Contactability

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Background

This contactability indicator was developed from a vision of networks from the theoretical geography tradition and in reaction to the classic accessibility indicators, which emphasize too much the quantification of a level at the expense of understanding the network view of the access conditions.

The scientific question was to supplement accessibility indicators with a complementary view that would allow for a better understanding of how transport networks contribute to the local level of accessibility.

The planning issues to be addressed are associated with the objectives of spatial cohesion such as they are enunciated in the ESDP (European Spatial Planning Perspective): Which degree of cohesion in a city network? Which level of contactability for cities and metropolitan regions? What are the missing links in the transport network to favour a better spatial integration of a city network?

Conceptual framework and theoretical underpinnings

Metropolises have become the focus of contemporary economic development. They constitute a type of settlement organising both the short distances of co-presence and the long distances of telecommunication and transport through the mastering of fast transport systems. Despite the rise of telecommunications, it is acknowledged by many analysts in the field of innovation, that face-to-face contact remains a key element. The analysis of professional mobility shows those contacts are dominantly performed through single day trips.

Time-geography (Hägerstrand, 1970) provides the theoretical and conceptual framework still suitable for analysing this type of metropolitan mobility. In that it considers the space-time individual constraints as key parameters in the measurement of the access conditions. The main indicator is contact potential (Erlandsson, 1979), also called contactability (Haggett, 2001). It measures the possibility to realise a trip to a distant location respecting the time-space prism.

Accessibility is defined in the contactability indicator as the potential, for somebody in a location, for having face-to-face contact with somebody else in a single or a group of distant locations.

The measure of accessibility is Boolean for each O-D pair considered: is it (YES) or is it not (NO) possible to perform a contact under some time constraints? Departure not earlier than 5am, return not later than 11pm and a minimum period of time of 6 hours for a contact are leading criteria, while connection times are also considered (see details in Figure 1).

Operational aspects

The type of accessibility that the indicator measures is “travel times using public transport”.

Contactability is measured by associating two optimal transport chains corresponding to a return trip. Fast transport systems -by rail and air - are operated with timetables. To reach a certain level of realism, and to consider intermodality in a satisfactory way a scheduled minimum path must be computed (L’Hostis and Baptiste, 2006). Therefore timetable information must be collected and manipulated in a large database.

Data is available by purchasing the OAG [1] database for flights and by automatic queries of the public website DieBahn.de for the train timetables.

The data has been stored on a mysql database. Timetables and nodes (the graph) must be put in the database, and then the minimum paths are processed through the database. The minimum paths have been computed with the Musliw software (not publicly available, developed by P. Palmier from the Centre d'Etudes Techniques

[1] http://www.oag.com/

de l'Equipement Nord-Picardie). The degree of technical expertise is high for performing the calculation and processing the information, because of the mass of information it involves.

Tasks and time consumption:

- selection of the cities to be considered;
- 1 month for gathering railway information with an ad hoc java web capturing tool developed at the IFSTTAR;
- 3 days for formatting transport supply information under the form of a graph;
- 3 days week for modelling the full graph in a GIS environment with pedestrian connections for intermodality;
- 2 x 4 hours for computing minimum paths with Musliw (roughly 1 million minimum paths for 200 cities);
- 5 days for processing minimum paths in the database;
- 1 day for realising the cartography;

The degree of technical expertise for interpretation is low.

Relevance for planning practice

Contactability indicators are particularly suitable in the frame of the polycentrism option for organising the territory with city networks.

It has been used in the frame of the European Spatial Planning Observation Network (ESPON) for proposing European cities competitiveness indicators (Lennert *et al.*, 2010) as can be seen on Figure 2 and Figure 3. Furthermore, it has been used by BBR[2] in the ESPON Atlas [3] to propose the constitution of Global Integration Zones outside of the pentagon [4], as stated in the ESDP polycentrism option.

Coupled with the classic accessibility indicator developed by Spiekermann and Wegener (Spiekermann and Wegener, 2007) it allows for a better understanding of the levels of accessibility by identifying the top level contactability link.

It has also been used for clustering European cities in a research for the French DATAR (project ACME 2011).

