2. Accessibility and Peripherality

A peripheral region is defined as a region with low accessibility. However, in addition to accessibility, many other criteria are used to delineate centres and peripheries in regional research. Notwithstanding this qualification, accessibility is clearly a key criterion of geographical peripherality and also of major importance in defining economic peripherality. Therefore in this section first basic concepts of accessibility are discussed.

2.1 Basic Accessibility Indicators

Accessibility is the main 'product' of a transport system. It determines the locational advantage of a region relative to all regions (including itself). Indicators of accessibility measure the benefits households and firms in a region enjoy from the existence and use of the transport infrastructure relevant for their region.

Accessibility indicators can be defined to reflect both within-region transport infrastructure and infrastructure outside the region which affect the region.

Simple accessibility indicators consider only intraregional transport infrastructure expressed by such measures as total length of motorways, number of railway stations (e.g. Biehl, 1986; 1991) or travel time to the nearest nodes of interregional networks (e.g. Lutter et al., 1993). While this kind of indicator may contain valuable information about the region itself, they fail to recognise the network character of transport infrastructure linking parts of the region with each other and the region with other regions.

More complex accessibility indicators take account of the connectivity of transport networks by distinguishing between the network itself, i.e. its nodes and links, and the 'activities' (such as work, shop or leisure) or 'opportunities' (such as markets or jobs) that can be reached by it (cf. Bökemann, 1982). In general terms, accessibility then is a construct of two functions, one representing the activities or opportunities to be reached and one representing the effort, time, distance or cost needed to reach them:

\[ A_i = \sum_j g(W_j) f(c_{ij}) \]  

where \( A_i \) is the accessibility of region \( i \), \( W_j \) is the activity \( W \) to be reached in region \( j \), and \( c_{ij} \) is the generalised cost of reaching region \( j \) from region \( i \). The functions \( g(W) \) and \( f(c) \) are called activity functions and impedance functions, respectively. They are associated multiplicatively, i.e. are weights to each other. That is, both are necessary elements of accessibility. \( A_i \) is the accumulated total of the activities reachable at \( j \) weighted by the ease of getting from \( i \) to \( j \).

It is easily seen that this is a general form of potential, a concept dating back to Newton's law of gravitation and introduced into regional science by Stewart (1947). According to the law of gravitation the attraction of a distant body is equal to its mass weighted by a decreasing function of its distance. Here the attractors are the activities or opportunities in regions \( j \) (including region \( i \) itself), and the distance term is the impedance \( c_{ij} \).
The interpretation here is that the greater the number of attractive destinations in regions \( j \) is and the more accessible regions \( j \) are from region \( i \), the greater is the accessibility of region \( i \). This definition of accessibility is referred to as destination-oriented accessibility. In a similar way an origin-oriented accessibility can be defined: The more people live in regions \( j \) and the more easily they can visit region \( i \), the greater is the accessibility of region \( i \). Because of the symmetry of most transport connections, destination-oriented and origin-oriented accessibility tend to be highly correlated.

Different types of accessibility indicators can be constructed by specifying different forms of functions \( g(W_j) \) and \( f(c_{ij}) \). Table 2-1 shows the three most frequently applied combinations of \( g(W_j) \) and \( f(c_{ij}) \), where \( W_{\text{min}} \) and \( c_{\text{max}} \) are constants and \( \alpha \) and \( \beta \) parameters:

<table>
<thead>
<tr>
<th>Type of accessibility</th>
<th>Activity function ( g(W_j) )</th>
<th>Impedance function ( f(c_{ij}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travel cost</strong></td>
<td>( W_j ) if ( W_j \geq W_{\text{min}} ) \smallskip ( 0 ) if ( W_j &lt; W_{\text{min}} )</td>
<td>( c_{ij} )</td>
</tr>
<tr>
<td>Accumulated travel cost to a set of activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Daily accessibility</strong></td>
<td>( W_j )</td>
<td>( 1 ) if ( c_{ij} \leq c_{\text{max}} ) \smallskip ( 0 ) if ( c_{ij} &gt; c_{\text{max}} )</td>
</tr>
<tr>
<td>Accumulated activities in a given travel time</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Potential</strong></td>
<td>( W_j^\alpha )</td>
<td>( \exp(-\beta c_{ij}) )</td>
</tr>
<tr>
<td>Accumulated activities weighted by a function of travel cost</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Travel cost**

