、可持续管理水平提升与气候行动之间的关系，已成为受到关注的重要问题。具有标志性的遗产地可以被用于提升人们对气候变化和气候行动紧迫性的认识。价值导向的管理方法仍被认为是遗产地变化管理的最佳实践，包括应对气候变化减缓与适应所带来的变化。

联合国教科文组织于 2023 年指出，世界遗产地凭借其遗产地位和社会影响力，可以作为知识发展的平台，用于监测变化、连接政策与实践，并促进对气候变化的理解。约有一半被列为遗产的建筑仍保留其原有功能，其他则是通过适应性再利用转变为文化功能的遗产建筑，例如用于展示藏品。这些艺术与文化机构同时也是遗产建筑的管理者和守护者，它们通过社区参与、创造性文化活动以及实践行动，在提升公众对气候变化的认识方面发挥着重要作用，并展示了遗产保护与可持续管理实践如何实现有效结合。国际古迹遗址理事会指出，每一个地方都有自己的气候变化故事，而利用遗产地向当地和全球社区传播这些故事，既是一种机遇，也是一种责任。

本文旨在通过气候行动案例研究，展示悉尼歌剧院如何达到全球可持续发展标杆。文章将探讨歌剧院如何在采取气候行动的同时，保

Introduction

Climate change has emerged as a significant challenge to the conservation and management of built heritage. Challenges in reconciling heritage conservation with improved sustainable management and climate action have been recognized (ICOMOS 2019). A values-based management approach continues to be considered the best practice for managing change at heritage places, including changes arising from climate mitigation and adaptation.

UNESCO (2023) notes that World Heritage sites, with their status and visibility, can serve as platforms for developing knowledge, monitoring change, linking policy to practice and fostering understanding of climate change. About half of the heritage-listed buildings retain their original function, and the others are heritage buildings that have been adaptively reused for a cultural function (e.g. the display of a collection). These arts and cultural institutions, also custodians of heritage buildings, play an important role in promoting awareness of climate change through community engagement, creative programming, and practical action that demonstrates how heritage conservation and sustainable management practices can work together successfully. ICOMOS (2019) identified that every place has a climate change story and that using heritage sites to communicate these stories to local and global communities is both an opportunity and a responsibility. Iconic heritage sites can be used to promote a sense of urgency about climate change and climate action (ICOMOS 2019).

护甚至加强其文化遗产价值。

1 应对气候变化的治理

悉尼歌剧院（以下简称“歌剧院”）是一座建筑杰作，是澳大利亚享誉国际的标志性建筑，也是一座卓越的表演艺术中心。其文化遗产意义在于它既是一座建筑丰碑，又是一座世界级的表演艺术中心，并因此获得了正式的认可和保护，先后被列入新南威尔士州遗产名录（2003 年）、澳大利亚国家遗产名录（2005 年）和联合国教科文组织世界遗产名录（2007 年）。



图 1：悉尼歌剧院。图片来源：汉密尔顿 · 伦德，© 悉尼歌剧院信托所
Figure 1. Sydney Opera House. Source: Hamilton Lund. © Sydney Opera House Trust

1.1 组织战略的制定

组织领导力、文化和资源对于在文化遗产场所实施气候行动所需的变革至关重要。2009 年至 2012 年，悉尼歌剧院的战略目标包括“打造充满活力且可持续发展的场所”，旨在“确保各项发展工程与场所的遗产价值和谐共存”。环境绩效目标侧重于减少温室气体排放。这些目标随着时间的推移而不断提升，从“低碳”（2009 年）到“碳中和”（2015 年设定目标，2018 年实现），再到制定实现气候正效益的路径（2030 年目标）。2013 年至 2023 年，组织战略计划的重点是制定和实施一项雄心勃勃的十年资本工程计划。名为“十年复兴”的项目是实现其组织使命的关键组成部分，该使命旨在“珍视并复兴歌剧院，造福子孙后代的艺术家、观众和游客”，其中包括确保所有游客都能公平地进入歌剧院并观看演出。这一时期的可持续发展目标包括：在遗产和环境管理

This paper aims to demonstrate how the Opera House has achieved a global sustainability benchmark through a case study on climate action. The paper will address how climate action is achieved at the Opera House while the site's cultural heritage significance (the building and its function) is conserved and even strengthened through these actions.

1 Governance for tackling climate change

The Sydney Opera House (hereafter 'Opera House') is an architectural masterpiece, an internationally recognised icon of Australia, and a pre-eminent performing arts centre (Croker 2017). Its cultural heritage significance is based on its twin roles as an architectural monument and a world-class performing arts centre, that was formally recognised and protected through registration on the New South Wales State Heritage Register (2003), Australian National Heritage List (2005) and UNESCO World Heritage List (2007).

1.1 The development of organisational strategies

Organisational leadership, culture and resources are crucial in implementing the changes required for climate action in cultural and heritage places. From 2009 to 2012, the Opera House's strategic goals included 'A Vibrant and Sustainable Site', aiming to 'ensure progress works in harmony with the heritage values of the site'. Environmental performance goals focused on reducing greenhouse gas (GHG) emissions. These goals became increasingly ambitious over time, from being 'low carbon' (2009) to 'carbon neutral' (goal set 2015, achieved 2018) to developing a pathway to being climate positive (goal set for 2030). From 2013 to 2023, organisational strategic plans focused on the development and delivery of an ambitious 10-year program of capital works. A project known as 'The Decade of Renewal' was a key part of fulfilling the organisational mission 'to treasure and renew the Opera House for future generations of artists, audiences and visitors', including equitable access to the site and shows for all visitors. Sustainability targets in this period included demonstrating leadership in heritage and environmental management and setting a national benchmark in environmental performance by the Opera House's 50th anniversary in 2023.

In 2019, the Opera House became Australia's first major arts institution

方面展现领导力，并在歌剧院 2023 年 50 周年之际，树立环境绩效方面的全国标杆。

2019 年，悉尼歌剧院成为澳大利亚首个采纳联合国全球目标的主要艺术机构，并发布了名为《激励积极变革》的公开承诺。全球目标有助于应对包括气候变化在内的最紧迫的全球挑战。这些目标为歌剧院的社会和环境可持续发展目标（包括文化遗产保护）提供了一个框架。全球目标 13“气候行动”是该机构九大重点领域之一，其具体目标贯穿于各项业务计划，涵盖减缓和减少排放、气候风险管理和适应能力以及员工和社区参与等方面。

这些目标经过审查并纳入了悉尼歌剧院最新的组织战略（2024-2026）。该战略加强了环境管理与遗产管理之间的联系，并将其置于首要位置。四个战略目标中的两个体现了这一点：“我们已为未来做好准备”和“我们引领并激励积极变革”，并制定了“我们将如何实现这些目标”的具体目标和措施。该战略还提出了气候行动的具体目标，包括：（1）到 2030 年实现气候正效益；（2）采纳并推广可持续活动管理原则；（3）扩大悉尼歌剧院在激励社区积极变革方面的作用；以及（4）最终确定气候适应计划。

1.2 环境可持续性和遗产管理框架

从 20 世纪 90 年代到 2000 年代中期，悉尼歌剧院通过减缓气候变化的项目和“自下而上”的方式，致力于提升其环境可持续性，从而采取气候行动。20 世纪 90 年代，气候行动主要包括通过改变用户行为来减少温室气体排放，例如办公和建筑垃圾回收利用以及节能目标。2001 年，该机构制定了一项部门战略和行动计划，其中确定了未来 10 年内由维护团队和基建团队实施的节能项目，包括照明、供暖和制冷系统的升级改造，以及引入工具来改进能源消耗监测。

2009 年，歌剧院正式确立了环境管理框架，旨在通过配备专职人员、制定并实施环境政策和行动计划来实现战略目标。2010 年，歌剧院启动了首个三年环境行动计划（EAP）。

to adopt the UN Global Goals and published a public commitment to the Goals called ‘Inspiring Positive Change’. The Global Goals help address the most pressing global challenges, including climate change (United Nations 2023). The Goals provided a framework to bring together the Opera House’s social and environmental sustainability goals, including heritage. Global Goal #13, ‘Climate Action’, is one of the organisation’s nine focus areas, with objectives sitting across business plans covering mitigation and emissions reduction, climate risk management and resilience, and staff and community engagement.

The Goals were reviewed and incorporated into the Opera House’s most recent organisational strategy (2024–26). The Strategy strengthens the relationship between environmental and heritage management and brings them to the forefront. Two of the four strategic objectives reflect this: ‘we are future ready’ and ‘we lead and inspire positive change’ with specific goals and measures on ‘how we will get there’. Targets for climate action are called out, including (1) to be on track to be climate positive by 2030, (2) adopt and promote sustainable events management principles, (3) amplify the Opera House’s role to inspire positive change in the community, and (4) finalise a climate adaptation plan.

