



Deliverable 6.2

CATALOGUE OF CLASSIFIED LAND USE TYPES WITH RELEVANCE FOR ACCESSIBILITY

Publishable summary

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Purpose and methodology

The goal of the deliverable D6.2 is to identify land use patterns with relevance for accessibility. Accessibility has been mainly defined in terms of time, distance and cost to certain or aggregated destinations. To reach this goal, two main research questions have been answered:

- Which is the connection between single land use components (also called land use variables) and accessibility?
- How are these components combined in land use typologies and which are the links between the resulting land use types and accessibility?

Additionally to the interrelation between land use and accessibility issues, this deliverable also includes a third dimension of study: the effect of both on mobility behaviour. This third dimension represents the consequence of land use and accessibility features. The hypothesis is that land use issues are associated with accessibility levels. And if accessibility to/by a transport mode is not satisfactory, it will affect the quality of transport and the passenger experience evaluated in METPEX.

In order to answer the aforementioned research questions this deliverable explores existing literature. The literature review will focus in academic research to find the connections between land use components and accessibility, while grey literature and national data will be also analysed.

Structure

- Section 1 introduces the topic, the objective inside the project and the structure.
- Section 2 explains from a theoretical point of view the meaning of the terms and the fields of study that are involved in the following sections.
- Section 3 maps the confirmed connection between the single components of the three dimensions of study (land use, accessibility and mobility behaviour) based on an extensive literature review of scientific publications.
- Section 4 shows the connections between the three dimensions, but not in terms of single land use components, but in terms of land use typologies, i.e. combination of different components.

- Section 5 reviews the existing disparity of land use types and accessibility levels in Europe, including socio-economic implications on both aspects.
- Section 6 focuses on case studies to illustrate the evidences of quantitative connections between land use and accessibility found in Europe based on national or regional reports and data.
- Section 7 summarizes the main results and synthesises the conclusions for the work package and the project.

Results

Land use variables can be summarized in the so called “D variables” (Section 2). This deliverable covers four D variables: Density (population and employment density), Diversity (mix of residential and employment in land use), Neighbourhood Design (in terms of street connectivity, i.e. intersections density) and Demand Management (e.g. car parking fee, car parking supply, speed limit).

Figure 1 summarizes the result of the extensive academic literature review undertaken in section 3. Thus, the most relevant findings regarding the connection between land use and accessibility (main goal of the deliverable) are the following:

- Population density is negatively associated with average trip distance by public transport
- No association was found between population density and average trip distance on foot and travel cost.
- Population density, land use diversity and street connectivity reduce average trip distance by car.

Furthermore, the literature regarding the connection between land use and mobility behaviour reveals the below findings:

- Increases of population density, land use diversity and street connectivity lead to decreases of VMT (Vehicle Miles Travelled) and car use encouraging the use of more sustainable transport modes (public transport and active modes).
- Job density shows similar connections to population density with some contradictory results.
- The demand management factors such as car parking price are also related to lower car use, while a reduction of car parking supply increases active mobility.
- There is controversy regarding the factors determining travel frequency. Contradictory and no-association results were found.

Accessibility also seems to be associated with mobility behaviour:

- Accessibility to city centre in terms of distance (proximity) leads to lower VMT, while proximity to public transport stations and long distances to highways reduce car use.

- Job accessibility is related with high walking levels. In contrast, proximity to stores seems to reduce walking, an unexpected result that might be explained by the location of stores in suburban areas.

A last conclusion of the literature review in section 3 is that the association of land use and accessibility with mobility behaviour have attracted a big attention of researcher. Nevertheless the link between land use and accessibility seems to have been less investigated. Two likely reasons are the following: Firstly, some authors have considered accessibility as a land use variable, becoming an internal factor out focus of the study. Secondly, mobility behaviour concentrates a great attention because it is the final goal of many research and policies, disregarding the connection between other interrelated factors such as land use and accessibility.

