

I. PROPOSAL ABSTRACT:

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Proposal Title	Vegetation Knowledge-based Indicators for Urban Sustainable Planning (2014-2016)

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This project is about the relationship between urban vegetation and air quality in cities, which works both ways: the vegetation can affect air quality, improving it, but when there are high levels of air pollution the vegetation itself may be affected. Urbanized areas contribute with about 80% of total carbon emissions and the air pollution has become a relevant environmental problem as it can affect human health in many different ways, varying from premature mortality to chronic effects such as coughing, airway infections, damage to lungs, or even emphysema.

In 1996, the whole Santiago Metropolitan Region (SMA) was declared Saturated Zone for PM10, PTS (Total Suspended Particulates), O3, CO and latent for NO2. In SMA the last assessment of the urban forest contribution to improve air quality was done in 2002, and since then the city has exhibited a great deal of changing in both spatial extension and vegetation structure within its boundaries. There are many new developments, especially in the urban-rural fringes, and the fairly new construction of several motorways, have rapidly change Santiago's landscape. Nevertheless, to use the urban forest to improve air quality is one thing, but assessing the effects of urban pollutants on the growth of plants (photosynthesis) is another. Urban forest ecological services may drastically be reduced when the concentrations of air pollutants reach or exceed certain values, plants structures can stress and even get damaged. There are two specific goals associate to these issues: i) to quantify the actual (2014) urban forest status in terms of its structure and the provision of ecosystem services and determine their changes since 2002; ii) to assess the effects of urban pollutants, under surveillance by the Environmental Ministry - MACAM network-, on the growth of selected tree species. For the first objective we will apply UFORE/i-Tree methods proposed the USDA Forest Service, and for the second, chlorophyll fluorescence techniques.

We propose that vegetation-based knowledge that emerged from quantifying ecological services and assessing stress levels, will allow the development of a new set of spatial explicit indicators that, in turn, can be used to monitor how much of the ecological services are provided in a sustainable way, in SMA. This approach is aligned with the new proposal for a National Policy of Urban Development - Sustainable Cities and Quality of Life -, recently announced by Chilean authorities. This new policy express the need to consider natural systems as fundamental support for planning and designing interventions over the territory. Among its main objectives it is point out the necessity of a permanent assessment and monitoring of the environmental urban variables. Specifically, it indicates the need to create indicators to monitor the achievement of environmental goals to be included in territorial planning. We propose a final third specific goal for this matter: to develop spatial explicit indicators, based on the knowledge provided by the accomplishment of the two previous specific objectives, suitable for sustainable urban planning according to the new proposed National Policy of Urban Development. In order to reach this final goal, we will use a spatial explicit approach using geo-processing tools.