SESYNC Lesson: Spatial Ecology: Land Sparing versus Land Sharing

Article: Balanced spatial distribution of green areas creates healthier urban landscapes
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Abstract:

1. The benefits of green infrastructure on human well-being in urban areas are already well-established, with strong evidence of the positive effects of the amount and proximity to green areas. However, the understanding of how the spatial distribution and type of green areas affect health is still an open question.

2. Here, through a land sharing and sparing framework, we explore how different spatial configurations of green and built-up areas and how different types of green areas can affect cardiovascular and respiratory hospitalizations in São Paulo city, Brazil.

3. Sharing/sparing indicators were selected as the main explanatory factors in the control of all groups of diseases. Land sharing appeared as a favourable spatial condition to prevent cardiovascular hospitalization, while land sparing and arboreal vegetation were relevant to reduce hospitalization by lower respiratory diseases.

4. For upper respiratory diseases, forests seem to provide a disservice, once they were associated with increased rates of hospitalization by respiratory allergies causes.

5. Considering that hospitalization rates and severity of cardiovascular diseases are substantially higher than those of upper respiratory ones, dense vegetation tends to provide more services than disservices. The land sharing configuration, which is characterized by green areas spread throughout the urban network (in streets, gardens, small squares or parks), should

lead to higher exposure and use of the benefits of green areas, which may then explain the greater prevention of cardiovascular diseases.

6. These novel results indicate that a more balanced distribution of green areas across built-up areas creates healthier urban spaces, and thus can be used as an urban planning strategy to leverage the health benefits provided by green infrastructure.

7. Policy implications. Aiming to reduce hospitalizations by cardiovascular and pulmonary causes, urban planning should promote the spreading of green areas across the cities, in order to increase daily contact with natural attributes, giving preference to distribution over total quantity of green in urban landscape.

Introduction

A broader framework for assessing the spatial distribution of green areas is provided by the land sharing and land sparing strategies (Lin & Fuller, 2013; Soga et al., 2014; Stott et al., 2015). Land sparing is a conservation strategy that combines the intensification of human use in some areas (in principle, the most favourable areas for use), with setting aside other areas for conservation of more preserved (with higher quality) native vegetation (Balmford et al., 2012).

On the other side, land sharing strategy promotes less intensive use in more extensive areas, leading to shared use of the same space for production and conservation purposes. In urban areas, a land sparing configuration can typically be represented by neighbourhoods with a high population density and with the presence of well-maintained green areas (parks, squares). Land sharing is typically represented by neighbourhoods of lower population densities, with plenty of green areas among households, as occurs in many suburbs of cities in more developed countries. Originally, the sharing–sparing framework was developed to analyse its impacts on species density and biodiversity, both in rural and urban areas (e.g. Soga et al., 2014; Caryl et al., 2016; Geschke et al., 2018; Ibáñez-Álamo et al., 2019).

Here, we expand the application of this framework to understand its effects on human health, which should occur through its effects on the provision of regulating and cultural services. The effect of urban sharing and sparing on duration, frequency and intensity of exposure to nature (Shanahan et al., 2015, 2016), and thus on the provision of ecosystem services and human health, is still an open question, with important implications for landscape urban planning and nature-based solution interventions in cities (Cohen-Shacham et al., 2019).

Our aim here was to evaluate the relative effects of the quantity, type and spatial distribution of green areas in an urban landscape on the frequency of hospitalizations by cardiovascular and respiratory diseases. We tested those relationships using public data of hospitalization rates in one of the world's largest megacities, São Paulo (Brazil), relating them to the level of land sharing and sparing, the amount and type of green areas in a neighbourhood scale. To perform

this analysis, we developed new indicators which allow us to assess, in a continuous way, how the landscape structure reflects the level of land sharing and sparing in a particular region (here, a neighbourhood).

We expect that: (1) greener neighbourhoods will present lower occurrence of diseases (due to higher provision of regulating and cultural services); (2) more complex/diverse vegetation types will provide more health benefits; and (3) land sharing schemes will provide more benefits than land sparing schemes, if we suppose they allow more frequent exposure of people to green areas.

Conclusions

Not just the amount but also the type and distribution of green coverage matters in efforts to prevent cardiovascular, upper and lower respiratory diseases. Our data show that the configuration of urban green seems to be as important as total green coverage.

Land sharing configuration was associated with lower cardiovascular system hospitalization rates, probably by providing greater exposure to and usufruct of regulating and cultural ecosystem services that act on human health. The amount of dense tree canopy reduces lower tract respiratory hospitalization rates, but potentially increases allergy-based hospitalizations. In general, the services provided by forests and urban woods on human health, particularly a land sharing configuration, seem to be bigger than their disservices.

Thus, the increase in green areas and the intensification of sharing configuration are relevant targets for urban planning, in particular through multiple small interventions scattered throughout the urban landscape. Those interventions can be more efficient, cheaper and lasting, since green areas can remain for generations on urban landscapes and can benefit the population in the long term.