

| Oriol García Antúnez | Biología Ambiental, 2018 |

1. BACKGROUND: Particulate Matter (PM) and Green Roofs

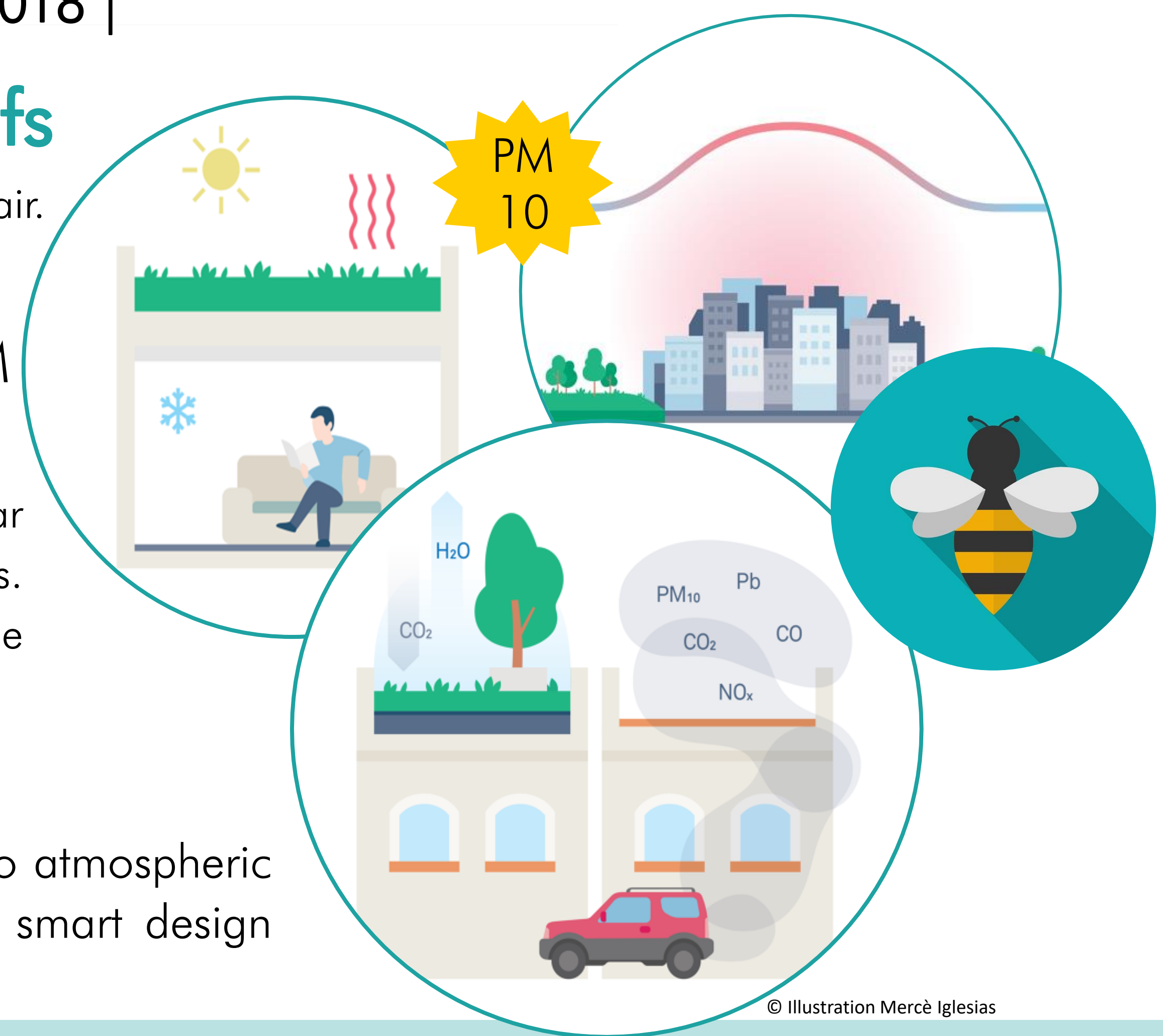
Particulate matter (PM) is a mixture of both solid and liquid compounds that can be found suspended in the air. PM 2.5 ($>2.5 \mu\text{m}$) is the most hazardous portion as it can penetrate to the gas-exchange region of the lung.

“Respiratory diseases and dysfunctions are the main concern to the increasing PM concentration in dense cities”

Micro and macro morphological characteristics of vegetation like roughness, epidemical and cuticular features, and leaf arrangement design are key factors that determine their potential as PM retention surfaces. However, weather conditions like precipitation and wind speed can remove a 48% to up a 36% of the retained PM on leaf surface of urban vegetation.