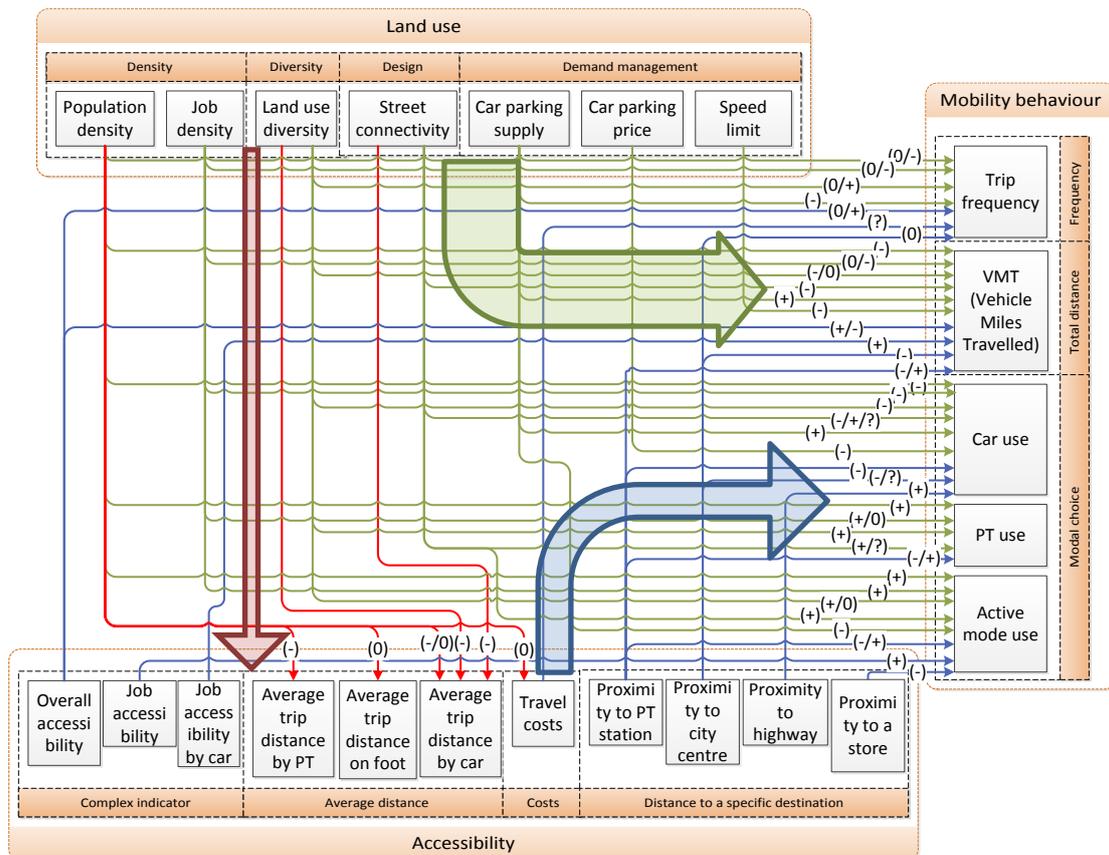


Figure 1 Association between land use, accessibility and mobility behaviour based on literature review ("-" means negative elasticity, "+" positive elasticity, "0" no elasticity, "?" unclear result)

Section 4 has reviewed several definitions of land use types (classification combining different levels of land use variables) and their relationship with accessibility and mobility behaviour. The focus of the research has been on the urban-rural land use typology. Urban and rural areas are differently defined depending on the institution (e.g. OCDE, Eurostat, DG Regio, SERA Project). Threshold values differ but a common and crucial feature when defining an urban or rural area is the population density. According to the literature, urban areas report less car use in comparison with suburban and

rural areas. Other land use typologies such as transit oriented and traditional neighbourhoods were also reviewed and report low levels of car use, while as urban sprawl is associated with the opposite mobility behaviour.

Section 5 shows the distribution of land use types (urban-rural) as well as the distribution of accessibility in European regions. It was found that Western Germany, The Netherlands, Belgium, Central and Southern England have the largest concentration of urban regions. All these areas report polycentric settlement structure and high urban and rural density, with exception of England, where rural regions have lower density. The above European areas plus north-eastern France and northern Italy report the highest concentration of high accessibility by car and train and high GDP.

Land use typology seems to be associated with socio-economic disparities in Europe, according to the literature. GDP is higher in urban areas (compared to rural areas) and in northern Europe. The highest absolute number of employment concentrates in urban areas. However, nowadays it does not necessarily lead to lower relative unemployment rates. In the last year, as result of the economic crisis, unemployment has grown in urban as well as in rural areas following similar patterns. In rural areas migrations to urban areas is aging population. Finally, no correlation between car ownership and land use type was found at European level, since results seem to be more depending on the country.

Distance to employment, shopping or leisure centres have a high attractiveness that determines land price as wells as demand and costs of products, production levels, incomes and type of economic activity. The demand of these central locations increases land price as proximity increases. Thus, individuals have to decide between lower land prices with lower accessibility or high prices in high accessible areas. Therefore, the unequal distribution of accessibility results in different economic frameworks and consequently different socio-economic groups derived of the existing conditions.

Section 6 has presented four national case studies (Switzerland, United Kingdom, Lithuania and Greece) to illustrate the connection between urban-rural land use types and accessibility. Compared to suburban and rural areas Swiss urban areas report higher accessibility in terms of average travel time and distance, distance to all likely destinations, distance to public transport and by both car and public transport. A higher accessibility by public transport lead to higher public transport use among the land use types. However, a high accessibility by car of urban areas, do not lead to higher use. A lower car ownership, the competent Swiss public transport offer and a high demand management might motivate the low car use in urban areas. Moreover, suburban municipalities located far from centres have lower accessibility than smaller cities with character of centre, pointing the relevance of centrality. Furthermore, national particularities have been identified. Topography plays a relevant role in accessibility. Mountains reduce the level accessibility of rural areas in countries such as United Kingdom, Greece or Switzerland. And island territories require special attention in Greece. Traffic congestions

around British agglomerations determine travel times, which therefore are crucial to measure and foresee accessibility.

Implications

The aforementioned results can be summarized in Figure 2. It illustrates the land use types in term of their variables and as a function of their urban features and accessibility by/to public transport¹.

