



Contents lists available at ScienceDirect

Urban Climate

journal homepage: <http://www.elsevier.com/locate/uclim>



Green roofs: Experimental and analytical study of its potential for urban microclimate regulation in Mediterranean–continental climates



Susana Saiz Alcazar*, Francesca Olivieri, Javier Neila

Universidad Politécnica de Madrid, Spain

Escuela Técnica Superior de Arquitectura, Departamento de Construcción, Spain

ARTICLE INFO

Article history:

Received 1 June 2015

Received in revised form 7 December 2015

Accepted 22 February 2016

Keywords:

Ecosystem services

Climate change

Green roofs

Microclimate

Computer Fluid Dynamics (CFD)

ABSTRACT

Green infrastructure elements such as green roofs, walls and urban forests provide multiple regulating ecosystem services to the urban environment, including storm water management, heat island effect control, esthetic values and improvement of air and water quality. However, specific regulating services on urban microclimate at street level have not been widely quantified. This article analyzes the effects of green roofs and urban forests on urban microclimate, quantifying its potential for regulating ambient temperature in hot season in Mediterranean–continental climates. The results show a moderate effect of green roofs on the surrounding microclimate, but a larger contribution when combining it with vegetation at pedestrian level. This experimental study has identified the potential of the ground moisture content for microclimate regulation leading to alternative solutions for microclimate regulation based on permeable materials used for ground coverage in urban cores in combination with shading elements. The conclusion shows the potential of the green roofs, urban forests and porous-moist materials as a strategy for adapting urban ecosystems to the effects of climate change.

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

Climate change has moved to the header in the list of global problems in recent years. Many times refuted, the effects of climate change have already become an undeniable reality and its effects are increasing worldwide. In recent years, many organizations have arisen whose goal is to develop strategies and mechanisms to

* Corresponding author at: Paseo de Rinconete y Cortadillo 17, Portal 14, 3-A, 28906 Getafe, Madrid, Spain.
E-mail address: susana.saiz.alcazar@alumnos.upm.es (S.S. Alcazar)

- Susca, T.G., 2011. Positive effects of vegetation: urban heat island and green roofs. *Environ. Pollut.* 159 (8), 2119–2126.
- Theodosiou, T.G., 2003. Summer period analysis of the performance of a planted roof as a passive cooling technique. *Energy Build.* 35 (9), 909–917.
- VanWoert, N.D., 2005. Green roof stormwater retention. *J. Environ. Qual.* 34 (3), 1036–1044.