“Up to **50%** of the impervious city surface is rooftops”

By making use of this unexploited space, non-cultivable surface in cities would be transformed into atmospheric PM sinks. **Green roofs (GR)**, with all their benefits to human and environmental health, are a smart design solution to use up this forgotten urban space.



3. HYPOTHESES

"Grasses, with their parallel grooves and blade-like macro morphology, together with **hairy** leaf species, will presumably retain higher amounts of atmospheric PM. A loss of PM is expected to be found after **rainy and windy events**, being of a higher or lesser importance depending on leaf **wax** content and leaf **micro and morphological characteristics**."

2. OBJECTIVES

“Experimental **quantification of PM accumulation** on Mediterranean GR species and assessment of the **effects of wind and rain** on PM deposition rates on plant leaves.”

4. MATERIALS AND METHODS



"Sedum Mix"



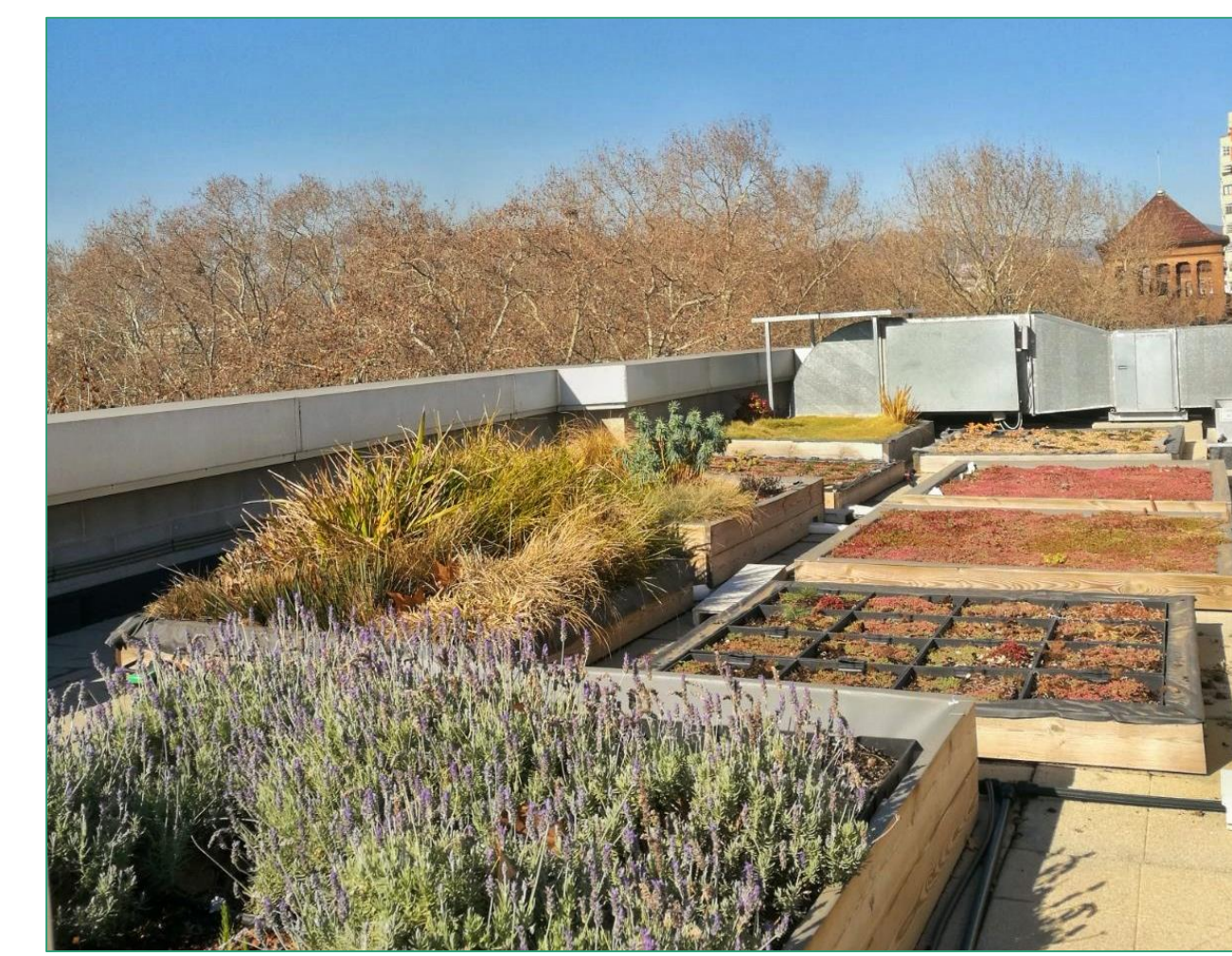
Lavandula dentata



Festuca glauca



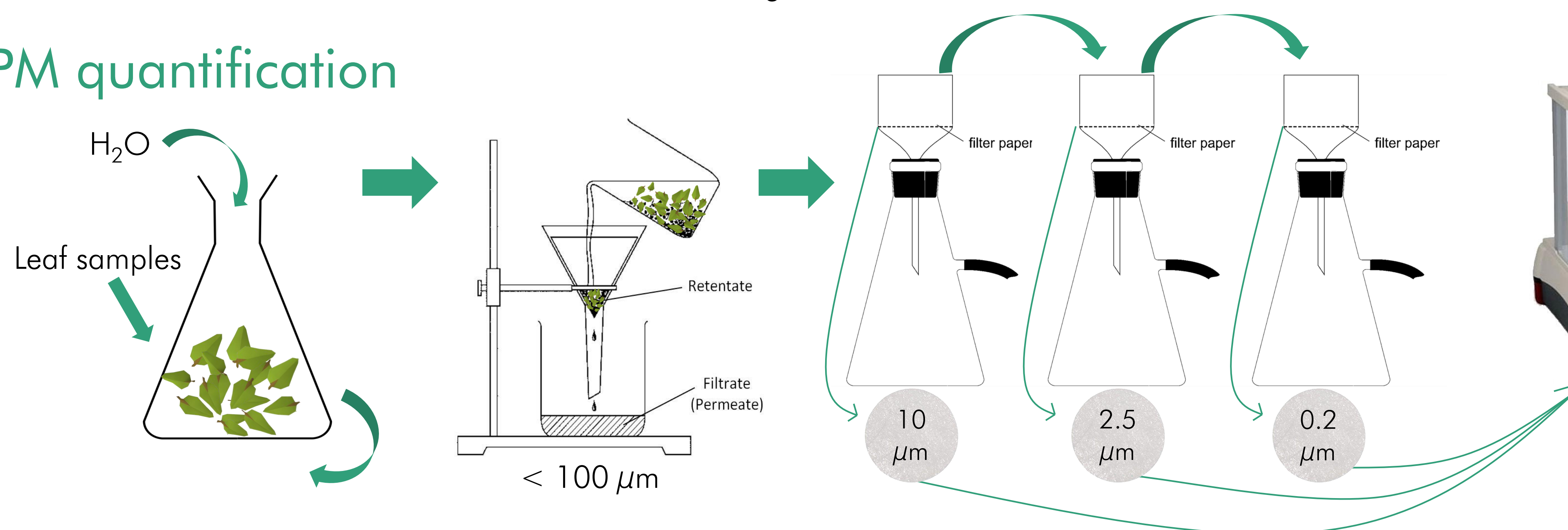
Coberta Experimental
Mercè Rodoreda (MR)
Barcelona, Spain



9 Green Roof Beds (GrB) of 4m² + Weather Station



PM quantification



Retained PM estimation:

