Polluted cities in Chile and the contribution of green vegetation: the motivation to my PhD research
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Introduction

- The air pollution is a major cause of death in the world, causing around 3 million premature deaths and other diseases such as heart disease, stroke, lung cancer, and acute respiratory infections, this is due to prolonged exposure to pollutants such as PM$_{2.5}$ and PM$_{10}$.
- It is accepted that urban vegetation (UV) improve the air quality, removing large amounts of air pollutants.
- The accumulation of PM on leaves depends on the species-specific characteristics, such as roughness, leaf size and leaf shape, meteorological parameters, and the process of dispersion and deposition.

Motivation

Fig 1. Santiago, the capital city of Chile, with a population of 7 million, has a strong automotive activity and particular geographical conditions, which is the third most polluted city in South America.

Fig 2. Coyhaique, a south city of Chile, with fewer than 60,000 inhabitants is the most polluted city in South America. PM$_{2.5}$ annual mean is 64 μg/m$^3$. This city has 86 m$^2$ of green areas per inhabitants.

Research question

1. Under what conditions can urban vegetation maximise the removal of PM in urban areas? Are these conditions the same for urban trees, green walls and green roofs in urban areas?

2. What could be the optimum position of urban vegetation in a busy road of London? We need more green areas or is time to think of change the city centre?

Fig 3. Amount of PM (mean + S.E.) collected on leaves with different shapes (expressed in mg/cm$^2$ of leaf). Leonard et al., 2016.

Fig 4. Particulate matter deposited on leaf. Song et al., 2015.

Fig 5. Dispersion model (Pugh et al., 2012)

What happens when:
- Replace traffic line by trees.
- Replace traffic line by green walls.
- To plant green walls in the middle of the street.

Objectives

1. To identify and assess which are the main morphology and external conditions that urban trees, green walls, and green roofs have, to maximise the PM removal in urban areas.
2. To quantify the deposition of PM and compare the effectiveness of morphological and external conditions between UV with and without the main conditions defined.
3. To use a dispersion model to define new location for the urban vegetation selected in different scenarios.

Method

- Literature review
- Field data
- Modelling