1.2 Environmental sustainability and heritage management framework

From the 1990s to the mid-2000s, climate action has been undertaken at the Opera House through mitigation projects and a ‘bottom-up’ approach to improving environmental sustainability at the site. In the 1990s, climate action comprised reducing GHG emissions through changes in user behaviour, such as office and building waste recycling and energy-saving targets. In 2001, the organisation developed a departmental strategy and action plan that identified energy efficiency projects to be undertaken within the next 10 years by the maintenance team and capital works team, including lighting, heating and cooling system upgrades and introducing tools to improve energy consumption monitoring.

An environmental management framework was formalised in 2009 to achieve strategic goals through hiring an in-house resource and developing and

在 2009 年设立的新环境可持续发展经理的领导下，环境行动计划使歌剧院能够制定目标并采取切实措施来加强环境管理，包括应对气候变化，并公开报告进展情况。前三个计划均包含与提升建筑环境可持续性、完善机构治理、推进温室气体减排项目以及吸引和激励社区参与的相关行动。例如，为了改善治理，歌剧院于 2012 年制定了首个环境管理政策，其中规定了原则、政策和责任。该政策的最新更新于 2021 年进行。所有环境行动计划中的遗产考虑因素都是一致的，包括承认歌剧院的世界遗产地位，力求为可持续遗产建筑树立标杆，以及考虑拟议环境项目的遗产价值和潜在影响。

在环境管理在该机构兴起的同一时期（20 世纪 90 年代至 21 世纪初），悉尼歌剧院的文化遗产意义也得到了认可，并制定了基础性政策和管理文件，以指导该遗址的保护和管理。歌剧院开放仅 20 年后，就被公认为具有重要文化遗产意义的场所、建筑杰作、澳大利亚的标志性建筑、世界知名的表演艺术中心以及社区中心。

自 20 世纪 90 年代以来，遗产管理政策文件一直存在，旨在指导该遗址文化遗产价值的保护及变化管理。悉尼歌剧院过去和现在都采用保护管理计划。该遗址的首份保护规划于 1993 年发布。到了 20 世纪 90 年代末，鉴于需要对该遗址进行长期改善，约恩 · 乌松再次受邀，将其设计理念记录下来，作为未来保护和基建工程的指导，并形成了《乌松设计原则》（UDP）。乌松还为当地建筑事务所制定的《战略建筑规划》提供了意见，该规划是该遗址的长期总体规划。SBP（战略规划）着重于改善场地条件，通过提升无障碍设施和声学效果，保障其作为表演艺术中心和旅游景点的正常使用。SBP 简要提及了环境管理，强调了降低能源消耗的必要性，但并未提及其他气候减缓或适应项目。2003 年，保护管理计划第三版发布。该版本未包含环境可持续性或气候变化政策，但提供了歌剧院应对变化的政策，例如气候项目。2003 年至 2007 年间，该场地被列入遗产名录，标志着十多年来在认可和保护其文化遗

implementing environmental policy and action plans. The Opera House launched its first three-year environmental action plan (EAP) in 2010. Led by a new Environmental Sustainability Manager role established in 2009, the EAPs enabled the organisation to take targets and practical steps to strengthen environmental management at the Opera House, including climate action, and publicly report progress. The first three plans consistently included actions relating to improving the environmental sustainability of the building and governance in the organisation, GHG emissions reduction projects, and engaging and inspiring the community. For example, improving governance required the development of the first environmental management policy in 2012, which set out principles, policies, and responsibilities. The latest update to the policy occurred in 2021. Heritage considerations in all the EAPs have been consistent, including the recognition of the Opera House's World Heritage status, the ambition to set a benchmark for sustainable heritage buildings, and the consideration of the heritage values and potential impacts of proposed environmental projects.

Over the same period as environmental management emerged in the organisation (1990s to mid-2000s), the Opera House's cultural heritage significance was recognised, and foundational policy and management documents were developed to guide the conservation and management of change at the site. Only 20 years after its opening, the site was recognised as a place of cultural heritage significance, an architectural masterpiece, an icon of Australia, a world-renowned performing arts centre, and a place for the community.

Heritage management policy documents have existed since the 1990s to guide the conservation of the site's cultural heritage values and management of change. The Opera House used, and continues to use, the Conservation Plan methodology. The site's first CMP was published in 1993. By the late 1990s, in recognition of the need to make long-term improvements to the site, Jørn Utzon was re-engaged to document his design vision to inform future conservation and capital works in the Utzon Design Principles (UDP). Utzon also provided input into a Strategic Building Plan (SBP), a long-term master plan for the site, developed by local architectural firm Johnson Pilton Walker. The SBP focused on addressing improvements for the site to

产价值以及构建遗产管理框架方面所做工作的圆满完成。

2010 年代，通过发布第四版管理计划以及在 2017 年聘请首个内部文化遗产专员来领导实施，文化遗产治理得到了加强。其内容更加深入，并新增了关于包容性和变革机遇的创新章节。它是首个包含气候变化章节和政策的版本，要求组织开展研究，评估应对气候影响可能需要采取的措施。该政策指出，气候变化减缓措施应：（1）在设计和实施过程中保护场所的重要价值，但不得对其造成不利影响；（2）符合 CMP 和 UDP 中的指导方针和政策；（3）处于创新前沿；（4）在现场实施前经过测试和验证。该政策已体现在 2020-2023 年环境行动计划（EAP）中。

借鉴环境行动计划 (EAP) 的成功经验，悉尼歌剧院采用类似模式制定了首个遗产行动计划 (HAP)，并于 2022 年启动。该遗产行动计划记录了为落实和实现保护管理计划 (CMP) 的政策和业务优先事项而采取的短期和中期行动，从而为制定更长期的保护行动和计划奠定了战略基础。该计划包含五大支柱或目标，以及将在四年内实施的 100 多项行动。遗产行动计划涵盖了环境可持续性和气候相关行动，旨在通过持续评估和适应性规划（符合保护管理计划政策的要求），更好地了解和应对气候变化对遗址遗产价值的风险。这些行动是由项目团队与环境可持续发展经理共同制定的。

1.3 资源与倡导者

内部专门的环境和遗产资源对组织战略和行动计划的实施产生了积极影响。除了设立专门的岗位外，一个倡导和协调可持续发展行动的内部团队，例如“绿色团队”，也成为加强组织可持续性的关键预测因素。悉尼歌剧院的内部“绿色倡导者”负责推动可持续发展并激发积极变革。该绿色团队成立于 2010 年，名为“可持续发展环境行动领导者”（SEALs）。SEALs 作为一个影响力中心，负责调动员工积极性，并将可持续发展理念融入到整个组织中。他们负责落实环境行动计划（EAP）的各项行动，

safeguard its use as a performing arts centre and visitor attraction through accessibility and acoustic upgrades. The SBP briefly references environmental management by highlighting the need to reduce energy consumption but does not identify other climate mitigation or adaptation projects. In 2003, the third edition of the CMP was published. It did not include environmental sustainability or climate change policies but provided policies for managing change at the Opera House, such as climate projects. Heritage register inscriptions from 2003 to 2007 rounded out more than a decade of work in recognition and protection of the site's cultural heritage values and development of the foundations for its heritage management framework.

In the 2010s, heritage governance was strengthened through the launch of the fourth edition of the CMP (CMP4) and the hiring of the first in-house heritage role in 2017 to lead CMP implementation. The CMP4 was more in-depth and included innovative new sections on tolerance and opportunities for change. It was the first edition to include a section and policy on climate change that requires the organisation to undertake research to assess what measures may be required to address climate impacts. It states that climate change mitigation measures should be: (1) designed and implemented to protect the significant values of the place but not adversely impact them; (2) comply with guidelines and policies in the CMP and the UDP; (3) be at the forefront of innovation; and (4) tested and proven before implementation on site. This policy is reflected in the EAP 2020–23.

Drawing on the success of EAPs, the Opera House used a similar model to develop the first Heritage Action Plan (HAP) launched in 2022. The HAP documents short- and medium-term actions to operationalise and meet CMP policies and business priorities, enabling strategic thinking about longer-term conservation actions and plans. The plan includes five pillars or goals and more than 100 actions to be taken over four years. The HAP includes environmental sustainability and climate-related actions focused on better understanding and addressing climate risk to the site's heritage values through ongoing assessment and adaptation planning as required by CMP policy. The actions were developed with the Environmental Sustainability Manager.