This indicator is based on the assumption that not all possible destinations are relevant for the accessibility of a region but only a specified set. This set may, for instance, consist of all cities over a certain size or attraction \( W_{\text{max}} \). The indicator measures the accumulated generalised travel costs to the set of destinations. In the simplest case no distinction is made between larger and smaller destinations, i.e. all destinations in the set get equal weight irrespective of their size and all other destinations are weighted zero (the activity function is rectangular). In many applications, however, destinations are weighted by size (the activity function is linear). The impedance function is always linear, i.e. does not take into account that more distant destinations are visited less frequently.
To make the index easier to compare, the accumulated generalised cost so generated is frequently divided by the number of destinations or the total of attractions $g(W_j)$, respectively. The indicator then represents the average travel cost to the set of destinations:

$$A_j = \frac{\sum g(W_j) c_{ij}}{\sum g(W_j)} \quad \text{with} \quad g(W_j) = \begin{cases} W_j & \text{if } W_j \geq W_{min} \\ 0 & \text{if } W_j < W_{min} \end{cases}$$  \hspace{1cm} (2)

In both cases the indicator expresses a disutility, i.e. the lower its value the higher the accessibility.

Travel cost indicators are popular because they are easy to interpret, in particular if they are expressed in familiar units such as average travel cost or travel time. Their common disadvantage is that they lack a behavioural foundation because they ignore that more distant destinations are visited less frequently and that therefore their values depend heavily on the selected set of destination, i.e. the arbitrary cut-off point of the $W_j$ included.

**Daily accessibility**

This indicator is based on the notion of a fixed budget for travel, generally in terms of a maximum time interval in which a destination has to be reached to be of interest. The rationale of this accessibility indicator is derived from the case of a business traveller who wishes to travel to a certain city, conduct business there and return home in the evening (Törnqvist, 1970). Maximum travel times of between three and five hours one-way are used. Because of its association with a one-day business trip this type of accessibility is often called 'daily accessibility'.

$$A_j = \sum_j W_j \cdot f(c_{ij}) \quad \text{with} \quad f(c_{ij}) = \begin{cases} 1 & \text{if } c_{ij} \leq c_{max} \\ 0 & \text{if } c_{ij} > c_{max} \end{cases}$$  \hspace{1cm} (4)

where $c_{max}$ is the travel time limit. The daily accessibility indicator is equivalent to a potential accessibility (see below) with a linear activity function and a rectangular impedance function, i.e. within the selected travel time limit destinations are weighted only by size, whereas beyond that limit no destinations are considered at all.

Daily accessibility indicators, like the travel time indicators above, have the advantage of being expressed in easy to understand terms, e.g. the number of people one can reach in a given number of hours. However, they also share their disadvantage that they heavily depend on the arbitrarily selected maximum travel time beyond which destinations are no more considered.
Potential accessibility

This indicator is based on the assumption that the attraction of a destination increases with size and declines with distance or travel time or cost. Therefore both size and distance of destinations are taken into account. The size of the destination is usually represented by regional population or some economic indicator such as total regional GDP or total regional income. The activity function may be linear or non-linear. Occasionally the attraction term $W_j$ is weighted by an exponent $\alpha$ greater than one to take account of agglomeration effects, i.e. the fact that larger facilities may be disproportionally more attractive than smaller ones. One example is the attractiveness of large shopping centres which attract more customers than several smaller ones that together match the large centre in size. The impedance function is non-linear. Generally a negative exponential function is used in which a large parameter $\beta$ indicates that nearby destinations are given greater weight than remote ones.

$$A_i = \sum_j W_j^\alpha \exp(-\beta c_{ij})$$ \hspace{1cm} (5)

Earlier versions of the potential accessibility used an inverse power function reminiscent of Newton's gravity model:

$$A_i = \sum_j \frac{W_j}{c_{ij}^\alpha}$$ \hspace{1cm} (6)

This form was proposed by Hansen as early as 1959 and is therefore called 'Hansen' accessibility. Later improvements led to the empirically similar but behaviourally derived negative exponential function used above (Wilson, 1967).

