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ConSciR: An R package for Conservation Science data

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Summary

`ConSciR` is an R package (Team, 2024) designed for cultural heritage conservation, providing tools for preventive conservation data analysis (Cosaert & Beltran, 2022). `ConSciR` streamlines workflows across museums, galleries, and heritage sites by offering humidity calculations, conservation risk assessments, and sustainability metrics (Cosaert, Gérard, Mayer, & Deparis, 2023). The package contains a useful set of calculations for conservators, engineers, scientists, and data scientists to manage environmental data, assess collection risks, and develop custom analytical and communication tools in the R environment. In line with the FAIR principles (Larsson, Bornsäter, & Hacke, 2025), `ConSciR` is intended to evolve alongside emerging conservation science research and user feedback.

Statement of need

Preventive conservation relies on managing environmental risks such as humidity, temperature, light, pests, and pollutants. Modern heritage management increasingly involves analysing large time-series environmental datasets to make sound data-driven decisions (Cosaert, 2021). Existing workflows typically require manual data tidying and knowledge of how to encode, often tedious, physical chemistry, mechanical, biology and thermodynamic calculations (Cosaert et al., 2023). Pre-compiled tools have been developed for these tasks, but these are either paid-for services, have been deprecated, provide only single data point calculations or are not open-source ("Dew point calculator," n.d.; "eClimateNotebook," n.d.; Kupczak et al., 2018; Padfield, 2010; Pretzel, 2023; Smulders, 2014; Vaisala, n.d.). There is a gap for an open-source package of commonly used calculations for conservation to create their own bespoke tools to adhere to preventive conservation standards (Taylor et al., 2023). This is highlighted in the 2022 Getty Conservation Institute's Tools paper (Cosaert & Beltran, 2022), for the need for practical, user-friendly, cost-efficient, and decision-oriented tools for environmental monitoring. `ConSciR` is a step towards meeting conservation needs by consolidating environmental data cleaning, preservation metrics and calculations into a single R package. Interactive Shiny applications (Chang et al., 2024) are included for quick data visualisation for users without prior training in coding.

Features

The functions in `ConSciR` are grouped into three themes: humidity calculations, conservation tools, and sustainability metrics. These address heritage needs for environmental analysis, risk assessment for material damage, and estimating the costs of mitigation, especially at a time when energy efficiency is important for heritage organisations. Humidity functions are used to determine the relationship between temperature and moisture in air, helping conservators, scientists, and engineers understand and manage damage to moisture-sensitive materials and air-conditioning systems. Humidity calculations for dew