领导员工参与项目和倡议，并与同样热衷于可持续发展的同事建立联系。同样，遗产行动计划（HAP）也包含一项行动，即组建一个类似于 SEALs 的保护行动团队。

1.4 创意节目策划与社区参与

文化遗产场所可以用来宣传和讲述气候故事。像悉尼歌剧院这样的文化机构，通过其项目活动，在推动可持续发展方面发挥着重要的社会作用。悉尼歌剧院的战略目标之一是激励社区做出积极的改变。作为标志性的文化遗产和澳大利亚最具代表性的象征之一，悉尼歌剧院深知自身在促进气候行动和可持续发展方面所扮演的重要角色。

根据全面的规划和遗产保护监管框架，悉尼歌剧院可以举办临时户外活动和装置艺术。2022 年悉尼艺术节期间，当地艺术家“墙上的腿”创作了一件与气候相关的行为艺术作品。一块重达 2.7 吨的冰块悬挂在海港上方 20 米处，在装置艺术表演期间缓慢滴落（图 2）。该行为艺术作品可在三天内通过现场和线上观看，并配有现场讲座和关于气候变化的启发性讨论。经评估，该行为艺术作品对场地遗产价值的影响极小且短暂（例如，不会对望向歌剧院及从歌剧院向外眺望的主要视线造成负面影响）。



图 2：Legs on the Wall 表演艺术与悉尼歌剧院建筑及其环境的关系。来源：劳拉 · 马塔雷塞，© 悉尼歌剧院信托所
Figure 2. Performance art by Legs on the Wall shown in relationship to the building and setting. Source: Laura Matarese. © Sydney Opera House Trust

通过推广环保项目，可以促进社区参与气候行动。2018 年，悉尼科技大学海洋生态学家大卫 · 布斯教授和吉吉 · 贝雷塔合作，在悉尼歌剧院附近的海域安装了人工鱼礁。这些鱼礁

1.3 Resourcing and champions

Dedicated in-house environmental and heritage resources made a positive difference in the implementation of the organisational strategies and action plans. In addition to a dedicated role, an internal group advocating for and coordinating sustainability action, such as a ‘green team’, emerges as a key predictor for strengthening sustainability in an organisation. The Opera House’s in-house ‘green champions’ are responsible for driving sustainability and inspiring positive change. A green team was established in 2010, known as the Sustainability Environmental Action Leaders or SEALs. The SEALs act as a hub of influence to engage staff and embed sustainability across the organisation. They are responsible for delivering EAP actions, leading staff engagement projects and initiatives, and fostering relationships with fellow colleagues who are passionate about sustainability. Similarly, the HAP includes an action to develop a conservation action team similar to the SEALs.

1.4 Creative programming and community engagement

Heritage places can be used to promote and tell climate stories. Cultural organisations such as the Opera House have a significant societal role as change agents for sustainability through programming. One of the Opera House’s strategic goals is to inspire positive change in the community. As an iconic heritage site and one of the most recognisable symbols of Australia, the Opera House understands its role as a megaphone in promoting climate action and sustainability.

Temporary outdoor events and activations can be undertaken at the Opera House in accordance with a comprehensive planning and heritage regulatory framework. A climate-related performance art took place during the 2022 Sydney Festival by local artist Legs on the Wall (Legs on the Wall 2022). A 2.7-tonne block of ice suspended 20 m above the harbour slowly dripped away for the duration of the installation. The performance art could be viewed over three days, on-site and online and was accompanied by an on-site talk and inspired conversations about climate change (Legs on the Wall 2022). The performance artwork was assessed as having minimal and temporary impacts on the site's heritage values (e.g., no negative

旨在改善人工海堤区域的栖息地，这些区域的海洋物种数量已知会下降（图 3）。该项目鼓舞了社区，因为它支持了“建筑环境可以以积极和再生的方式为自然环境做出贡献”的理念。由于该项目位于遗址边界之外且低于水线，因此没有对遗址的重要性造成任何负面影响。



图 3：濒危的白氏海马依附于人工鱼礁结构上，2022 年。来源：吉吉娅 · 贝雷塔，悉尼科技大学海洋生态学家
Figure 3. The endangered White's seahorse attached to artificial reef structures, 2022. Source: Giglia Beretta, UTS Marine ecologist

2 设定环境绩效基准

2014 年，悉尼歌剧院与澳大利亚绿色建筑委员会（GBCA）合作，率先试用了首个“既有建筑”性能评级工具（Broadsheet 2015）。这是歌剧院首次接受独立环境绩效评估。此举也是澳大利亚建筑行业关注历史建筑环境绩效的重要举措。当时，GBCA 授予的四星级绿色之星评级被认为是环境可持续性方面的最佳实践。该评级系统（类似于美国的 LEED 或英国的 BREEAM）现已成为国际公认的独立评估工具，用于衡量房地产行业既有建筑的性能（参见 GBCA、LEED 和 BREEAM）。

悉尼歌剧院于 2014 年采用“绿色之星”绩效评级工具，并以此作为四星级绩效基准。该机构承诺在未来十年内逐步提升其环境绩效。歌剧院分别于 2018 年和 2022 年荣获五星级和六星级评级，这意味着其在可持续发展领域的全球领先地位，也是该机构最雄心勃勃的目标之一。歌剧院的绩效评级将继续每年进行评估。

借助 GBCA 绩效评估工具，歌剧院在遗产保护、无障碍等方面的贡献和成效也被纳入了评估。2022 年评级申请中评估的项目使歌剧院能够重点展示提升文化遗产

impacts to key view lines to and from the Opera House).

Community engagement regarding climate action can be achieved through the promotion of environmental projects. In 2018, artificial reef pods were installed in the marine area adjacent to the Opera House in partnership with University of Technology marine ecologists Professor David Booth and Gigi Beretta. The structures were designed to enhance habitat in areas where artificial seawalls had been constructed and were known to be associated with marine species decline (Fig. 3). This project inspires the community because it supports the notion that the built environment can contribute to nature in a positive and regenerative way. The project had no negative impacts on the heritage site's significance, being located outside the site boundary and below the waterline.

2 Setting the benchmark for environmental performance

The Opera House collaborated with the GBCA to pilot the first 'existing building' performance rating tool in 2014. It was the first time the Opera House had been independently assessed for its environmental performance. It was also an important industry move to consider the environmental performance of historic buildings in Australia. A 4-star Green Star rating awarded by the GBCA was considered the best practice in environmental sustainability at the time. The rating system (similar to LEED in the United States or BREEAM in the United Kingdom) is now an internationally recognised independent assessment tool used to measure the performance of existing buildings in the property sector (see GBCA, LEED and BREEAM).

The Green Star performance rating tool was adopted by the Opera House in 2014, providing a 4-star performance baseline. The organisation has committed to incrementally improving its environmental performance for the next decade. The Opera House was awarded a 5-star rating in 2018 and a 6-star rating in 2022, equivalent to global leadership in sustainability and one of the organisation's most ambitious goals. The Opera House performance rating will continue to be assessed annually.

The GBCA performance tool enables the Opera House to be assessed for its contribution and achievements in other strategic areas, including heritage,

价值的项目，并说明建筑的环境管理和保护管理如何相互补充以实现共同目标。使歌剧院获得六星级评级的项目包括气候减缓和适应措施，例如室内环境质量监测和管理、建筑服务信息管理以及先进的能源和水计量与监测。其他可评估的项目包括可持续采购框架、运营和翻新废弃物管理以及公众参与项目。

3 尊重遗产价值的减缓措施

悉尼歌剧院二十多年来一直致力于开展气候减缓项目，以减少温室气体排放。这些项目包括测量和监测排放量、改变用户行为以及使用可再生能源。减缓项目的具体例子包括：实施碳排放测量系统、减少排放（照明和设备升级以及使用可再生能源）以及改变用户行为（采购和废物管理）。

悉尼歌剧院于 2010 年首次测量了其碳排放量或“碳足迹”。排放量由碳管理专家每年测量，并经独立机构核实。2017 年，歌剧院安装了一套全新的楼宇管理控制系统（BMCS），旨在更智能地监控和控制楼宇运营（包括水、电、废物等），并作为收集数据和监测环境状况的重要工具。照明升级是首批现场减排项目之一。音乐厅的顶灯最初于 2015 年进行了升级。新的照明方案需要进行定制，以确保灯具和装置符合建筑和文物保护方面的严格要求，并符合《保护管理计划》（CMP）和《乌松设计原则》（UDP）的要求。通过改变用户行为来减少浪费，可以降低消费量，从而减少碳排放。悉尼歌剧院还应通过支持澳大利亚的可再生能源转型来展现其领导地位。购电协议（PPA）使歌剧院能够从新南威尔士州的一个太阳能和风力发电场“购买”电力。两个场外可再生能源（太阳能和风能）项目产生的电力与歌剧院的日常用电需求相匹配。自 2023 年以来，歌剧院已实现 100% 使用可再生能源电力。

4 评估气候风险

遗产地管理者需要清楚了解其遗产地面临的气候风险。这对于做好应对这些风险的准备至关重要（联合国教科文组织，2023）。2019 年，悉尼歌剧院与新南威尔士州政府合作开展了一

accessibility and reconciliation action (GBCA 2023b). Projects assessed as part of the rating submission in 2022 enabled the organisation to highlight projects that enhance cultural heritage values and demonstrate how the environmental and conservation management of the building complement each other to achieve shared goals. Projects that enabled the Opera House to be awarded a 6-star rating included climate mitigation and adaptation measures, including indoor environment quality monitoring and management, building services information management, and sophisticated energy and water metering and monitoring. Other assessable projects included a sustainable procurement framework, operational and refurbishment waste management, and engagement projects.

3 Mitigation measures that respect heritage values

The Opera House has undertaken climate mitigation projects to reduce GHG emissions for over two decades. Projects include measuring and monitoring emissions, changing user behaviours, and using renewable energy. Mitigation project examples include implementing systems to measure carbon, reducing emissions (lighting and equipment upgrades and renewables), and changing user behaviour (procurement and waste management).

