

**Table 1.** Framework of Sustainable Built Heritage Management (SBHM).

Management steps	Environmental dimension	Social dimension	Economic dimension	Key SDGs
Identification & value analysis	<ul style="list-style-type: none"> <li>Assessment of heritage assets and surrounding environment</li> <li>Identification of disaster and climate risks</li> </ul>	<ul style="list-style-type: none"> <li>Analysis of stakeholders' value recognition and preference differences</li> <li>Identification of diverse socio-cultural values</li> </ul>	<ul style="list-style-type: none"> <li>Preliminary assessment of heritage economic potential</li> <li>Lifecycle cost prediction</li> </ul>	SDG 10, 11, 13, 16
Strategic planning	<ul style="list-style-type: none"> <li>Design of eco-friendly management strategies</li> <li>Prioritization of reversible intervention measures</li> </ul>	<ul style="list-style-type: none"> <li>Multi-stakeholder collaborative governance mechanisms</li> <li>Development of an open data-sharing platform to enhance participation</li> </ul>	<ul style="list-style-type: none"> <li>Cost-benefit analysis</li> <li>Establishment of sustainable financing and incentive mechanisms</li> </ul>	SDG 7, 10, 11, 12, 13, 16, 17
Stakeholder identification	<ul style="list-style-type: none"> <li>Defining key stakeholder groups related to environmental improvement</li> </ul>	<ul style="list-style-type: none"> <li>Strengthening multi-level participation and community collaboration</li> <li>Clarification of core and auxiliary participants' roles</li> </ul>	<ul style="list-style-type: none"> <li>Encouraging investment incentives and public participation mechanisms</li> </ul>	SDG 5, 10, 16, 17
Resource integration & development	<ul style="list-style-type: none"> <li>Minimizing environmental impact during development</li> <li>Strengthening the connection between people and heritage environment</li> </ul>	<ul style="list-style-type: none"> <li>Promoting knowledge sharing and cross-sector collaboration</li> <li>Empowerment through cultural tourism and creative industries</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing local economic vitality through tourism marketing and fundraising</li> </ul>	SDG 8, 9, 11, 17
Community well-being enhancement	<ul style="list-style-type: none"> <li>Enhancing public environmental awareness</li> <li>Promoting heritage maintenance skills</li> </ul>	<ul style="list-style-type: none"> <li>Developing heritage education functions</li> <li>Empowering community participation in decision-making</li> </ul>	<ul style="list-style-type: none"> <li>Job creation and economic diversification</li> </ul>	SDG 4, 8, 11, 16
Policy & financial management	<ul style="list-style-type: none"> <li>Ensuring policy compliance and environmental responsibility implementation</li> <li>Preventive protection to reduce restoration costs</li> </ul>	<ul style="list-style-type: none"> <li>Mechanisms for balancing social needs and policies</li> </ul>	<ul style="list-style-type: none"> <li>Strengthening financial management and funding support systems</li> </ul>	SDG 10, 11, 12, 16
Technology & methods	<ul style="list-style-type: none"> <li>Application of digital tools (HBIM, GIS, etc.) for environmental monitoring</li> <li>Promotion of low-carbon and energy-saving technologies</li> </ul>	<ul style="list-style-type: none"> <li>Utilizing technology to enhance social collaboration and public participation efficiency</li> </ul>	<ul style="list-style-type: none"> <li>Expanding sustainable financing channels</li> <li>Optimizing lifecycle asset cost management</li> </ul>	SDG 7, 9, 12, 13, 17
Prevention & maintenance	<ul style="list-style-type: none"> <li>Preventive maintenance</li> <li>Establishment of buffer zones</li> </ul>	<ul style="list-style-type: none"> <li>Promotion of community technical capacity building through repair training</li> </ul>	<ul style="list-style-type: none"> <li>Cost-benefit optimization</li> <li>Resource recycling</li> </ul>	SDG 4, 11, 12, 13
Monitoring & evaluation	<ul style="list-style-type: none"> <li>Long-term environmental monitoring and risk prediction systems</li> </ul>	<ul style="list-style-type: none"> <li>Participatory monitoring to promote public feedback and participation</li> </ul>	<ul style="list-style-type: none"> <li>Tracking and evaluating economic impacts and investment returns</li> </ul>	SDG 10, 11, 12, 17
Feedback & improvement	<ul style="list-style-type: none"> <li>Dynamic adjustment of management strategies based on environmental assessment results</li> </ul>	<ul style="list-style-type: none"> <li>Continuous optimization of management processes to enhance public satisfaction</li> </ul>	<ul style="list-style-type: none"> <li>Dynamic updating of financial models to enhance system resilience</li> </ul>	SDG 10, 11, 16, 17

development, and environmental protection. Thus, SBHM is not only a theoretical model but also a management tool that can be translated into practical operations, enhancing both the scientific basis and the operational feasibility of policy-making and project implementation.

The findings of this study provide a foundation for the SBHM framework while also identifying areas that require further refinement. Since the literature review was primarily based on English-language databases, potential regional, and linguistic biases may exist. Therefore, a key priority for future research is to expand the integration of multilingual and cross-regional studies and case evidence. Moreover, the applicability and boundary conditions of the framework need to be tested and refined through diverse empirical projects. Subsequent research should focus on validating and adjusting the framework through widespread case applications to enhance its contextual adaptability and operational feasibility. Furthermore, integrating quantitative indicator systems and dynamic evaluation tools will be essential for establishing a more robust monitoring and feedback cycle. Collectively, these efforts will optimize management processes and comprehensively improve the scientific, systematic, and practical effectiveness of sustainable built heritage management.

Overall, the SBHM framework offers new perspectives and tools for both the theory and practice of built heritage management. It not only addresses existing gaps in life-cycle and systemic approaches but also provides a feasible pathway for the deeper integration of cultural heritage conservation and sustainable development goals. Within the context of the global sustainability agenda, the framework proposed in this study has the potential to serve as a vital foundation for promoting the long-term conservation, adaptive reuse, and maximization of the social benefits of built heritage.

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Data can be available on request.

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