Thus, the urban areas – especially downtown areas – could be characterized by high density, land use diversity, high street connectivity and high demand management. Accessibility by public transport is higher in urban areas due to the concentration of demand for residence and employment, as well as for the diversity of likely destinations and their high attractiveness. Demand management contributes to reduced car use which can lead to more fluid traffic and quick service of some public transport modes that share space with cars, such as trams and buses.

Around urban areas other settlements such as suburban areas (or peri-urban depending on the distance to the centre) have been built during the last few decades. Considering density as a key element for accessibility by public transport, we can differentiate between two types of suburban areas – high-density and low-density suburbs. Both types are normally mono-functional (either residential or employment) and have low street connectivity due to large blocks. Low residential prices of areas located moderately close to centres are only possible with high densities, exploiting the limited land available. Density can contribute to making distances shorter (relevant for pedestrians and cycling) and to increase occupancy and efficiency of public transport vehicles (thus making the service more justifiable economically), but it can also imply wide streets with intense traffic that may cause concentration of noise, pollution and discourage cyclists and pedestrians. On the contrary, in low populated areas, public transport supply and accessibility by this mode is more limited.

Finally, the economies of rural areas located far from urban centres concentrate on the following activities: primary sector, local factories or nature tourism. Small blocks of traditional city planning in rural areas increase street connectivity and the low density of population reduces the risk of traffic congestion, which may lead to less effort around demand management. Accessibility by public transport in these areas is low, due to low public transport supply. Low travel demand, the lack of opportunities (trip destinations), the lack of infrastructures and short trip distances make the service economically unfeasible for small municipalities

¹ Although METPEX evaluates the whole travel experience, we concentrate on public transport because of the abundance of literature and the intermodal character of this transport mode.

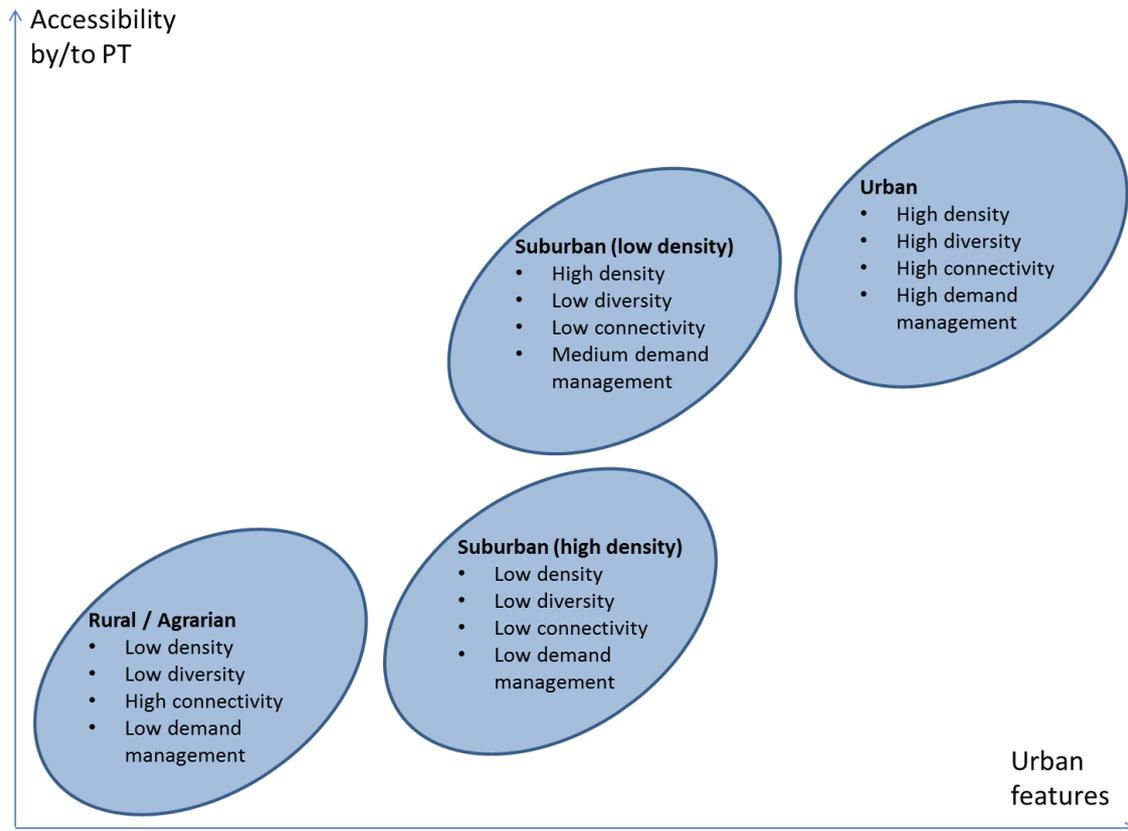


Figure 2 Land use types and land use variables as function of urban features and accessibility by public transport

This deliverable represent a theoretical basis for the deliverable D6.5, which will provide recommendations for decision makers to increase accessibility based to land use issues that motivate satisfaction in travel experiences.