Potential accessibility indicators are superior to travel time accessibility indicators and daily accessibility indicators in that they are founded on sound behavioural principles of stochastic utility maximisation. Their disadvantage is that they contain parameters that need to be calibrated and that their values cannot be easily interpreted in familiar units such as travel time or number of people. Therefore potential indicators are frequently expressed in percent of average accessibility of all regions or, if changes of accessibility are studied, in percent of average accessibility of all regions in the base year of the comparison.

2.2 Multimodal and Intermodal Accessibility

From the above three basic accessibility indicators, an almost unlimited variety of derivative indicators can be developed (cf. Ruppert, 1975). The most important ones are multimodal, intermodal and interoperable accessibility. In all three cases the equations given above remain valid; what changes is the way transport cost $c_{ij}$ is calculated.
**Multimodal accessibility**

All three types of accessibility indicator can be calculated for any mode. On a European scale, accessibility indicators for road, rail and air are most frequently calculated. In most studies accessibility indicators were calculated for passenger travel only; only few studies calculating freight accessibility indicators are known.

Differences between modes are usually expressed by using different 'generalised' cost functions. A frequently used generalised cost function is:

\[ c_{ijm} = v_m t_{ijm} + c_m d_{ijm} + u_m k_{ijm} \]  

(7)

where \( t_{ijm} \), \( d_{ijm} \) and \( k_{ijm} \) are travel time, travel distance and convenience of travel from location \( i \) to destinations \( j \) by mode \( m \), respectively, and \( v_m \), \( c_m \) and \( u_m \) are value of time, cost per kilometre and inconvenience of mode \( m \), respectively. In addition, there may be a fixed travel cost component as well as cost components taking account of network access at either end of a trip, waiting and transfer times at stations, waiting times at borders or congestion in metropolitan areas.

Modal accessibility indicators may be presented separately in order to demonstrate differences in accessibility between modes. Or they may be integrated into one indicator expressing the combined effect of alternative modes for a location. There are essentially two ways of integration. One is to select the fastest mode to each destination, which in general will be air for distant destinations and road or rail for short- or medium-distance destinations, and to ignore the remaining modes. Another way is to calculate an aggregate accessibility measure combining the information contained in the three modal accessibility indicators by replacing the generalised cost \( c_v \) by the 'composite' generalised cost

\[ \bar{c}_{ij} = -\frac{1}{\lambda} \sum_m \exp(-\lambda c_{ijm}) \]  

(8)

where \( c_{ijm} \) is the generalised cost of travel by mode \( m \) between \( i \) and \( j \) and \( \lambda \) is the sensitivity to travel cost (Williams, 1977). This formulation of composite travel cost is superior to average travel cost because it makes sure that the removal of a mode with higher cost (i.e. closure of a rail line) does not result in a – false – reduction in aggregate travel cost. This way of aggregating travel costs across modes is theoretically consistent only for potential accessibility. No consistent ways of calculating multimodal accessibility indicators for travel cost and daily accessibility exist.

**Intermodal accessibility**

A further refinement is to calculate intermodal accessibility. Intermodal accessibility indicators take account of intermodal trips involving two or more modes. Intermodal accessibility
indicators are potentially most relevant for logistic chains in freight traffic with different possible combinations of freight modes and terminals such as rail freight with feeder transport by lorry at either end. Intermodal accessibility indicators in passenger travel involve mode combinations such as rail-and-fly or car rentals at railway stations and airports.

The calculation of intermodal accessibility indicators requires, of course, the capability of minimum path search in a multimodal network. The intermodal generalised cost function consequently contains further components to take account of intermodal waiting and transfer times, cost and inconvenience.