The Opera House first measured its carbon emissions or ‘footprint’ in 2010. Emissions are measured yearly by a carbon management specialist and independently verified . In 2017, a new BMCS was installed to enable smarter monitoring and control of building operations (water, electricity, waste, etc.) and to serve as an important tool for gathering data and monitoring environmental conditions. Lighting upgrades were one of the first on-site emission-reduction projects. The crown lights in the Concert Hall were originally upgraded in 2015. The new lighting solution needed to be customised to ensure light fittings and fixtures met strict architectural and heritage requirements in accordance with the CMP and UDP. Reducing waste through changes in user behaviours yields reductions in consumption and, thus, carbon emissions. It is important for the Opera House to demonstrate leadership by supporting the renewable energy transition in Australia. The PPA enables the Opera House to ‘off-take’ electricity from a solar and wind farm within New South Wales.

项试点研究，旨在了解气候风险并确定适应行动的优先顺序。气候风险应对 (CRR) 方法采用参与式流程，邀请所有运营领域的利益相关者参与风险评估研讨会，共同探讨 21 世纪悉尼地区不同时期的极端天气预测。这使得悉尼歌剧院能够更好地了解未来情景，并识别脆弱性和风险领域，包括目前正在管理的风险以及需要优先评估或探索的风险（DPIE 2021）。风险评估调查了与运营维护、基础设施、安全和游客体验相关的物理气候风险。

过去十年，气候变化风险已成为现实。影响悉尼歌剧院功能及其相关遗产价值的气候相关风险和现有管理措施的例子包括极端天气事件对社区和表演艺术活动的影响。自 2020 年以来，由于极端天气，包括强降雨和持续降雨、大风、高温以及雷暴风险，多场户外演出被迫中断。气候风险评估过程强调了监测和报告这些中断事件及其影响以及制定适应性规划的必要性。如上所述，楼宇监测系统（BMCS）收集各种数据源，包括天气、悉尼周边郊区的空气质量和紫外线辐射。该系统监测空气污染水平以维持室内空气质量，当达到阈值时（例如，当山火烟雾降低室外空气质量时），系统会自动关闭场馆的室外进气口。导致演出中断的天气影响会被记录在悉尼歌剧院的事件管理系统中。为确保天气影响得到记录和报告，歌剧院设立了独立的“极端天气”类别。监测和记录这些数据有望展现长期趋势，并识别和评估极端天气对户外活动的影响。这些信息将帮助歌剧院更好地了解目前正在制定的适应计划中需要包含哪些措施。

5 适应性规划

适应气候变化如今已成为文化遗产地保护的必要气候行动。在全球尚未成功缓解气候变化的情况下，适应气候变化的影响仍然是未来保护文化遗产地的唯一途径。适应规划是悉尼歌剧院的战略重点。到 2026 年，歌剧院将进一步发展并完善组织内部的气候变化风险管理，并完成一项适应计划。该计划将着力保护和加强该遗址文化遗产价值的两个方面（建筑、场地及其功能）。该计划的其他行动包括：利用

Since 2023, the Opera House has been powered by 100% renewable electricity.

4 Assessing climate risk

Managers of heritage places require a clear understanding of the climate risks to which their properties are vulnerable. This is needed to prepare for and respond to these risks (UNESCO 2023). In 2019, the Opera House collaborated with the New South Wales Government in a pilot study to understand climate risk and prioritise adaptation actions. The Climate Risk Ready (CRR) methodology involved a participatory process, engaging stakeholders from all operational areas in risk assessment workshops on extreme weather projections for the Sydney area at several periods across the 21st century. This allowed the Opera House to understand future scenarios better and identify areas of vulnerability and risk, including those currently being managed and those to be prioritised for further assessment or exploration. The risk assessment investigated physical climate risks related to operations and maintenance, infrastructure, safety and visitor experience.

Over the past decade, the risk of climate change has become a reality. Examples of climate-related risk and current management practices affecting the Opera House's function and associated heritage values include the impacts of extreme weather events on the community and performing arts activities. Since 2020, several outdoor performances have been disrupted due to extreme weather, including intense and prolonged rain, high winds, high temperatures and the risk posed by electrical storms. The CRR assessment process highlighted the need to monitor and report these disrupted events and their impacts and adaptive planning. The BMCS, described above, captures various data sources, including weather, air quality in surrounding Sydney suburbs, and UV radiation. It monitors air pollution levels to maintain indoor air quality, and when thresholds are reached (e.g., when bushfire smoke reduces external air quality), actions are taken to automatically close outside air intakes to venues. Weather impacts that result in disruption are captured in SOH's incident management system. A standalone 'extreme weather' category was created to ensure weather impacts are captured and reported. Monitoring and recording this data is

现有内部能力，在审查保护和管理框架时纳入应对气候变化风险的措施，并通过其在气候变化行动和风险防范方面的领导力来激励社区。目前正在考虑采用多种方法和决策框架来制定该适应计划。例如，适应性路径方法使管理层能够预测变化并确定适应方案，即使气候影响何时发生可能存在不确定性。基于文化价值观的变革管理方法将是适应计划的基础。

风险评估中确定的一个未来潜在适应项目案例是，由于气候变化导致全球气温升高，主要用户区域的热负荷增加。风险评估发现，主要场馆（音乐厅和琼 · 萨瑟兰剧院）的门厅可能面临更高的热负荷。这些由彼得 · 霍尔与奥雅纳工程顾问公司合作设计的门厅（图 4）采用的是 20 世纪 60 年代末期安装的单层玻璃，隔热性能有限。在盛夏正午，太阳辐射热负荷尤其高，可达 27 摄氏度（80 华氏度）以上（奥雅纳：《悉尼歌剧院音乐厅北侧门厅热舒适度研究》，未发表）。夏季，门厅需要大量的制冷设备才能确保空间舒适宜人。供暖、通风和制冷约占建筑总用电量的 60%，因此任何节能措施都将改善用户体验（例如，在举办活动和参观时），并降低能源消耗和温室气体排放。

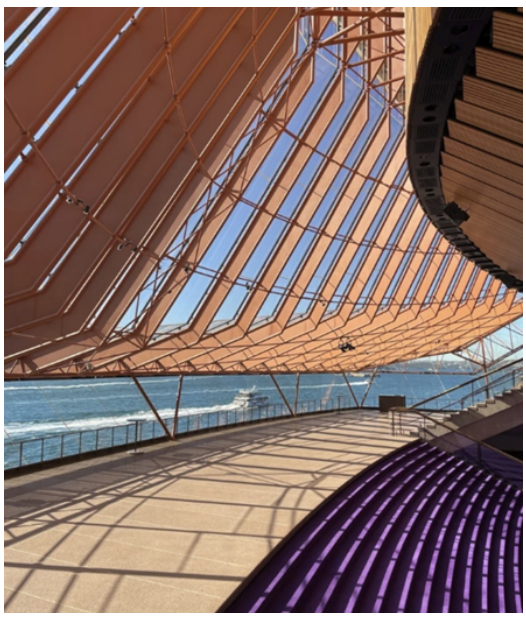


图 4：音乐厅北侧门厅。来源：劳拉 · 马塔雷塞，2023 年，© 悉尼歌剧院信托所
Figure 4. The Concert Hall's northern foyer. Source: Laura Matarese, 2023. © Sydney Opera House Trust

expected to show trends over time and identify and assess extreme weather-related impacts on outdoor activities. This information will help the Opera House to better understand what actions need to be included in an adaptation plan which is currently under development.

5 Adaptation planning

Adaptation is now a necessary climate action for heritage sites. In the absence of successful global attempts to mitigate climate change, adaptation to climate impacts remains the only approach for the conservation of cultural heritage sites in the future (Jacobs et al. 2019). Adaptation planning is a strategic priority for the Opera House. By 2026, the Opera House will further develop and embed climate change risk management in the organisation and complete an adaptation plan, which will address conserving and strengthening both aspects of the cultural heritage significance of the site (the building, site and its function). Other actions of the plan include building on existing internal capacity, addressing climate change risks as part of the review of conservation and management frameworks, and inspiring the community through its leadership on climate change action and risk preparedness. Various methodologies and decision-making frameworks for the adaptation plan are being considered. For example, an adaptive pathways approach allows management to anticipate change and identify adaptation solutions, even though the timing of the onset of climate impacts may be uncertain. A cultural values-based approach to managing change will be fundamental to the adaptation plan.

