Experts recommend the inclusion of rainwater-collection systems in cities

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Experts recommend the inclusion of rainwater-collection systems in cities. Credit: Image courtesy of Erix

Plain, sloping roofs can collect up to 50% more rainwater than flat roofs with gravel. This water is also of higher quality. These are the conclusions of a study conducted by researchers from Autonomous University of Barcelona (UAB, Spain) which suggests the incorporation of systems to collect rainwater in urban planning. The water collected can be used to water streets and gardens, wash floors or vehicles and fill cisterns.

Ramon Farreny, co-author of different projects developed by the UAB, said "It is important to consider the collection of rainwater when planning and designing cities, as this is an alternative water source with

many different uses, it can even be used to save drinking water".

One such project, published in the journal Water Research, indicates that roofs "are the first choice for collecting rainwater in urban areas, but not all roofs function in the same way and it is necessary to select the most appropriate ones".

The results show that plain, sloping roofs, such as those made of metal or plastic, make it possible to collect up to 50% more rainwater than flat, rough ones. The information was obtained between 2008 and 2010 using four types of roofs on the university campus: three sloping roofs (tiled with metal and polycarbonate sheets) and one flat gravel roof.

To analyse the information, the authors developed a model which estimates the runoff volume (quantity of water that runs over a surface) and initial losses of each roof which were greater in the gravel roof, due to its roughness.

Water obtained from the sloping roofs was better in terms of physical and chemical quality compared to the water collected from the gravel roof. This can be seen in practically all the parameters (conductivity, total organic carbon and carbonates). In the water from gravel roofs, greater meteorisation, depositioning of particles and colonisation by plants were observed.

Farreny explains "The inclusion of criteria related to the slope and roughness of roofs in urban planning may be useful in promoting the harvesting of rainwater as an alternative water source. This could also contribute to preventing flooding and water shortages".

According to the study, the results are of "importance" for local governments and urban planners in designing buildings and cities from the perspective of sustainable rainwater management. With the

appropriate filtering and treatment, the resulting water can be used to wash floors and vehicles, water gardens, streets and even for filling cisterns or washing machines.

Making the most of this resource requires the installation in buildings of a collection and filtering system, pipes and tanks that should be separate from the drinking water system, to prevent the risk of cross contamination. Installations of this kind are being tested on the university campus, and in pilot projects promoted by some local governments, such as Barcelona City Council.

Cost-effective and eco-efficient

"However, the costs and environmental impact of these systems have yet to be assessed", says Tito Morales-Pinzón, another author of the study and a researcher at UAB and Pereira Technological University (Colombia), "because although one material may be efficient in collecting or storing the rainwater, it may also be too expensive or cause contamination".

The team has evaluated the most 'cost-effective' strategy for collecting rainwater in a estate of the town of Granollers in the province of Barcelona, as an example of a densely populated urban environment (600 inhabitants/ha) in the Mediterranean area and an average rainfall of 650 mm per year.

The results of this study, published in the journal *Resources, Conservation and Recycling*, show there are doubts about the economic feasibility of this type of project considering current water rates. However if the price reached €1.86/m3 it could be profitable.

"Under the Water Framework Directive, local water prices will increase to include the real supply costs and this could lead to an interest in

rainwater-collection strategies from the economic point of view", say the authors.

Regarding the environmental impact of these systems, scientists from the team have conducted a third study which shows that the best infrastructures are those which have a covered rainwater tank on the roof.

The conclusions, published in the *International Journal of Life Cycle Assessment*, also recommend including these rainwater devices in urban planning, but adapting the design to the purpose intended for the water. This would prevent subsequent impacts in building renovation.

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