Intermodality is also an issue when calculating *intraregional* accessibility. Most accessibility studies so far have concentrated on the accessibility of cities, i.e. network nodes which are assumed to represent the whole metropolitan area or region. This presents several problems:

- Accessibility indicators calculated for network nodes only ignore that accessibility is continuous in space. The decline of accessibility from the central node (centroid) of a region to smaller towns and less urbanised parts of the region is not considered.

- Also the quality of the interconnections between the high-speed interregional and the low-speed intraregional transport networks cannot be taken account of. Yet the ease of getting from home or office to the nearest station of the high-speed rail network or the next international airport may be more important for a location than the speed of the long-distance connection from there.

- In addition the estimation of access times from locations within the region to the regional centroid as well as of travel times between activities within the region itself ('self-potential'), which greatly influence the accessibility of a region, increases in difficulty with spatial aggregation.

Calculating intraregional accessibility indicators is not straightforward as it requires high-resolution data on the spatial distribution of activities in the region. If also the quality of the intraregional transport network and its connection with the long-distance interregional networks are to be assessed, detailed information on the intraregional road and public transport networks and the transfer possibilities at railway stations and airports are required.

Difficulties in travel or goods transport across network boundaries, e.g. between different railway systems, can be taken into account by assigning extra costs or waiting times to border nodes or border links when calculating accessibility indicators.

### 2.3 Accessibility Indicators Used in Other Studies

There is a large variety of approaches to measuring accessibility in the geographic and economic literature. Below a few examples of accessibility indicators calculated for the EU territory are referred to. More information is contained in Wegener et al. (2000).
Travel cost

Total or average travel time to a specified set of destinations has received increasing recognition as accessibility indicator in recent studies because of its straightforward interpretability. In 1993 the Bundesforschungsanstalt für Landeskunde und Raumordnung (BfLR) (Lutter et al., 1993) in a study for DG XVI of the European Commission calculated accessibility of NUTS-3 regions in the formerly twelve member countries of the European Community (EUR12) as average travel time by fastest mode (road, rail, air) to 194 economic centres. The selection of centres was based on RECLUS (1989) and Zumkeller and Herry (1992). Similar accessibility indicators were developed for the reunited Germany by Eckey and Horn (1992) and Lutter et al. (1992).

Gutiérrez and Urbano (1996) calculated average travel time by road and rail from about 4,000 nodes of a multimodal European transport network to 94 agglomerations with a population of more than 300,000 with and without planned infrastructure improvements. Road travel times included road and car ferry travel times modified by a link-type specific coefficient and a penalty for crossing nodes representing congested population centres (maximum 30 minutes for Paris). Rail travel times included time-table travel time plus road access time and penalties for changes between road and rail (60 minutes), rail and ferry (180 minutes) and change of rail gauge between Spain and France (30 minutes).

A road freight accessibility index expressing total road transport cost to a market of size M is the FreR(M) index used in the UTS study (Chatelus and Ulied, 1995). The indicator accumulates road transport cost to NUTS-2 regions in EUR15 plus Norway and Switzerland multiplied with regional population. Road transport cost include cost of the driver's time, cost per kilometre and a fixed cost component. Average travel time to selected destinations was also proposed as accessibility indicator for the EUNET study (INRETS, 1997).

Daily accessibility

As indicated above, the concept of daily accessibility is due to Törnqvist who as early as 1970 developed the notion of 'contact networks' hypothesising that the number of interactions with other cities by visits such as business trips would be a good indicator of the position of a city in the urban hierarchy (Cederlund et al., 1991). In the accessibility study of the BfLR for DG XVI mentioned above (Lutter et al., 1993) daily accessibility was calculated in terms of the number of people that can be reached in three hours by the fastest mode. Modes considered included road, rail and air with and without planned infrastructure investments (new motorways, high-speed rail lines and more frequent flight connections).

