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## ENVIRONMENTAL IMPACT ASSESSMENT OF TOURISM PROJECTS THROUGHOUT THE FULL LIFE CYCLE: DEVELOPMENT OF A DYNAMIC TOOL

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### Abstract

The rapid expansion of the tourism sector has heightened concerns regarding its environmental impact. Tourism projects, spanning various phases—planning, construction, operation, and decommissioning—impose different degrees of strain on natural resources and ecosystems. Effectively evaluating the environmental repercussions throughout the entire life cycle of these projects is essential for promoting sustainability within the industry. Life Cycle Assessment (LCA), as a comprehensive methodology, enables the quantification of environmental impacts across all stages of a tourism project, providing valuable insights for decision-makers to identify environmental burdens, optimize resource use, and mitigate adverse effects. Despite its potential, existing studies predominantly focus on individual stages or isolated environmental factors, thereby lacking a holistic approach that captures the dynamic and interdependent nature of impacts over time. Furthermore, traditional LCA methods often fail to incorporate the spatial and temporal variations in activities across different phases, leading to incomplete assessments. This study addresses these gaps by proposing a dynamic LCA framework that integrates spatiotemporal variations in environmental impacts, providing a more accurate and comprehensive evaluation of tourism projects. The framework includes three core components: an assessment of the environmental impact characteristics at each life cycle stage, an analysis of the spatiotemporal distribution of activities, and the development of a dynamic LCA model that captures the evolution of environmental impacts over time and space. The proposed methodology aims to support the green transformation of the tourism industry by providing a robust tool for policymakers and practitioners to design more sustainable tourism practices. By considering both temporal dynamics and spatial distributions of impacts, this research contributes to the development of more effective and adaptive environmental management strategies, ensuring that tourism projects minimize their ecological footprint while fostering long-term sustainability.

*Key words:* environmental impact, life cycle assessment (LCA), spatiotemporal distribution, tourism project, tourism sustainability

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