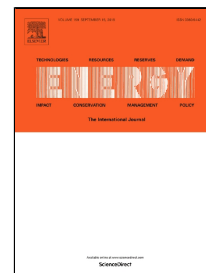


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Improvement of Passive Behaviour of Existing Buildings through the Integration of Active Solar Energy Systems

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Abstract: This study aims at making an environmental assessment of the integration of active solar energy systems on building envelopes in southern Europe. More specifically, it focuses on energy production of active solar systems, as well as on the investigation of shading and insolation of indoor spaces in relation to the energy requirements and the visual comfort of inhabitants. For the needs of the present research, five active solar systems and three representative space typologies were selected for in-depth investigation. Autodesk Ecotect Analysis software v.5.2, Desktop Radiance v2.0 Beta and Clean Energy Project Analysis Software Retscreen4 were used for the simulations. The simulation results are presented and discussed comparatively. The findings indicate that the integration of active solar systems contributes to the reduction of the cooling and heating loads. In terms of natural lighting, the integration of active solar systems enables high levels of natural lighting while it minimizes glare issues for the majority of systems. The research highlights the role of building integrated active solar systems, both in the indoor built environment and in energy performance, introducing a comprehensive environmental approach. Moreover, it highlights the importance of an integrated architectural design approach in the built environment.

Keywords: Environmental Assessment, Active Solar Systems, Architectural Integration, Thermal and Visual Comfort, Southern Europe

Highlights:

- Environmental assessment of BIPV and BISTS in horizontal and vertical configuration
- The energy consumption of building typologies under study is positively affected
- Building integrated systems provide adequate shading and insolation conditions
- Results indicate high lighting levels and minimization of glare issues
- BIPV and BISTS form viable solutions for energy retrofitting of existing buildings

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