Also three hours was the time limit set for the CON(T) accessibility indicator used in the UTS study (Chatelus and Ulied, 1995). The indicator accumulated population of NUTS-2 regions of EUR15 plus Norway and Switzerland reachable within three hours by any combination of car, rail and air with transfers times between modes explicitly considered. In the same study the FreR(T) index, a freight accessibility indicator expressing the size of the market that can be reached in T days was developed. The indicator accumulates the population that can be reached in one, two or three days by the fastest connection using road, rail or combined traffic with driving time restrictions observed.
Potential accessibility

The most popular type of accessibility indicator found in the literature continues to be potential accessibility.

Keeble et al. (1982; 1988) analysed the centrality of economic centres in Europe using a gravity potential (see Section 3.1) with regional GDP as destination activity; the resulting centrality contours are shown in Figure 2-1. The figure clearly shows two central areas of high accessibility in Europe: one between London and northern Italy and one between Paris and Berlin.

Bruinsma and Rietveld (1992) calculated potential accessibility of European cities with respect to population.

In studies for the Highlands and Islands European Partnership and for DG XVI of the European Commission, Copus (1997; 1998; 1999) developed 'peripherality indicators' for NUTS-2 and NUTS-3 regions based on road-based potential measures. Figure 2-2 shows the economic potential using GDP as the destination variable and Figure 2-3 the peripherality index derived from it as the inverse standardised to the interval between zero (most central) and one hundred (most peripheral).
Figure 2-2. Economic potential in 1994 (Copus, 1997).
The final example (Figure 2-4) shows three-dimensional accessibility surfaces of potential rail accessibility in Europe in the year 1996 constructed by Spiekermann and Wegener (Spiekermann and Wegener, 1994; 1996; Schürmann et al., 1997; Vickerman et al., 1999). Figure 2-5 shows absolute growth in accessibility until 2010 due to the high-speed rail TEN Outline Plan. It can be seen that potential indicators tend to predict that the already highly accessible central regions will benefit most from the TEN programme, i.e. predict divergence in accessibility rather than convergence.
Figure 2-4. Accessibility potential in 1996 by rail (Spiekermann and Wegener, 1994).

Figure 2-5. Absolute growth in accessibility until 2010 by rail (Spiekermann and Wegener, 1994).
2.4 Accessibility, Cohesion and Peripherality

The important role of transport infrastructure for regional development is one of the fundamental principles of regional economics. In its most simplified form it implies that regions with better access to the locations of input materials and markets will, *ceteris paribus*, be more productive, more competitive and hence more successful than more remote and isolated regions (see Linneker, 1997).

The two-way interaction between regional economic development and interregional transport is illustrated by Figure 2-6. The relationship between regional development and transport can be seen as a self-reinforcing positive feedback loop in which regional economic growth creates more traffic and, vice versa, transport opportunities generate regional economic growth, with congestion and factor prices acting as equilibrating negative feedbacks:

![Figure 2-6. Transport and regional development.](image)

(1) The spatial distribution of economic activity and population gives rise to shipments of goods and movements of travellers between the regions.

(2) Shippers and traveller make use of the existing transport infrastructure by a sequence of decisions about vehicle ownership, trips to make (or not to make), choice of destination, choice of mode(s) and choice of route(s).

(3) These decisions lead to congestion in parts of the networks which result in increases in transport and travel costs and times which in turn affect the transport decisions of shippers and travellers.
(4) Transport and travel costs in the (congested) networks are location factors co-determining the attractiveness of regions for investors and households.

(5) Investors decide on the location or relocation of capital and firm locations, this leads to changes in employment opportunities in the regions.

(6) Households make migration decisions as a function of employment opportunities, this leads to changes in regional population.

According to SACTRA (1998) a list of important regional effects of transport investment effects has to include the following aspects: Transport investment may broaden the access of employers to qualified labour, expand market areas, attract inward investment, improve the image of a region, unlock suitable development sites and induce further economic activity and further employment. However, there may be also negative impacts: The net effect on employment and regional activities depends on the balance between export promotion and import substitution for local production. Transport improvement may have displacement effects in other regions. Marginal changes in the quality of an already good infrastructure system are less likely to have significant effects. Transport investments may reduce the demand for transport resources (e.g. drivers and vehicles) by improving the productivity of the transport sector. And finally, labour market characteristics have to be considered.