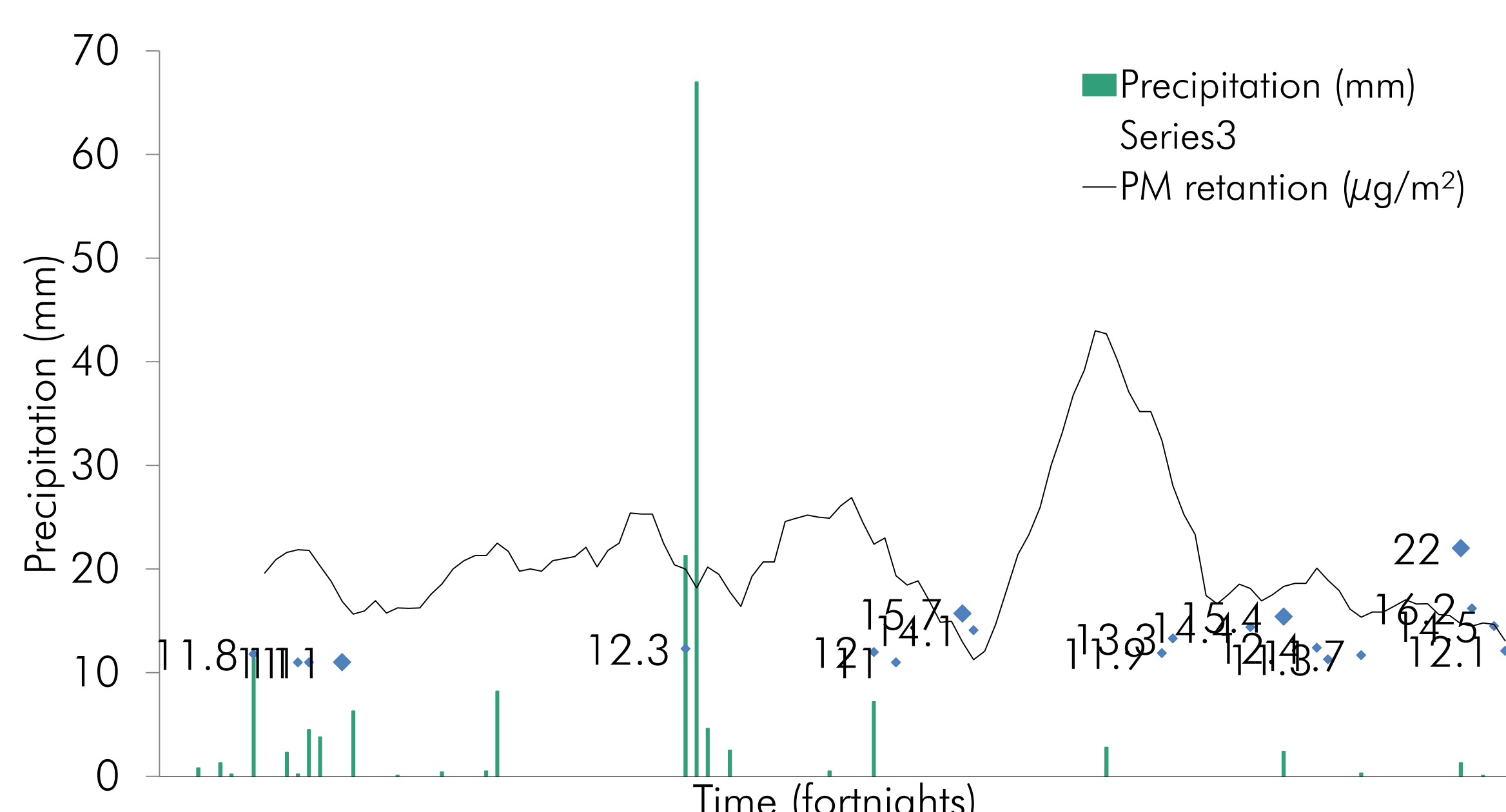
$$W_1 - W_2 = PM$$

Where W_1 : post-filtration weight, W_2 : pre-filtration weight and PM : total retained PM

3 fractions of PM will be obtained

- GrB LAI measurements
- Statistical analysis

5. EXPECTED RESULTS



Representation of the expected results regarding PM retention rates and weather condition influences.

"Different retention rates according to micro and **macro morphological characteristics** of selected species"

6. TIME TABLE

Year 1												Year 2											
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept

GrB
installation

Leaf sampling period

PM quantification analysis

Data analysis and Preliminary results

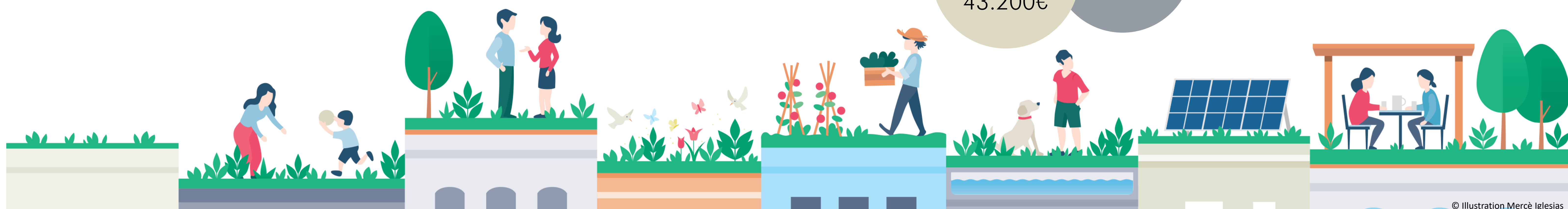
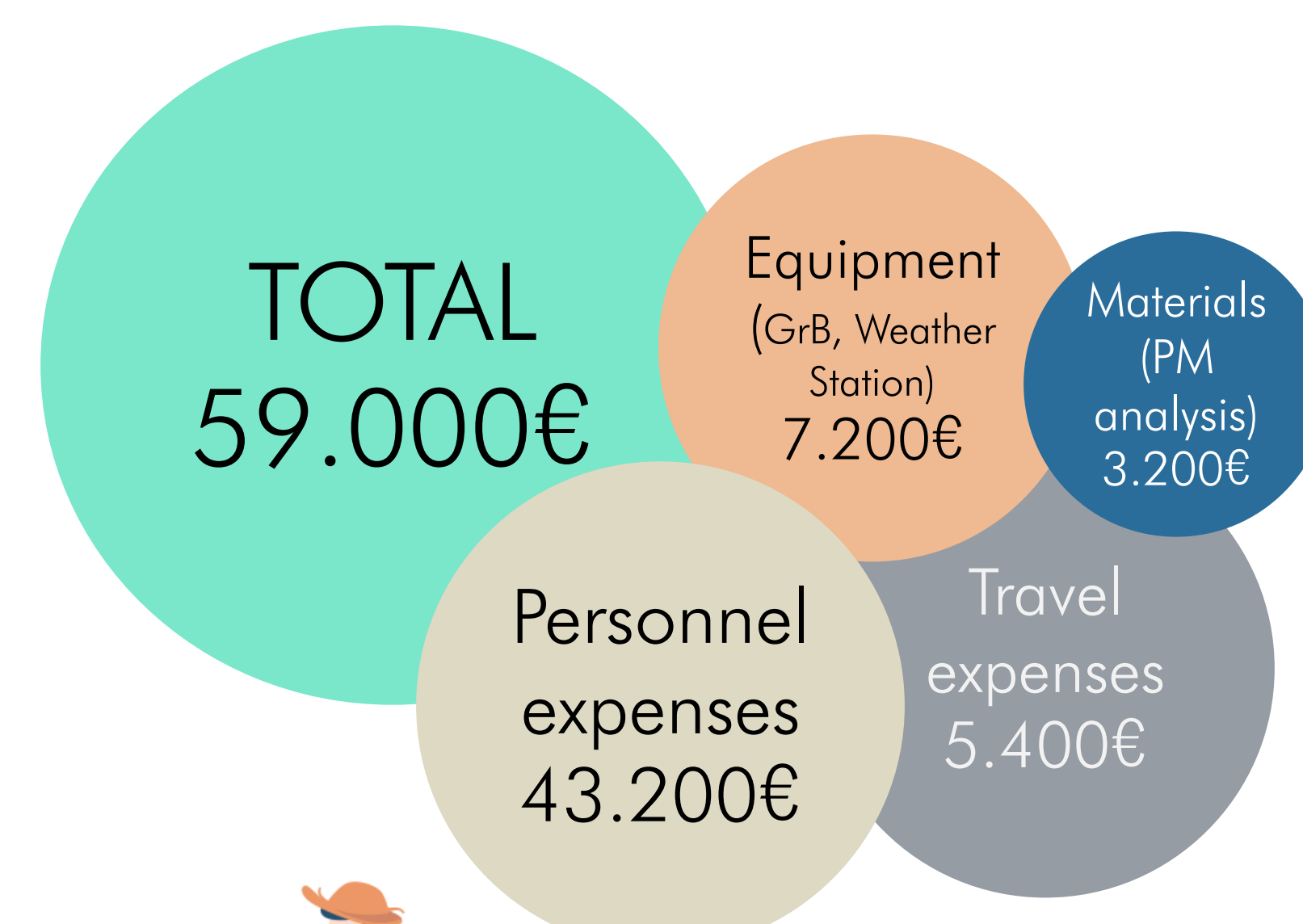


Illustration Mercè Iglesias

References: [1] Wang H., Shi H. and Wang Y. 2015. *Effects of Weather, Time, and Pollution Level on the Amount of Particulate Matter Deposited on Leaves of Ligustrum lucidum*. The Scientific World Journal. Vol. 2015 (2015). DOI:10.1155/2015/935942. [2] Jönhäll S. 2015. *Review on urban vegetation and particle air pollution – Deposition and dispersion*. Atmospheric Environment Vol. 105 (2015) 130-137 DOI:10.1016/j.atmosenv.2015.01.052. [3] Speak A.F., Rothwell J.J., Lindley S.J. and Smith C.L. 2012. *Urban particulate pollution reduction by four species of green roof vegetation in a UK city*. Atmospheric Environment. Vol. 61 (2012) 283-293. [4] Brunekreef B. and Holgate S.T. 2002. *Air pollution and health*. The Lancet Vol. 360 (2002).1233-1242. [5] Dzierżanowski K., Pogorzala H., Sæbø A. and Gawroński S.W. 2011. *Deposition of Particulate Matter of Different Size Fractions on Leaf Surfaces and in Waxes of Urban Forest Species*. International Journal of Phytoremediation, 10:13 (2011) 1037-1046. DOI:10.1080/15226265.2011.552929.