An example of a future potential adaptation project identified through the risk assessment was the thermal load of key user areas due to an increase in global temperatures from climate change. The risk assessment identified potential increased thermal load of the main venue foyers of heat in the major venues (Concert Hall and Joan Sutherland Theatre). These foyers, designed by Peter Hall with engineers Arup & Partners, have single-pane glass dating from the late 1960s with limited solar protection. The solar heat load can be particularly high in the middle of a summer day, reaching upwards of 27 °C or 80°F (Arup: Sydney Opera House Concert Hall Northern Foyer Thermal Comfort Study, unpublished). The foyer requires significant cooling in summer to ensure the space is

结论

作为全球标志性建筑、社区聚会场所和现代澳大利亚的象征，悉尼歌剧院有责任通过气候行动帮助塑造一个更可持续的未来。

悉尼歌剧院开展气候行动已有三十年之久。其成功归功于五大因素。首先，健全的治理框架将可持续发展和遗产保护融入组织战略，并为实施和协作提供了框架。为确保气候行动战略目标的落实，歌剧院配备了专人来领导和实施行动计划，并由内部的“绿色团队”倡导者推动变革。其次，作为标志性建筑和文化机构，歌剧院通过社会和社区项目在激发积极变革方面发挥着关键作用。有关气候变化的项目和宣传活动促进了知识共享、能力建设和公众意识的提升。第三，与激发积极变革密切相关的是环境绩效的基准评估。歌剧院气候行动成功的关键因素之一是公开设定（并实现）可持续发展基准。通过稳健、独立的评估来确保问责制，对于展示气候行动的进展以及赢得公众对歌剧院可持续发展转型的信任至关重要。第四，与节目策划一样，各项缓解措施的实施并未对歌剧院的有形遗产价值造成负面影响，反而增强了其无形价值。最后，歌剧院已对气候风险进行了评估，并正在制定适应计划。通过参与式流程评估风险，加深了该机构对气候直接和间接影响以及对剧院文化意义影响的理解。这五个成功要素可应用于其他遗产地、遗产机构和文化机构。

comfortable for guests. Heating, ventilation and cooling account for about 60% of the building's total electrical energy load, so any reduction would improve user experience (e.g., for events and tours) and reduce energy consumption and GHG emissions.

Conclusion

As a global icon, a community meeting place and the symbol of modern Australia, the Opera House has a responsibility to help shape a more sustainable future through climate action.

Climate action has been undertaken at the Opera House for three decades. Five factors have contributed to its success. Firstly, a strong governance framework embeds sustainability and heritage conservation in organisational strategies and provides the framework for implementation and collaboration. Implementation of the strategic goals on climate action was enabled by a dedicated resource to lead and implement an action plan, supported by an internal 'green team' of champions to drive change. Secondly, as an icon and cultural institution, the Opera House plays a key role in inspiring positive change through social and community programming. Programming and communications about climate change enable knowledge-sharing, capacity-building and awareness-raising. Thirdly, and related to the role of inspiring positive change, is benchmarking environmental performance. A key factor in the site's climate action success has been publicly setting (and achieving) sustainability benchmarks. Accountability through robust, independent assessment is important to demonstrate progress on climate action and gain public trust for the organisation's sustainability transition. Fourth, as with programming, mitigation projects were undertaken without negative impacts on the Opera House's tangible heritage value and strengthened the site's intangible value. Lastly, the Opera House has assessed climate risk and is preparing an adaptation plan. Assessing risks through a participatory process enhanced the organisation's understanding of direct and indirect climate impacts, as well as the impacts on the site's cultural significance. The five elements of success could be applied to other heritage sites, heritage organisations and cultural institutions.

平台动态 Platform Dynamics

成都铁像寺大雄宝殿木柱与建筑彩画保护

Conserving Timber Columns and Architectural Polychromy in the Mahavira Hall of Tiexiang Temple in Chengdu

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来源：高韵蕊、李姝靓、麦贤敏：《成都铁像寺大雄宝殿木柱修缮技术》，《中国民族建筑学术论文特辑 2025》，第 180-185 页。图 1-4 分别选自原文图 8、9、10、13，照片与示意图均归原文作者。

Source: Gao Yunrui, Li Shuliang and Mai Xianmin. Timber Column Repair Techniques for the Mahavira Hall of Tiexiang Temple in Chengdu. *Chinese Ethnic Architecture Academic Papers Special Issue 2025*, pp. 180-185. All figures retain original author credits.

1 遗产价值与保护背景

铁像寺是成都的一座藏传佛教寺院，作为尼众修行场所具有独特的历史。据原文援引的地方史料记载，1590 年此地出土铁铸释迦牟尼像，随后建寺供奉；寺院于 1626 年和 1739 年重修，此后又经历毁损、恢复与重建。在这一不断变化的建筑环境中，大雄宝殿被原文认定为留存的明代木构建筑。因此，对大雄宝殿的保护，也是对现存寺院中较为稀有的历史实物的保存。

大雄宝殿的价值并不止于承重骨架。木构体系记录了传统营造方式，墙面、梁枋等处的彩画承载着佛教图像信息，并共同塑造殿内空间的特征；持续开展的宗教活动又赋予建筑现实的社会功能。因此，修缮决策会同时影响旧木料的留存、传统构造的可辨识性、装饰表面的完整性以及殿堂的持续使用。正是这些相互关联的价值，使木柱修缮成为一项整体性的建筑遗产保护工作。

区分古老殿堂与后期重建建筑，有助于理解该场所真实性的具体内涵。原文记述，寺院其他建筑多属后期增建或重建，其中还包括使用现代材料的仿古建筑。因此，大雄宝殿留存的木材和彩画提供了周边建筑外观本

1 Heritage significance and conservation context

Tiexiang Temple is a Tibetan Buddhist temple in Chengdu with a distinctive history as a place of practice for Buddhist nuns. According to the historical account cited in the source article, its foundation followed the discovery of an iron statue of Shakyamuni in 1590. Repairs were undertaken in 1626 and 1739, and the complex subsequently experienced destruction, recovery and rebuilding. Within this changing setting, the Mahavira Hall is identified as the surviving Ming dynasty timber building. Its conservation therefore concerns a comparatively rare repository of historic fabric within the present temple.

The hall's significance extends beyond its structural frame. Its timber construction records building practices, while painted decoration on walls, beams and lintels expresses Buddhist imagery and contributes to the interior's character. Continued religious activity also gives the building a present social function. Repair decisions consequently affect several connected attributes: the survival of old wood, the legibility of traditional construction, the integrity of decorative surfaces and the ability of the hall to remain in use. These relationships provide the basis for examining the column repairs as a heritage conservation undertaking.

身无法替代的历史证据。保存这些实物，也维系了寺院历史发展与当代佛教活动之间的物质联系，使单根木柱的精细处理具有超出受损支撑构件维修本身的意义。

2 损伤特征与分类干预需求

成都属亚热带季风性湿润气候，持续潮湿对历史木构建筑形成长期影响。大雄宝殿瓦件破损、灰缝脱落、檐口变形，引起屋面漏雨。原文将雨水渗入地基与不均匀沉降，以及构件进一步开裂、变形和糟朽联系起来。木构件还存在虫蛀，部分梁架节点出现松动、拔榫等现象。因此，木柱修缮是揭顶维修、构架拨正及受损构件处理等整体结构干预的组成部分。

不同位置木柱的损伤存在明显差异。前檐柱及北侧山柱虽有裂缝和局部表层糟朽，但总体仍具承重条件；后檐柱的腐朽、虫蛀则较为严重，柱体下沉，并伴随后檐木构架约 3 厘米的后倾。原文认为后檐柱已不适合仅通过加固继续使用。这种差异构成分类修缮的核心依据：对全部木柱采用同一种处理方法，既可能失去保存历史材料的机会，也可能忽略必须替换才能保障安全的部位。

整体勘查进一步说明，损伤应作为相互关联的过程加以理解。梁架构件出现位移、弯曲、开裂和糟朽，部分大木构件甚至存在通裂。原文记述，木柱施工之外，受损上部梁架也需要较大范围的构件替换。这些现象为局部修补提供了整体背景：保留的木柱只有置于能够承受、传递荷载的构架中，才能继续发挥作用；同样，修复一处柱面本身，也不能消除原文所述的屋面漏雨及长期潮湿等损伤原因。

3 通过传统修缮保留历史材料

修缮以保存文物原状和建筑特征为基本原则，将干预限制在必要范围。原文强调材料、形制、结构与工艺技术的延续，由熟悉传统加固方法的工匠运用传统工具，并尽可能利用拆换后保留下来的旧木料。落实到具体操作，其目标是保留既有构件中完好的部分、恢复使用能力，避免因局部糟朽而直接导致整根木柱被弃用。

The distinction between the old hall and later reconstruction is particularly relevant to the meaning of authenticity at the site. The source describes other temple buildings as later additions or rebuilding, including structures made with modern materials. The hall's surviving timber and decoration consequently offer evidence that cannot be supplied by the appearance of the surrounding complex alone. Conservation of this fabric also maintains a tangible link between the temple's historical development and its continuing Buddhist role. This gives the detailed treatment of individual columns a significance beyond the immediate repair of damaged supports.

2 Deterioration and the need for differentiated intervention

Chengdu's humid subtropical monsoon climate creates persistent moisture pressures on historic timber buildings. In the hall, broken roof tiles, deteriorated mortar joints and distorted eaves allowed rainwater to enter. The source connects this leakage with moisture penetration into the foundations, uneven settlement and further cracking, deformation and decay. Timber members also exhibited insect damage, and some beam connections had loosened or suffered withdrawal of their tenons. Column repair thus formed part of a wider structural intervention involving roof work, frame correction and the treatment of damaged members.