The discussion about the importance of infrastructure capital for economic growth was revived at the end of the 1980s by the so-called public-capital hypothesis. Pioneered by Aschauer (1989), the hypothesis states that increases in public capital, i.e. public investments, will have either positive or negative (crowding-out) influence on private investment and productivity. One part of economic capital is directly linked to the transport sector. Public infrastructure capital is a part of the whole capital stock, so increases in public infrastructure will generate private investment.

Empirical Problems

The impact of transport infrastructure on regional development has been difficult to verify empirically. There seems to be a clear positive correlation between transport infrastructure endowment or the location in interregional networks and the levels of economic indicators such as GDP per capita (e.g. Biehl, 1986; 1991; Keeble et al., 1982, 1988). However, this correlation may merely reflect historical agglomeration processes rather than causal relationships effective today (cf. Bröcker and Peschel, 1988). Attempts to explain changes in economic indicators, i.e. economic growth and decline, by transport investment have been much less successful. The reason for this failure may be that in countries with an already highly developed transport infrastructure further transport network improvements bring only marginal benefits. The conclusion is that transport improvements have strong impacts on regional development only where they result in removing a bottleneck (Blum, 1982; Biehl, 1986; 1991; Fürst et al., 2000a, 2000b).

While there is uncertainty about the magnitude of the impact of transport infrastructure on regional development, there is even less agreement on its direction. It is debated whether transport infrastructure contributes to regional polarisation or decentralisation. Some analysts argue that regional development policies based on the creation of infrastructure in lagging regions have not succeeded in reducing regional disparities in Europe (Vickerman, 1991a), whereas others point
out that it has yet to be ascertained that the reduction of barriers between regions has disadvan-
taged peripheral regions (Bröcker and Peschel, 1988). From a theoretical point of view, both
effects can occur. A new motorway or high-speed rail connection between a peripheral and a
central region, for instance, makes it easier for producers in the peripheral region to market their
products in the large cities, however, it may also expose the region to the competition of more
advanced products from the centre and so endanger formerly secure regional monopolies (Vick-
erman, 1991b; Bundesminister für Verkehr, 1996).

While these two effects may partly cancel each other out, one factor unambiguously increases
existing differences in transport infrastructure. New transport infrastructure tends to be built not
between core and periphery but within and between core regions, because this is where transport
demand is highest (Vickerman, 1991a). It can therefore be assumed that the trans-European net-
works will largely benefit the core regions of Europe.

New developments

These developments have to be seen in the light of changes in the field of transport and commu-
nications which will fundamentally change the way transport infrastructure influences spatial
development (see Masser et al., 1992). Several trends combine to reinforce the tendency to dim-
ish the impacts of transport infrastructure on regional development:

- An increased proportion of international freight comprises high-value goods for which trans-
  port cost is much less than for low-value bulk products. For modern industries the quality of
  transport services has replaced transport cost as the most important factor.

- Transport infrastructure improvements which reduce the variability of travel times, increase
  travel speeds or allow flexibility in scheduling are becoming more important for improving the
  competitiveness of service and manufacturing industries and are therefore valued more highly
  in locational decisions than changes resulting only in cost reductions.

- Telecommunications have reduced the need for some goods transports and person trips,
  however, they may also increase transport by their ability to create new markets.

- With the shift from heavy-industry manufacturing to high-tech industries and services other
  less tangible location factors have come to the fore and have at least partly displaced tradi-
  tional ones. These new location factors include factors related to leisure, culture, image and
  environment, i.e. quality of life, and factors related to access to information and specialised
  high-level services and to the institutional and political environment.

On the other hand, there are also tendencies that increase the importance of transport infra-
structure:

- The introduction of totally new, superior levels of transport such as the high-speed rail system
  may create new locational advantages, but also disadvantages for regions not served by the
  new networks.
Another factor adding to the importance of transport is the general increase in the volume of goods movements (due to changes in logistics such as just-in-time delivery) and travel (due to growing affluence and leisure time).

