

Urban Accessibility: perception, measurement and equitable provision

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ABSTRACT

Transport is essentially a set of technical instruments that may be deployed to facilitate access to destinations (goods, people, opportunities in general) that would otherwise be difficult or impossible to reach, but this nature of remedial instrument should not be forgotten: the real objective is access, not transport efficiency. The objective of this work is to lay out as clearly as possible how to measure the real levels of physical access (to jobs, health, education, etc.) enjoyed by the different parts of an urban settlement, using different transport modes. This would allow a more rigorous foundation for the policy discussions on how best to define the desirable levels of access and on how to finance the public interventions towards achieving those policy goals.

The notion of accessibility and the associated adjective "accessible" are very widely used and understood in current language, with "accessible" corresponding to being "near" and "not accessible" to being "far". Based on intuition and some preliminary evidence, we have decided to pursue the notion that there would be a permanent difference of the perception of "near" related to the purpose / function being sought and the transport mode.

A survey was organized by our research team in Lisbon involving several hundred (1,289 respondents) adult interviewees. In average, each interviewee answered questions about 9 urban functions, stating for each function and transport mode what was the time threshold for "near" and the time threshold for "far". As expected, that was significant variation among persons for the same function and transport mode, but also for the average across persons among functions (all modes combined) and among transport modes for the same function.

Trying to fit an attraction decay curve to this evidence, we found that an inverted logistical curve was the best fit, much more adequate than the more usual "step function" or negative exponential approaches. This inverted logistical curve can easily be calibrated to the "near" and "far" thresholds for each case being studied.

The method used in this paper adopts a spatial resolution based on the city block, for which many cities currently have very rich land-use databases, including the functional area (square meters) associated to each type of activity in each city block, as well as the number of jobs associated with it. On the basis of the accessibility calculations, we analyse their variations across the urban space and across modes, and highlight situations of social injustice that must be corrected. The examples provided in this paper are exactly that – examples – with the aim of highlighting what insights can be gained, and do not in any way intend to present a significant part of those insights.

The objective is to measure the level of accessibility, i.e. "accessible mass of opportunities", based on each city block and exploring the whole urban agglomeration, in this case the Lisbon Metropolitan area. Based on each city block i as origin of travel, the accessible mass of opportunities provided by each other city

block j for a particular function is given by its real mass multiplied by the value of the distance-decay curve for that function and for the transport mode m under consideration.

The interesting results for policy analysis are not the absolute values but the variations across the geographical space and across modes, as well as the corresponding Gini coefficients, which provide us with a measure of inequality.

Urban functional diversity is recognised as an important element of quality of life, and an approach to include it in accessibility calculations has been proposed in (Cervero and Kockelman, 1997), but it has two problems: its maximum value (1.0) is obtained when the proportions of all functions are equal, which would hardly be considered as ideal by any urban planner or citizen; and it gives equal importance to all instances of the same function across the study area, irrespective of its distance to the city block taken as origin. We propose an alternative formulation that addresses both these issues, by assuming that there is a "desirable" set of proportions for the various functions being considered – recognizably different for different social groups – and measuring the difference between the available proportions and the desirable proportions of the various urban functions, as well as by weighting the contribution of each location of a function to its total supply by the distance-decay factor.

The formulation proposed here, and the results presented as examples, show that it is possible to study these complex issues of land use and transport with simultaneous concerns for

- *Social inclusion*, by allowing easy identification of urban areas of low accessibility in general, and also targeted analyses for access to jobs and to the types of facilities most desired by each social group
- *Quality of life*, by jointly considering ease of access to multiple types of opportunities and facilities

Interventions must be conceived and enacted to solve or at least mitigate the identified problems. These corrective interventions can be made on the transport system or on the land-use / planning system, and the accessibility gains from each intervention must be compared with the corresponding costs and implementation difficulties and lead times.

This has important implications for the definition of strategic objectives in Urban Mobility Plans, which, as indicated above, should be made at the level of access provided and not at the level of travel time savings, average speeds or other indicators that are "blind" to the purpose of the travel.

Moreover, recognition of this alternative and sounder approach to the formulation of strategic objectives leads to the perception that part of the urban motorized transport (and associated traffic congestion) is avoidable and constitutes a negative externality of poor land-use planning, without proper care for non motorized access.

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