Damage varied substantially with column position. Front eaves columns and columns along the northern gable generally retained load-bearing potential despite cracks and local surface decay. Rear eaves columns were more severely affected by rot and insects; settlement was associated with a backward inclination of approximately three centimetres in the rear frame. These columns were considered unsuitable for continued service through strengthening alone. This contrast is central to the conservation logic: treating every column identically would overlook both opportunities to retain historic fabric and locations where replacement was required for safety.

The wider condition survey reinforces the need to understand deterioration as a connected process. Members in the beam frame showed displacement, bending, cracking and decay, and some large timbers had cracks extending through them. The article reports that substantial replacement

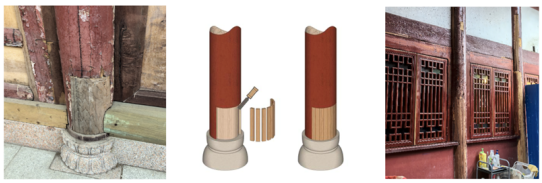
这一思路要求对单个构件及其连接关系逐一判断。原文记述的处理包括：浅层损伤采用包镶，可保留有效木材的局部严重损伤采用墩接，无法继续承担作用的木柱则予以替换。修缮多使用楠木，以对应原有材质；但其中一根墩接柱因缺少符合尺寸要求的楠木，改用了杉木。因此，材料延续是一项受到实际供应条件影响的保护目标，并非在所有部位均得到完全相同的落实。

尊重原有营造方式，并不意味着所有干预都不加变化地复现早期技法。原文中的施工将手工加工、传统榫接与拼板胶、防腐处理、金属约束相结合，并多次强调新旧构件严密贴合：补配木料要吻合原柱曲面，接合面则通过凿子、木锉等工具修整。这些细节表明，工程将保存历史特征的总体目标转化为具体操作；同时，也说明理解其修缮方法，需要同时关注木作工艺及配合使用的其他材料。

4 表层包镶与局部墩接

木柱 A、B、C 采用包镶，其柱心及剩余截面被认为仍能满足承重需要。工匠先剔除糟朽部分，直至露出健康木质，再将经干燥、防腐处理的楠木条加工成与凹缺深度、长度和弧度相吻合的形状，使用拼板胶黏结，最后修整至与柱面曲度一致。图 1 展示了修缮实例及包镶方式。其保护意义在于将剔除范围集中于受损部分，保留木柱的主要历史实体。

浅层糟朽能够采用包镶，取决于受损表面以下仍存有足够的有效截面。原文记载，木柱 A 使用约 60—100 毫米宽的木条，并根据柱体形状进行调整；木柱 B、C 同样按各自尺寸加工木条，使用耐水性拼板胶黏结。这些细节突出了根据既有构件加工补配材料的重要性。处理目标是形成紧密、连续的贴合，并在材质状态允许继续使用的部位尽可能保留原柱。



(a) 木柱A　(b)镶补柱示意图　(c)木柱 B、C

图 1：木柱 A、B、C 的包镶修缮
Figure 1. Surface patching of columns A, B and C

of the damaged upper frame was necessary alongside the column work. These observations place the localized repairs in context: a retained column could only continue to function within a frame capable of supporting and transferring loads. Likewise, conserving a patched surface did not by itself address the roof leakage and prolonged moisture exposure described as causes of damage elsewhere in the building.

3 Retaining historic fabric through traditional repair

The stated guiding principle was to preserve the building's historic condition and architectural characteristics while limiting intervention to necessary work. The article emphasizes continuity of materials, form, structural arrangement and craftsmanship. Where feasible, repair used traditional tools and salvaged timber under the direction of craftspeople familiar with established strengthening methods. In practical terms, the aim was to keep sound portions of existing members and restore their serviceability, rather than allow local deterioration automatically to determine the loss of an entire column.

This approach required judgment at the scale of individual members and their connections. The reported repairs comprise surface patching for shallow deterioration, splicing where a damaged section could be removed while retaining useful timber, and replacement where the original column could no longer perform adequately. Nanmu was commonly selected to correspond with existing wood, but a replacement section of Chinese fir was used in one instance because nanmu of the required dimensions was unavailable. Material continuity was therefore an objective shaped by actual supply conditions, rather than an outcome achieved uniformly throughout the work.

Respect for original construction did not mean that every intervention reproduced an earlier technique without modification. The recorded work combined hand cutting and traditional joints with wood adhesive, preservative treatment and metal restraints. For the retained members, close-fitting surfaces were repeatedly emphasized: replacement wood was shaped to existing curves, and joint faces were trimmed with chisels and files. These details show how the project translated a broad commitment to retaining historic character into specific operations. They also make clear that understanding the repair

对于沿柱长局部深入发展的糟朽，工程采用墩接。木柱 D 柱头附近损坏较重，但自上而下未超过柱高的四分之一。在支顶上部梁架后，切除损坏部分，配制材种、尺寸相应的干燥楠木段。新旧柱段采用巴掌榫搭接，原文记载搭接长度不小于 400 毫米，之后使用拼板胶和两道铁箍连接，并对铁箍进行防锈处理。

木柱 E 柱根糟朽而上部仍可使用，因此在柱根采取相似墩接，并在这一新接段中以杉木替代楠木。接缝以上的浅层糟朽则另用楠木条镶补，相关做法见图 2。同一构件上同时采用不同方法，表明各类修缮并非相互排斥：同一根柱子的不同缺陷，可以对应不同程度的干预。能否保留，应依据各部分的实际状态，而不能仅凭对整根构件的单一分类决定。

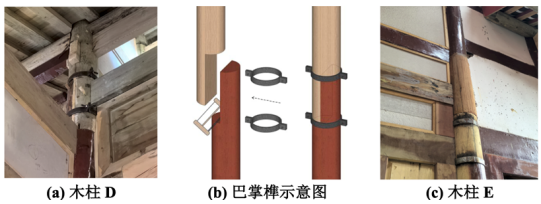


图 2：木柱 D、E 的巴掌榫墩接
Figure 2. Palm shaped splices in columns D and E

木柱 F 与 B 之间相连的枋保存较好，因此采用了不同的墩接方式。为保留该构件及其连接，工匠将原木柱、新楠木柱段和细长连接木件组合成三部分接头，并依据形状称之为“鱼尾榫”，其构造见图 3。该做法的保护意义在于根据既有构件调整接头形式，使一根木柱的修缮能够兼顾另一构件及原有连接关系的延续。

原文记载，鱼尾榫的连接木件竖向长度不小于 900 毫米。施工在支顶上部构架、切除糟朽柱头之后，分别在保留柱段与新配柱段上加工相应榫槽，使三部分严密对缝，并用拼板胶及铁箍固定连接部位。原文明确，该名称是木匠依据这一具体构造形状所作的称呼。介绍技术时保留这一限定十分必要，因为此处记录的是工匠描述的特定变形做法，不能据此认定所有同名传统接头都具有完全相同的构造。

5 整柱替换与建筑彩画保护

requires attention to both the carpentry and the supplementary materials used with it.

4 Surface patching and sectional splicing

Surface patching was applied to columns A, B and C, whose sound cores and remaining sections were considered capable of carrying the required loads. Decayed material was carefully removed until sound wood was exposed. Dried, preservative-treated nanmu strips were shaped to match the depth, length and curvature of each recess, bonded with wood adhesive and finished to follow the column surface. Figure 1 records both the repaired members and the patching arrangement. The conservation benefit lies in concentrating removal on damaged material while retaining the principal historic body of the column.

The treatment of shallow decay depended on the survival of an adequate section beneath the damaged surface. The source describes strips approximately 60 to 100 millimetres wide for column A, adjusted to its geometry. For columns B and C, strips were likewise prepared to the particular dimensions of each column and secured with water resistant wood adhesive. These details underline the importance of shaping the repair to the existing member. The objective was a close, continuous fit, with the original column retained wherever its material condition permitted continued use.

Where decay extended more deeply into a limited length of the column, the project used sectional splicing. Column D had severe damage near its head, extending downwards for no more than one quarter of its height. After temporary support of the upper frame, the damaged portion was removed and a matching dried nanmu section prepared. The two parts received a bazhang, or palm shaped, half lap splice, with a reported overlap of at least 400 millimetres. Adhesive and two iron hoops completed the connection, and the hoops received rust protection.