Both above tendencies are being accelerated by the increasing integration of national economies by the Single European Market, the ongoing process of normalisation between western and eastern Europe and the globalisation of the world economy.

The conclusion is that the relationship between transport infrastructure and economic development has become more complex than ever. There are successful regions in the European core confirming the theoretical expectation that location matters. However, there are also centrally located regions suffering from industrial decline and high unemployment. On the other side of the spectrum the poorest regions, as theory would predict, are at the periphery, but there are also prosperous peripheral regions such as the Scandinavian countries. To make things even more difficult, some of the economically fastest growing regions are among the most peripheral ones.

**Cohesion**

Article 2 of the Maastricht Treaty stated as the goals of the European Union the promotion of harmonious and balanced economic development, stable, non-inflationary and sustainable growth, convergence of economic performance, high levels of employment and social security, improvement of the quality of life and economic and social coherence and solidarity between the member states.

A prominent role for the achievement of these goals play the trans-European networks in the fields of transport, communications and energy (TEN). Already Article 129b of the Maastricht Treaty linked the TEN to the objectives of Article 7a (free traffic of goods, persons, services and capital) and Article 130a (promotion of economic and social cohesion). In particular the trans-European transport networks were to link landlocked and peripheral areas with the central areas of the Union. These objectives were confirmed in the European Spatial Development Perspective (ESDP 1999, 14). The trans-European transport networks (TETN) are the most relevant in spatial development policy and in financial terms. The TETN absorb more than 80 % of the total TEN budget. A large part of the investments in TETN is currently concentrated on high-speed railway lines, often connecting major conurbations. Cities close to high-speed transport stops and with a comparatively poor connection until now are likely to benefit most from these investments. In addition, in areas with a high volume of long-distance road traffic, high-speed lines may offer an incentive to shift increasing shares of traffic to the railways, thus helping to relieve road congestion and improve the environment. Indeed, rising traffic levels, in particular on road and air networks, are threatening the competitiveness of some central areas in the EU. A multitude of different initiatives are also required in long-distance traffic, in particular by increasing the shift to rail, inland water-ways and coastal and maritime transport.

Also the Structural Funds, in particular the European Regional Development Fund (ERDF), follow the objective of economic and social cohesion (as measured by traditional macroeconomic indicators). The First Report on Economic and Social Cohesion concluded that disparities between Member States have tended to decrease, but that at the same time regional concentration of economic activities is increasing. This is related to the lack of mechanisms
for spatial co-ordination. The latter could substantially contribute to a more balanced distribution of economic activities. For this reason, increasingly, spatial typologies are being used to frame the interventions of the Funds (for example, urban areas), in addition to traditional subsidising (ESDP, 1999, 16).

**Peripherality**

In the ESDP document, improvements in accessibility are given a high priority as a policy target: "Good accessibility of European regions improves not only their competitive position but also the competitiveness of Europe as a whole." (ESDP 1999, 69) "The creation of several dynamic zones of global economic integration, well distributed throughout the EU territory and comprising a network of internationally accessible metropolitan regions and their linked hinterland (towns, cities and rural areas of varying sizes), will play a key role in improving spatial balance in Europe" (ESDP, 1999, 20). However, it is admitted that "it is not possible to achieve the same degree of accessibility between all regions of the EU" (ESDP, 1999, 36).

This goal-setting reflects the assertion that improvements in accessibility have positive implications for regional (economic) development. Unfortunately, there is no unicausal and straightforward link between these two phenomena, and thus the question remains *a priori* open: upgrading a region's accessibility provides actors in that particular region with improved possibilities to reach destinations outside, but at the same time, they meet increasing competition from outside. The net effect on regional development remains an empirical issue.

Accessibility indicators can be used to analyse peripherality in several ways: regions can be classified into central and peripheral regions, impacts of different policy measures such as transport investments can be evaluated, or impacts of accessibility on regional development can be analysed.