CONSTRUCTION AND DEMOLITION WASTE AS DRAINAGE IN LANDSCAPED ROOFS

[1]Mercedes del Río Merino

[2]Veronica Vitiello

[3]Paola Villoria Sáez

[4]Alejandra Vidales Barriguete

[5]Carolina Piña Ramírez

[1]Dpto. de construcciones arquitectónicas y su control. ETS Edificación. UPM. Grupo de investigación TEMA. mercedes.delrio@upm.es
[2]Dpto de Ingegneria civile edile e ambientale. Universidad Federico II de Nápoles. veronica.vitiello@unina.it
[3]Dpto. de construcciones arquitectónicas y su control. ETS Edificación. UPM. Grupo de investigación TEMA. paola.villoria@upm.es
[4]Dpto. de Tecnología de la Edificación. ETS Edificación. UPM. Grupo de investigación TEMA. alejandra.vidales@upm.es
[5]Dpto. de construcciones arquitectónicas y su control. ETS Edificación. UPM. Grupo de investigación TEMA. carolina.pina@upm.es

Keywords: *Waste management; recycling; ceramic waste; concrete waste; green roofs*

Since 1990, the world has seen an increased gathering of its population in urban areas. This trend is not new, but relentless, and has been marked by a remarkable increase in the absolute numbers of urban inhabitants. In 1990, 43 per cent of the world's population (2.3 billion) lived in urban areas, by 2015, this had grown to 54 per cent (4 billion) [1].

As the urban population increases, the land area occupied by cities has increased at an even higher rate. It is expected that by 2030, the urban population of developing countries will double, while the area covered by cites would triple [2].

Thus, cities must play a greater role, because urban areas have the potential to reduce ecological footprints and to connect rural and natural environments, and this is the reason why cities are included in the 2030 agenda for sustainable development, in the goal 11: to make cities and human settlements inclusive, safe, resilient and sustainable [3].

In this sense, green or landscaped roofs can be an important asset for the recovery of abandoned spaces in the city, and an opportunity for the development of more sustainable cities. In addition, the incorporation of vegetation into the urban system generates benefits in all three aspects of sustainability: social, economic and environmental [4, 5].

On the other hand, and according to the UK Green Building Council [6], the construction sector uses more than 400 million tons of material each year, much of which has a negative environmental impact**.** Therefore, in recent years there have been numerous researches that have aimed to find alternatives for construction and demolition waste trying to replace the costly raw material for the environment and incorporate Circular Economy criteria in the sector [7-14]. However, after a detailed bibliographic and documentary search, no studies have been found that attempt to analyze the possible replacement of the drainage layer of the landscaped roofs with construction and demolition waste, which is the objective of this study.

Therefore, an experimental plan in two phases was designed. In the first phase, the ceramic and concrete wastes were selected, and their physical properties (density and water behavior), as well as their leachate were analyzed. In a second phase, the capacity of these materials as a substrate is checked.

The results of the experimental plan were that ceramic waste has greater capacity for water absorption, which means a better use of rainwater and a decrease of the water necessary for cultivation, which is an interesting issue for roofs located in dry climates.

REFERENCES

[1] Unhabitat, 2016. Urbanization and development emerging futures. World cities report 2016.

https://new.unhabitat.org/sites/default/files/download-manager-files/WCR-2016-WEB.pdf

[2] United Nations. 2019. World Urbanization Prospects The 2018 Revision.

https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf

[3] United Nations. 2015. Transforming our World: The 2030 Agenda for Sustainable Development. https://sustainabledevelopment.un.org/post2015/transformingourworld/publication

[4] BCN ECOLOGIA, Cobertes i murs verds a Barcelona. Estudi sobre les existents, el potencial i les estratègies d'implantació, 2010.

[5] Guía de azoteas vivas y cubiertas verdes. Ayuntamiento de Barcelona. Edit: Área de Ecología Urbana. Ayuntamiento de Barcelona. Diciembre del 2015

[6] Márton Herczeg et al. 2014. Resource efficiency in the building sector. Copenhagen Resource Institute.

[7] del Rio Merino, Mercedes; Cruz Astorqui, Jaime Santa; Gonzalez Cortina, Mariano. Viability analysis and constructive applications of lightened mortar (rubber cement mortar). Construction and building materials. Volumen: 21 Número: 8 Páginas: 1785-1791 AUG 2007

[8] del Rio Merino, Mercedes; Cruz Astorqui, Jaime Santa; Villoria Saez, Paola; et ál. Eco plaster mortars with addition of waste for high hardness coatings. Construction and building materials. Volumen: 158 Páginas: 649-656 Fecha de publicación: JAN 2018

[9] del Rio Merino, Mercedes; Villoria Saez, Paola; Longobardi, Iolanda; et ál.. Redesigning lightweight gypsum with mixes of polystyrene waste from construction and demolition waste. Journal of cleaner production. Volumen: 220 Páginas: 144-151 Fecha de publicación: MAY 2019

[10] Jaime Santa Cruz Astorqui, Mercedes del Río Merino, Paola Villoria Sáez, César Porras Amores. Analysis of the viability of prefabricated elements for partitions manufactured with plaster and eps from waste recycling. 2019. Dyna. Vol. 94 nº 4, 415-420. Doi: http://dx.doi.org/10.6036/8984.

[11] Gutiérrez-González, S., Gadea, J., Rodríguez Saiz, A., Blanco-Varela, M.T., Calderón, V. (2012) Compatibility between gypsum and polyamide powder waste to produce lightweight plaster with enhanced thermal properties. Construction & Building Materials, 34, 179-185. Doi: http://dx.doi.org/10.1016/J.CONBUILDMAT.2012.02.061

[12] Alameda, L. Calderón, V., Junco, C., Gadea, J., Rodríguez Saiz, A., Gutiérrez-González, S. (2016) Characterization of gypsum plasterboard with polyurethane foam waste reinforced with polypropylene fibers. Materiales de Construcción, 66 (324),1-10. Doi: http://dx.doi.org/10.3989/mc.2016.06015

[13] Pedreño Rojas, Manuel Alejandro, Morales Conde, María Jesús, Rubio de Hita, Paloma, Perez Galvez, Filomena. Impact of Wetting-Drying Cycles on the Mechanical Properties and Microstructure of Wood Waste-Gypsum Composites. En: Materials. 2019. Vol. 12(11). Núm. 1829. https://doi.org/10.3390/ma12111829

[14] Rubio de Hita, Paloma, Perez Galvez, Filomena, Morales Conde, María Jesús, Pedreño Rojas, Manuel Alejandro. Reuse of plastic waste of mixed polypropylene as aggregate in mortars for the manufacture of pieces for restoring jack arch floors with timber beams. En: Journal of Cleaner Production. 2018. Vol. 198. Pag. 1515-1525. https://doi.org/10.1016/j.jclepro.2018.07.065