Strengths and limitations

Strengths

- it allows for the identification of links, existing or missing, as opposed to the simple identification of high or low accessibility locations;
- it measures the possibility to realise real daily trips as opposed to the measure of an abstract level of accessibility (as in classic accessibility indicators), which helps the interpretation of the cartography.

Limitations

- it operates a selection through the full timetable information, therefore focuses on a limited type of mobility needs, and does not account for the full transport supply between two cities. For this reason, it is a complementary indicator to classic accessibility indicators (there is no way to overcome this limitation which is inherent to this type of indicator);
- the indicator measurement is highly dependent on the choice of cities; this step, the choice of cities, must be thus made on a clear and sound basis and is not an easy task at the European level (by experience the city list is often provided by the commissioner of the work i.e. Urban Audit cities chosen for the "Future Orientations for Cities" ESPON project).

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[2] The German federal Planning office "Bundesamt für Bauwesen und Raumordnung".

[3] ESPON and BBR, *ESPON atlas, Mapping the structure of the European territory* (BBR, 2006).

[4] The pentagon formed by the cities of London, Hamburg, Munich, Milan and Paris, concentrating population (40 %) and wealth (50 % of GDP) on a limited surface (20 %).

- the most recent implementation combines air and rail transport; the next step will be to integrate transport by road in a full multimodal and intermodal approach
- In the context of a planning discussion the experience is that this type of indicator is not easily readable at first sight, but once explanation is given, the stakeholders can clearly understand the type of mobility involved and represented. The representation of the indicator has required extensive work on graphical representation both schematic and cartographic;

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Figures

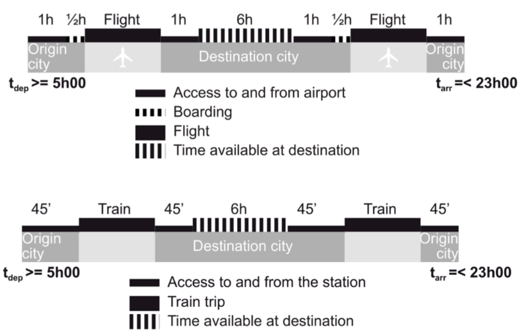

Figure 1 Structure of the air and rail return trips for computing the contactability indicator (author: A. L'Hostis)

