On access and pollution: an (un)even distribution of agglomeration's benefits and costs?

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Abstract

In this paper we study human exposure to air pollution in the Brussels metropolitan area from an urban accessibility perspective. In particular, we focus on various categories of "urban travellers", i.e. residents of the area travelling daily within or to the metropolitan core (i.e. the Brussels Capital Region-BCR). We look at individual exposure to air pollution, viewing this as a burden which is hypothetically unequally distributed among travellers, and we explore possible links between levels of exposure and personal levels of accessibility.
Distribution of environmental burdens has been looked at from different perspectives to explore different hypotheses. Within the literature on environmental justice, numerous studies have looked at the relation between the spatial distribution of air pollution and socio-economic inequalities, suggesting a relation between people's socio-economic profile (e.g. level of income, profession, ethnic background, nationality, ...) an the level of exposure (e.g. see Laurian 2008). From a different angle, other studies have focused more directly on exposure of urban travellers looking at the transport microenvironments and more specifically at the transport mode (e.g. see Kaur, Nieuwenhuijsen, and Colvile 2007; Zuurbier et al. 2010; Cepeda et al. 2016). The results are heterogeneous and, rather than providing a ranking among different modes, they point at a number of factors that need to be considered while comparing among them, including the position on the street and in/on the vehicle, the mouth's height from the ground, the route, the fuel type and the time spent on transport among many other.

In our study we propose an explanatory analysis of people exposure to air pollution and level of access of the place where they reside, which we look at as possible costs and benefits of urban agglomerations. In particular, we illustrate how these costs and benefits are distributed geographically and among social groups, and we develop a typology of neighbourhoods and urban travellers for the Brussels Capital Region. The results will contribute in providing a clearer image of the relation between the two and shed lights on the underlying dynamics.

In a first phase, we will look at air pollution (i.e. NO2, PM10 and PM2.5), as measured by the interregional fixed telemetric network. In particular, we will use the data from the Atmosys Air Quality Maps, which result from the spatial interpolation of air quality measurements (RIO interpolation technique) and the calculation of the air quality based on meteorological data and pollutants emissions of pollutants (bi-Gaussian dispersion model IFDM) (see ATMOSYS Services 2016). In a second phase, we will use Living Labs methodology, and

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work in conjunction with the local association BRAL and with groups of volunteers to collect the data for the analysis (see more on SmarterLabs.eu 2016). Data on the exposure will be collected through portable devices that measure PM2.5 concentration and reference it with a time and location (GPS) tag, providing details on the volunteers' exposure while travelling. This will be complemented with information such as the mode of transport and the trip's motivation provided by volunteers through trip logs. Information on the volunteers' profile (e.g. socio-economic data, residence, mobility habits), finally, will be collected through a questionnaire.

In both phases we look at accessibility levels of different neighbourhoods within the Brussels Capital Region (BCR), by car (both in traffic and no-traffic conditions) and by public transport at peak hour. Accessibility will be defined as the amount of people reachable within a given time-period, thus acting as a interaction-potential measure simulating urban.

The Brussels case is particularly relevant to test this hypothesis, because of the geographic and socio-economic configuration of the urban agglomeration. The metropolitan area, in fact, is characterised by a relatively poor and yet accessible urban core, and by a historical tendency of the middle class to migrate toward the periphery (both within and outside of the borders of the Brussels Capital Region). In this context, while existing maps of air pollution show how the centre is characterised by higher levels of pollution than the suburbs (ATMOSYS Services 2016), our analysis investigates whether the air pollution burden on urban travellers represents a different distribution.

Essential bibliography

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