

## The value of green roofs/façades: Incorporating life cycle assessment and investors/users' preferences in cost-benefit analysis

### Summary

The main objective of this thesis is to provide a comprehensive and systematic methodology for assessing the value of green infrastructure. The methodological framework aims to support private investors and urban planners in decision-making by combining two important methods: cost-benefit analysis and multi-criteria analysis.

The evaluation process is incremental at 3 levels, considering the financial, economic and socio-environmental impacts of green roofs and green walls installation. The evaluation model is based primarily on projects' economic efficiency. However, by incorporating multi-criteria model it is possible to address also non-momentary impacts while reflecting the trade-offs between benefits with different weights (i.e., relative importance), particularly those that depend on users / investors preferences. Thus, environmental impacts, well-being and other soft benefits can be included in a posterior monetization of the most significant costs and benefits (e.g., influence over the properties value, buildings energy efficiency, stormwater management, etc.) to feed the economic analysis and allow a more robust and complete consideration of all impacts.

Finally, the methodology developed can be replicated in different regions of the world and type of infrastructure. The case studies examine a selected set of solutions for green roofs and green walls and focus on Mediterranean climate conditions considering native vegetation. The studies cover different types of buildings with distinct types of users/investors profiles (e.g. schools, residences, commerce, etc.) and scales of analysis (e.g., building vs urban scale).

The resulting model will represent a significant improvement of existing methodologies for assessing the impacts of green roofs and green walls and will contribute to a general acceptance of these systems.

### Keywords

Green roofs/façades, cost-benefit analysis, environmental impacts, costs/benefits monetization, investors/users' preferences, case studies replication.



*Passeio dos Clérigos featuring a green roof (Porto, Portugal).*



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