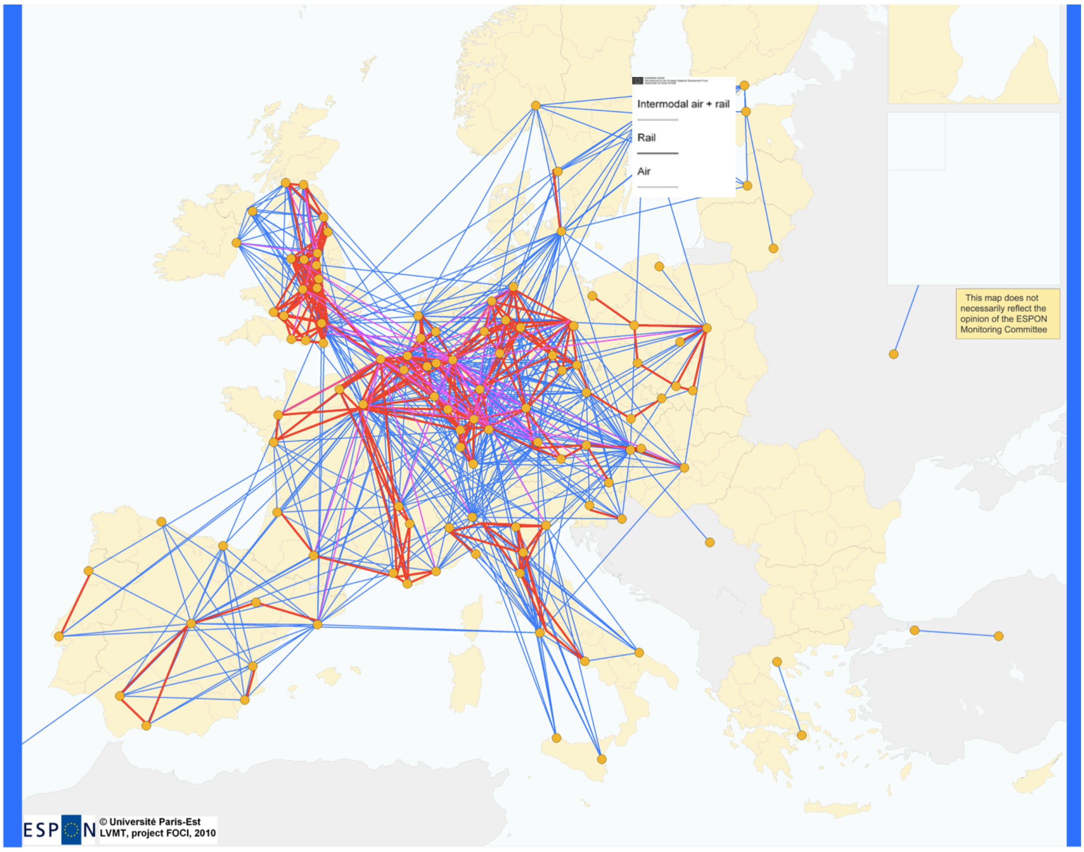

Figure 2 Contactability by monomodal and intermodal transport chains between European cities in 2009 (author: A. L'Hostis)

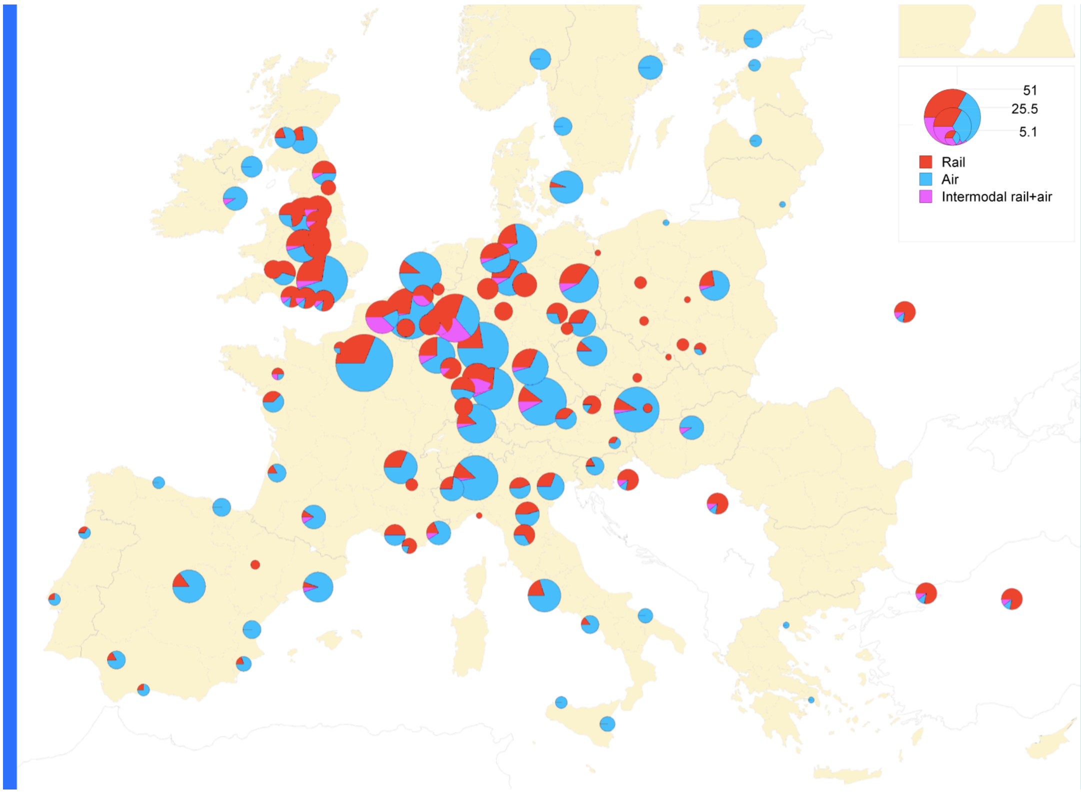

Figure 3 Contactability level by city and by monomodal and intermodal transport chains in 2009 (author: A. L'Hostis)