Column E required a comparable splice at its decayed base, while its upper part remained usable. This was the location where Chinese fir substituted for nanmu in the new section. Shallow decay above the splice was separately patched with nanmu strips. Figure 2 illustrates these repairs. The combination of techniques on one member shows that treatment categories were not

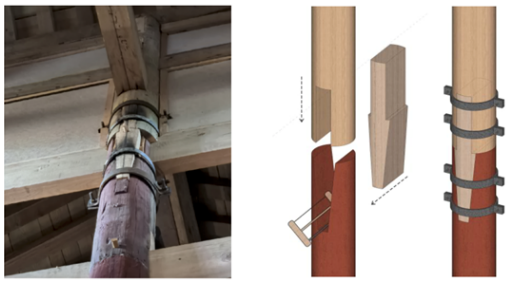


图 3：木柱 F 及鱼尾榫构造
Figure 3. Fish-tail splice in column F

木柱 X、Y、Z 因糟朽过重，无法通过包镶或墩接修复，遂予以替换。施工先将梁枋等相关构件支顶牢固，并控制抬升幅度，再撤出损坏木柱。新柱采用干燥楠木，按原柱高度制作，安装时与既有榫卯紧密衔接。由于殿门无法容纳整根长柱进入，施工将两根较短木料通过变形的插肩榫式接头拼接，并辅以拼板胶及经防锈处理的铁箍。这一替换过程同时回应了结构需求与既有建筑的运输、安装限制。

结构施工也给墙面与木构架上的彩画带来风险。揭顶、构件搬动及施工杂物可能损伤本已脆弱的装饰表面。原文现场勘查认为，仅有三处彩画保存相对较好，起甲、剥落较少，且未见严重粉化，因此在施工前予以封护。处理先将起翘部分回贴并清除表面灰尘，再轻覆透气薄膜和泡沫，最外层附加木板，以防碰撞和污染，相关留存彩画见图 4。



图 4：殿内留存彩画
Figure 4. Surviving architectural polychromy

木构件修缮完成后，拆除封护层、清理尘土，并将留存彩画恢复至原位。对于地仗大多脱落、装饰严重损失的区域，原文还记述了待木构件完全干燥后，依照原有形制、纹样和色彩重新绘制的处理。在理解工程时，应区分这两类行为：保护存留彩画能够保存历史材料，重新绘制则恢复了装饰面貌。两者都影响室内呈现，但保存的历史证据类型与数量有所不同。

6 对建筑遗产保护的启示

exclusive: different defects on the same column could justify different levels of intervention. Retention depended on the condition of each portion, rather than a single classification assigned to the whole member.

A different solution was adopted for column F because the connecting horizontal member between columns F and B remained in good condition. To preserve that member and its connection, the carpenters used a three-part splice incorporating the retained column, a new nanmu section and an elongated connecting piece. They called this a fish-tail joint because of its shape. Figure 3 shows the arrangement. Its relevance to conservation is the adaptation of joint geometry to existing fabric, allowing the repair of one member to accommodate the continued survival of another.

The fish tail arrangement involved a connecting piece with a reported vertical length of at least 900 millimetres. Corresponding recesses were cut into the retained and replacement sections, after the upper frame had been supported and the decayed head removed. All three components were fitted tightly, with adhesive and iron hoops securing the junctions. The source identifies the name as the carpenter's description of this particular configuration. Retaining that distinction matters when communicating the technique, because the project records a locally described variant rather than demonstrating that every similarly named traditional joint has the same form.

5 Replacement and protection of architectural polychromy

Columns X, Y and Z were judged too deteriorated for patching or splicing and were replaced. The beams and adjacent members were first securely supported, with lifting kept limited, before the damaged columns were withdrawn. New dried nanmu columns were made to the original heights and fitted to the existing mortise and tenon connections. Access constraints complicated installation: the doorway could not admit the full length members. Two shorter pieces were therefore joined using an adapted shoulder tenon arrangement, adhesive and rust protected iron hoops. The replacement procedure responded to both structural requirements and the physical limitations of the existing building.

Structural work also presented risks to painted surfaces on the walls and timber

铁像寺案例体现了依据损伤分布及存留材料可用程度开展分级修缮的思路。包镶保留柱心，墩接保存较多原构件并兼顾相邻构造，整柱替换则用于已无法修复的部位。传统木作技艺为这些决策提供了实施手段，彩画封护又将结构施工与宗教图像保护联系起来。其核心启示在于，应将木构架及装饰表面视为同一历史建筑中相互依存的部分。

原文主要记录修缮选择和施工做法，未提供长期性能的量化结果，也未系统比较接头强度、胶黏剂耐久性及修缮后的环境状况。因此，所列尺寸和材料应理解为该工程的具体记录。案例的参考价值，在于展示现状判断、选择性保留、工匠技艺及施工期间保护如何共同服务于仍在使用的宗教建筑遗产。

frame. Roof-covering removal, handling of members and construction debris could damage decoration that was already vulnerable. The survey reported only three painted areas in relatively good condition, with limited flaking and no severe powdering. These were selected for protective enclosure before work began. Raised paint was reattached, surface dust was removed, and breathable film and foam were gently placed over the decoration. Timber boards formed an outer protective layer against impact and contamination (Fig. 4).

After the timber repairs, the coverings were removed and the retained decoration returned to its original position. The source also describes repainting areas where the ground layer had largely detached and the decoration was extensively lost, following the former forms, patterns and colours after the timber had dried. These actions should be distinguished in interpreting the project: protecting surviving paint retains historic material, whereas repainting restores a decorative appearance. Their contributions to the interior are related, but they preserve different kinds and amounts of historical evidence.

6 Conservation implications

The Tiexiang Temple case demonstrates a graduated repair strategy in which the extent of intervention followed the distribution of damage and the usefulness of surviving material. Patching retained column cores; splicing preserved substantial portions of members and accommodated adjoining fabric; replacement addressed columns considered beyond repair. Traditional carpentry supplied practical means for these decisions, while protection of polychromy connected structural work with the conservation of religious imagery. The underlying lesson is to assess the timber frame and its decorative surfaces as interdependent parts of one historic building.

The account documents repair choices and construction practices rather than quantified long-term performance. It provides no systematic comparison of joint strength, adhesive durability or post-repair environmental conditions. The reported dimensions and materials should therefore be read as features of this project. Its value lies in showing how condition assessment, selective retention, skilled craft and protection during construction can inform the conservation of a living religious heritage site.

活动报道 Latest Events

第 7 届艺术研究与技术创新国际会议（InART2026）在马德拉岛举办

The 7th International Conference on Innovation in Art Research and Technology (InART2026) Held in Madeira

资料来源 Source:
https://jlbri.suda.edu.cn/e2/a7/c25199a713383/page.htm



图 1：会议海报
Figure 1. Conference Poster

当地时间 2026 年 9 月 7 日至 11 日，第七届艺术研究与技术创新国际会议（7th International Conference on Innovation in Art Research and Technology, InART2026）在葡萄牙马德拉岛首府丰沙尔举行，主会场设于马德拉大学耶稣会学院（Colégio dos Jesuítas）。本届会议由葡萄牙埃武拉大学及其 HERCULES 实验室与马德拉地区文化局（Direção Regional de Cultura）等单位共同主办，中国—葡萄牙文化遗产保护科学“一带一路”联合实验室作为会议合作伙伴单位之一，全程深度参与会务组织与学术交流工作。来自全球数十个国家的 200 余名专家学者齐聚一堂，围绕文化遗产保护领域的跨学科融合与技术创新开展深度学术研讨。

InART 国际会议深耕文化遗产保护创新研究领域，自 2013 年在葡萄牙埃武拉创办以来，已先后在比利时根特、意大利帕尔马、法国巴黎、挪威奥斯陆等地成功举办多届，始终致力于打通自然科学、人文艺术与遗产保护的学科壁垒，搭建全球化、多元化的学术交流平台。本届会议以促进文化遗产领域的科学互动、学术辩论与协同创新为核心宗旨，广泛吸纳考古、艺术、建筑、材料科学、数字技术等多领域科

From 7 to 11 September 2026 local time, the 7th International Conference on Innovation in Art Research and Technology (InART2026) took place in Funchal, the capital of Madeira Island, Portugal. The conference was co-hosted by the University of Évora and its HERCULES Laboratory, together with the Direção Regional de Cultura of Madeira. The China-Portugal Belt and Road Joint Laboratory on Cultural Heritage Conservation Science served as one of the conference partners and was deeply involved in conference organisation and academic exchanges. More than 200 experts and scholars from dozens of countries across the globe gathered to conduct in-depth academic discussions on interdisciplinary integration and technological innovation for cultural heritage conservation.

