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Resident group specific accessibility analysis and implications for the Great Helsinki Region using Structural Accessibility Layer

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ABSTRACT

This research analyses accessibility for different age population groups in the Great Helsinki Region (GHR). After discussing previous approaches done in the GHR, the authors use the *Structural* Accessibility Layer (SAL) as a tool for accessibility categorization for a grid with 8325 zones. SAL method was applied to assess accessibility categories for specific age population groups and the spatial distribution of the groups was used for identifying potential areas for urban development or requiring additional service allocation. The results for the general map show that 74,52% of residents have access to the services with public transport; however dissimilarities appear when calculating accessibility for specific groups: while 39,6% of pensioners enjoy accessibility by all transport modes, 32,8% and 32,0% of students and children between 0 and 7 years old reside in areas of car-dependent accessibility. The findings highlight the benefits of population group specific accessibility measures. Urban and transport planners of the region have validated the method derivation as a useful and reliable approach for public services planning and accessibility forecasting. Authors propose this accessibility approach for management of public services allocation and further research is indicated.

1. Introduction

In many cities all over the world there is a growing concern over car dependence and strategic decisions have been made to support more sustainable modes of transportation (European Comission, 2007; Banister 2008; Deng and Nelson 2013; EEA, 2013). Consequently, in all planning exercises, it is increasingly important to model accessibility not only for car, but more importantly for the existing public transport network and for non-motorized transport, in order to guide future policies and reallocate public services in the urban area.

The measurement of accessibility and its use for the optimization of the location of services is especially relevant in fast growing and changing urban areas, where the changes of services and transport network are in need of a more intense re-design. Accessibility has been defined in various ways by different authors (see for example Geurs and van Eck (2001, 2003), Bhat et al. (2000), Geurs and van Wee (2004) or Bertolini et al. (2005) for a complete review). In the current paper, the accessibility is based on the definitions proposed by Bertolini et al. (2005) as *"the amount and diversity of places that can be reached within a given travel time and/ or cost"* (page 209) and Geurs and van Eck (2001) as *"the extent to which the land use-transport system enables (groups of) individuals or goods to reach activities or destinations by means of a (combination of) transport mode(s)"* (page 36).

Ensuring similar levels of accessibility throughout a given urban area has been an often-used policy in order to reduce transport related social exclusion between neighbourhoods. In this sense, a balanced transportation network and a judicious spatial distribution of public services, such that all residential areas have good accessibility, are tools often used in urban planning and policy making. However, this practice it is based on the False Assumption of Older Cohort Homogeneity firstly observed by Davies and James (2011). Davies and James showed that the dissimilarity between individuals, even under the assumption that all other variables/ characteristics were equal through them (e.g. income level, education, household structure), is too large, to consider the group a homogeneous cohort in the accessibility studies. Therefore, age population groups should be subdivided in sub-

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groups as homogeneous as possible. Previous research papers focusing on different age groups have emphasized the importance of this subdivision of the groups, to obtain detailed accessibility measures. For example, elder population has been considered in specific studies (see for example Frändberg and Vilhelmson, 2011; Horner et al., 2015; Love and Lindquist, 1995; Mercado et al., 2010 or Sikder and Pinjari, 2012). However, to our knowledge, no approach so far, examined all population groups. Moreover, no attempt has been done to measure group-specific accessibility in the Great Helsinki Region (GHR).

This article proposes a derivation of the Structural Accessibility Layer (SAL – Silva, 2008) to categorize accessibility for different age population groups. This is done in the GHR as a case study, due to availability of data and opinion from experts in the region for its evaluation. This article is of interest for scholars, transport planners and city planners as it discusses a tool to evaluate service allocation, transport network and housing development possibilities in the urban area. As the results are validated by experts in the region, we have greater confidence in the usability and benefits of the method for urban planning purposes.

The remainder of this article is organized as follows: i) first, it reviews previous accessibility studies in the Great Helsinki Region (Section 2); ii) then it describes the method used in the paper and its derivation (Section 3); iii) results are presented next, as well as the potential housing development areas in the city and the evaluation done by expertise in the region (Section 4); iiii) finally, the paper discusses the suitability of the method for urban planners and policy makers to categorize accessibility for different age population groups, as well as for service allocation planning (Section 5), as well as the contributions of the case study results to the scientific debate involving use of accessibility methods (Section 6).

