5 Conclusions

Evaluation of peripherality indices

The accessibility indicators and peripherality indices presented confirm previous accessibility calculations undertaken for the SASI and ESPON projects (Fürst et al., 2000a; 2000b; Wegener et al., 2000). In summary, for all kind of indicators, regions in western Germany, northern France, Belgium, the Netherlands, southern England and northern Italy show the highest accessibilities and can be considered the most central regions.

When NUTS-3 regions are considered, great differences in peripherality can be found between peripheral regions, for example in Scandinavia, in Greece and on the Iberian Peninsula. This indicates that the model is able to capture relatively small, but nevertheless important differences. When higher NUTS levels are considered, these details partly disappear.

It was shown that the system can also be applied to future scenarios yielding reasonable results.

Comparisons between different peripherality indices show that the choice of indicator has great influence on the results. The following conclusions can be drawn:

- The overall spatial patterns of all peripherality indices are very similar, so correlations between different indicators are rather high. This reflects the fact that, irrespective of the kind of peripherality index used, the distant geographical position of peripheral regions cannot be fully removed by transport infrastructure improvements.

- Peripherality with respect to population by car is less polarised than peripherality with respect to GDP by lorry.

- Peripherality with respect to lorry favours regions around the Channel coast, since for lorries the ‘barrier effect’ of the Channel Tunnel is much less than for cars.

- Candidate countries benefit more if peripherality with respect to population by car is used; conversely, central regions benefit more if peripherality with respect to GDP by lorry is used.

- The type of indicator has relatively little influence on the results. Standardisation between the minimum and maximum shows slightly more differentiation among peripheral regions, whereas standardisation on the European average shows slightly more polarisation between the central regions.

- GDP in PPS has slight balancing effects compared to GDP in Euro, but nevertheless peripherality with respect to both is more polarised than peripherality with respect to population or employment.

- The greater the territory used for standardisation is, i.e. the more candidate countries are taken into account, the lower will be the European average, and the more will regions in EU member states improve their relative position.

- The higher the NUTS level, the greater will be the loss in spatial differentiation. Studies based on the NUTS-3 level yield a great number of detail and differentiation between and within peripheral and central regions. This is particularly true for the relatively small German, French and Italian regions.

Theoretical considerations

Accessibility is the main product of a transport system. It determines the locational advantage of a region relative to all regions and so is a major factor for the social and economic development of a region. Since peripherality can be seen as an inverse function of accessibility, it indicates not only central or peripheral regions in a geographic sense, but gives also information on the quality of its links with the European core.

Peripherality can be evaluated by a number of different peripherality indices with respect to NUTS levels, modes, mass terms, types of indicator and spatial scope of standardisation. The software system developed offers the full range of combinations of these parameters, totalling 192 indicators. The general spatial patterns of peripherality are very similar across all these indicators, reflecting the fact that distant geographical location cannot be fully compensated by transport infrastructure. Each indicator emphasises certain aspects of peripherality. So, the choice of the type of peripherality index to be used becomes a matter of concern. Depending on the purpose of the study, a certain indicator type may be more appropriate than another type.

For calculating distance measures, i.e. average road travel times of passengers and goods, the model takes account of road types, speed limits for cars and lorries, congestion in urban regions and delays due to mountainous areas, national borders and maximum driving hours of lorry drivers. In this the system goes far beyond the way usually travel times are measured in accessibility studies. Moreover, peripherality indices are calculated for NUTS-0, NUTS-1, NUTS-2 and NUTS-3 regions based on a unified and disaggregate approach.

Beside these theoretical and conceptual considerations, the software implemented has the following strengths and weaknesses (see the User Manual for more detail):

Strengths

- The modular structure is flexible, expandable and offers a number of capabilities.
- The core macro calculates all peripherality indices in one model run.
- Output options are available to fit user needs with respect to contents, processing time and disc space availability.
- The number of user interactions is minimised.
- Additional tools support a wide range of specific tasks.
- The system is running under UNIX or Windows NT / Windows 2000.
- All input coverages and input files can be manually edited, adjusted or exchanged.

- There is a combination of windows-based menu operations designed for user-friendliness and command line executions designed for efficiency.
- Capabilities for designing scenarios are provided.

Weaknesses

Compared to these strengths, the software has only little weaknesses. One is the relatively long processing time of the core macro which is due to the fact that it calculates all 192 indicators in one run. Also the relatively large amount of disc space required for temporary coverages and for storing results might limit the applicability of the model. In the current version, the model considers only road traffic and neglects rail, air and inland waterways and so is not able to calculate intermodal accessibilities. Moreover, only accessibility of the potential type can be calculated, whereas daily accessibility or average travel costs are not taken into account.

Possible extensions

From a theoretical point of view, it would be of great interest to incorporate also the other modes, namely rail, air and inland waterways, into the system to enable calculations of intermodal accessibilities and peripherality indices. Also of interest would be the possibility to calculate daily accessibility or average travel costs. A more practical extension would be to incorporate a ‘scenario manager’ into the system which would allow generation, management and application of different scenarios.

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