Dedicated to innovative research in cultural heritage conservation, the InART Conference was founded in Évora, Portugal, in 2013. It has been successively held in Ghent (Belgium), Parma (Italy), Paris (France), Oslo (Norway) and other cities. Committed to breaking disciplinary barriers among natural sciences, humanities-arts and heritage conservation, it has built a global and diversified platform for academic exchange. Centring on fostering scientific interaction, academic debate and collaborative innovation in cultural heritage, the 2026 edition brought together researchers from archaeology, art, architecture, materials science, digital technology and other fields. It focused on scientific conservation and innovative inheritance of diverse cultural heritage including archaeological relics, artworks and architectural heritage through cross-disciplinary and cross-sector discussions, injecting new research impetus

研工作者，聚焦考古文物、艺术品、建筑遗产等各类文化遗产的科学化保护与创新性传承，开展跨学科、跨领域的深度研讨，为全球文化遗产保护事业注入全新科研活力。

本届会议设置五大前沿核心议题，精准贴合当前国际遗产保护领域的研究热点与发展趋势：文物无损检测与非破坏性分析技术、文化遗产数字化与可持续创新、先进技术工具研发与应用、可持续保护材料与环境管理、数字遗产与馆藏资源数字化管理。会议开幕当日举办了“数字技术与现场理化分析”专题工作坊，会期内，会议采用大会主旨报告、学术专场与海报展示相结合的多元形式，并组织马德拉文化遗产实地考察等文化活动，为参会学者提供成果展示、经验分享、学术碰撞的优质平台，全方位呈现全球文化遗产保护领域的最新研究成果、技术突破与实践经验。

大会主席由埃武拉大学校长、HERCULES 实验室创始人、联合实验室葡方负责人 António Candeias 教授与 HERCULES 实验室 Sara Valadas 研究员、比利时根特大学 Peter Vandenabeele 教授共同担任。会议期间，联合实验室主任吴尧教授担任大会科学委员，并在大会发表题为《交叉融合与协同创新》的专题报告，立足文化遗产保护领域的学科交叉特性，深入剖析多学科融合、多技术协同在遗产活化保护、科研创新中的重要作用，分享跨学科科研创新的实践经验与发展思路。

into global cultural heritage conservation.

Five cutting-edge core themes were set in alignment with current research hotspots and development trends in international heritage conservation: Non-Invasive and Non-Destructive Analytical Approaches; digitalisation and sustainable innovation of cultural heritage; research, development and application of advanced technical tools; sustainable conservation materials and environmental management; and digital heritage plus digital management of museum collections. On the opening day, a thematic workshop entitled “Digital Technologies and On-site Physicochemical Analysis” was organised. Throughout the conference, multiple formats were adopted, including plenary keynote speeches, parallel academic sessions and poster presentations. A field visit to Madeira’s cultural heritage sites was also arranged. These activities provided high-quality opportunities for participants to present findings, share experience and spark academic ideas, comprehensively showcasing the latest research outcomes, technological breakthroughs and practical experience in global cultural heritage conservation.

During the conference, Professor Wu Yao, Director of the Joint Laboratory, served on the Scientific Committee and delivered a plenary presentation titled “Interdisciplinary Integration and Collaborative Innovation”. Rooted in the interdisciplinary nature of cultural heritage conservation, his speech elaborated on the vital role of multi-disciplinary integration and multi-technology collaboration in heritage revitalisation-conservation and research innovation, and shared practical experience and development perspectives for cross-disciplinary research.

2026 亚太地区世界遗产青年营造师国际交流活动在苏州举行

2026 Asia-Pacific Young Masters for Heritage Conservation Symposium Held in Suzhou

资料来源 Source:
https://jlbri.suda.edu.cn/ef/97/c25199a716695/page.htm

10 月 12 日，“2026 亚太地区世界遗产青年营造师”国际交流活动在世界文化遗产苏州古典园林沧浪亭举行。本次活动由联合国教科文组织东亚地区办事处、苏州市园林和绿化管

On 12 October, the “2026 Asia-Pacific Young Masters for Heritage Conservation Symposium was hosted at the Surging Waves Pavilion (Canglangting), a component of the World Cultural



图 2：活动合影
Figure 2. Group Photo of the Event

理局、联合国教科文组织亚太地区世界遗产培训与研究中心联合主办，亚太遗产中心苏州分中心、中国—葡萄牙文化遗产保护科学“一带一路”联合实验室共同承办。联合实验室主任吴尧教授、主任助理陈曦教授等教师出席活动。

本次活动以“古典景园：活态保护与公众参与”为主题，汇聚来自中国、巴基斯坦、越南、肯尼亚、坦桑尼亚、埃及等国家的青年营造师及专家学者近百人，共同探讨文化遗产保护与传统营造技艺的传承创新。苏州市人民政府副市长单杰、联合国教科文组织东亚地区办事处代表夏泽翰（Shahbaz Khan）、中国科学院院士常青等出席活动并致辞。

活动现场举行了“2026 亚太地区世界遗产青年营造师”荣誉证书颁发仪式。联合实验室钱晓冬老师凭借在文化遗产保护领域的研究与实践成果——《基于世界遗产苏州古典园林的“情境再生”设计》，获评“2026 亚太地区世界遗产青年营造师”。本届活动共收到全球 27 个国家的 68 项申报案例，最终遴选出来自 10 个国家的 19 项优秀案例，涵盖传统技艺传承、保护方法创新、遗产活化利用及公众参与等多个领域，展现了青年人才在世界遗产保护领域的创新活力。

Heritage Site of Suzhou Classical Gardens. Co-organised by the UNESCO Office for East Asia, Suzhou Bureau of Gardens and Greening Administration, and the UNESCO WHITR-AP, this event was undertaken by the Suzhou Branch of the Asia-Pacific Heritage Centre and the China-Portugal Belt and Road Joint Laboratory on Cultural Heritage Conservation Science. Professor Wu Yao (Director) and Professor Chen Xi (Assistant Director) of the Joint Laboratory attended the event alongside other faculty members.

Under the theme "Classical Gardens: Living Heritage Conservation and Public Participation", the event assembled nearly one hundred young heritage builders, experts and scholars from China, Pakistan, Viet Nam, Kenya, Tanzania, Egypt and other countries to discuss conservation of cultural heritage as well as inheritance and innovation of traditional construction craft.

A certificate award ceremony for “2026 Asia-Pacific Young Heritage Builders” was held on site. Qian Xiaodong from the Joint Laboratory received this honour for his research-based practice output “Situational Regeneration” Design for Suzhou Classical Gardens as World Heritage. A total of 68 proposals from 27 countries worldwide were submitted for this edition. Nineteen outstanding projects from ten countries were finally selected, covering traditional craft inheritance, conservation methodological innovation, heritage revitalisation and utilisation, and public engagement. These projects demonstrated the innovative vitality of young professionals engaged in world heritage conservation.

第 22 届国际古迹遗址理事会大会（ICOMOS GA2026）在马来西亚古晋召开

The 22nd ICOMOS General Assembly (ICOMOS GA2026) Convened in Kuching, Malaysia

资料来源 Source：
https://jlbri.suda.edu.cn/f4/f5/c25199a718069/page.htm

2026 年 10 月 17 日至 24 日，第 22 届国际古迹遗址理事会大会暨科学研讨会（ICOMOS GA2026）在马来西亚古晋举行。国际古迹遗址理事会（ICOMOS）是文化遗产保护领域具有

From 17 to 24 October 2026, the 22nd General Assembly and Scientific Symposium of the International Council on Monuments and Sites (ICOMOS GA2026) was held in Kuching, Malaysia. As a



图 3：大会现场
Figure 3. Venue of the Conference

重要国际影响力的专业组织，其三年一度的大会是全球文化遗产保护领域的重要学术盛会。

本届大会以"Living Heritage:Respect·Enhance·Accept·Partnership"（活态遗产：尊重、提升、接纳、伙伴关系）为主题，吸引了来自世界各地的 1800 余位专家学者及遗产保护工作者参会。大会围绕活态遗产保护、遗产价值认知、保护技术创新、知识传承及国际合作等议题展开研讨，为全球文化遗产保护领域的学术交流与实践合作搭建了重要平台。

苏州大学建筑学院、中国—葡萄牙文化遗产保护科学“一带一路”联合实验室陈曦教授、王诗若副教授参加大会并分别作专题学术报告，与国际同行开展深入交流，展示了学院及联合实验室在文化遗产保护领域的最新研究成果。

会议期间，两位教师围绕建筑遗产保护教育传播、活态遗产知识传承、文化遗产数智化技术等议题，与来自不同国家和地区的专家学者进行了广泛交流，进一步了解了文化遗产保护领域的国际研究动态，并就相关研究方向与未来合作可能性交换了意见。

globally influential professional organisation in cultural heritage conservation, ICOMOS holds its triennial General Assembly, which constitutes one of the world's premier academic events in heritage conservation.

Titled "Living Heritage: Respect · Enhance · Accept · Partnership", the General Assembly drew more than 1,800 experts, scholars and heritage practitioners from all over the world. Sessions addressed topics including living-heritage conservation, recognition of heritage values, innovation in conservation technologies, knowledge transmission and international cooperation. The event built an important platform for academic exchange and practical collaboration across the global heritage-conservation community.

Professor Chen Xi and Associate Professor Wang Shiruo from the School of Architecture, Soochow University and the "China-Portugal Belt and Road Joint Laboratory on Cultural Heritage Conservation Science" attended the assembly and delivered separate academic presentations. They engaged in in-depth dialogues with international peers, presenting cutting-edge research outcomes achieved by the School and the Joint Laboratory in cultural heritage conservation.

Throughout the assembly, the two faculty members conducted extensive exchanges with international counterparts covering architectural-heritage conservation education and communication, transmission of living-heritage knowledge, and digital-intelligent technologies for cultural heritage. They kept abreast of international research frontiers in heritage conservation and discussed potential directions for future joint research.



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