2. Review of previous accessibility studies in the Great Helsinki Region

GHR (Fig. 1) is formed by the cities of Helsinki, Espoo, Vantaa and Kauniainen. These four cities occupy 964 km^2 and are home for 1,022,380 residents (which represents approximately 19.5% of the Finnish population). The GHR provides an example of a region that has witnessed a rapid growth in the past decades (Haapanen 1998, 2001; Vaattovaara, 2011) due to its economic development and national socio-economic dynamics; GHR currently represents the 6th biggest growing rates of the European metropolitan areas (e-Geopolis, 2014).

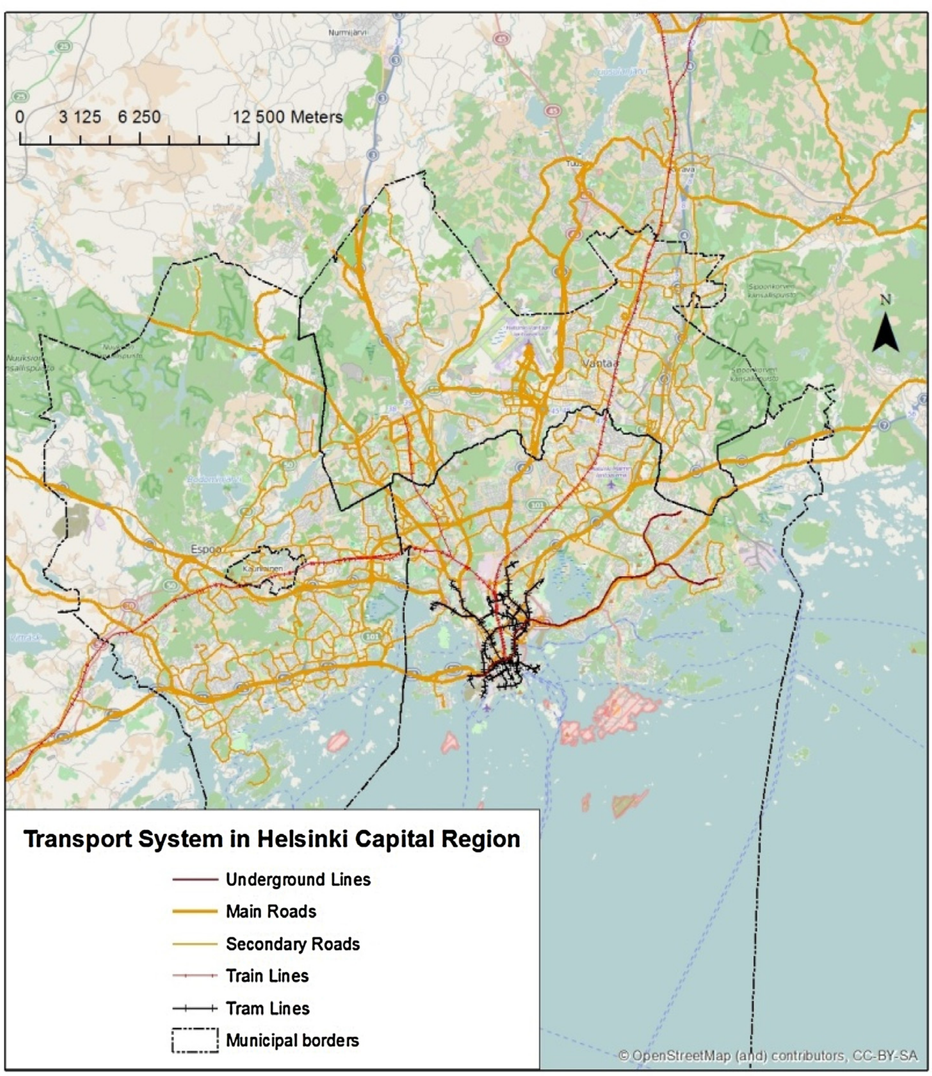

Fig. 1. GHR and the transport network.