SERIE RESEARCH MEMORANDA

REVITALIZATION OF REGIONAL RESOURCES -
A MULTIDIMENSIONAL PROFILE ANALYSIS

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In recent years several attempts have been made to improve the competitive position of regions by favouring a regional innovation policy, inter alia on the basis of science parks concepts and high tech developments. In various cases, however, the indigenous development potential of a region was not satisfactorily taken into account.

The present paper aims at analyzing the development and innovation potential of a region from the viewpoint of the potential contribution of small- and medium-sized firms to regional economic progress. Especially in many regions outside the industrial heartlands such firms account for a large share of the economic performance of these regions.

The analysis is based on a confrontation of multidimensional supply and demand profiles of these firms in the successive regions of a spatial system. A close harmony between a regional supply profile and an entrepreneurial demand profile is assumed to increase the development potential of a region. Such a profile analysis may then be used to make a systematic typology of regions.

The previous analytical model will be tested on the basis of a systematic comparison of regions in Europe, both in the more prosperous and the less developed countries.
1. **Regional Development Policy in Transition**

The economies of most industrialized countries show clear signs of structural change processes; the stagnation phenomena which hit our economies in the seventies have induced a process of economic restructuring, in which efficacy of public policy efforts and self-generating revitalization efforts of the private sector play a dominant role. Technological progress, research and development (R & D), innovation of production and management functions, and flexible adjustment to new circumstances are at present regarded as key forces for the enhancement of productivity and competitiveness (cf. Nelson and Winter, 1982, and Stoneman, 1983).

This re-orientation in economic policy has also gradually exerted a profound impact on regional planning. Until the mid-seventies regional planning was mainly caught in the dilemma of efficiency vs. equity. In order to find a compromise between these two conflicting policy objectives, regional development policy was usually based on attempts at favouring large-scale investments in fixed capital, the use of unskilled or idle labour, the exploitation of low-cost natural resources, and the production of medium-quality commodities, so that in less advanced regions price was the main factor for competition (cf. also OECD, 1986).

In the eighties, however, the context and contents of regional policy have dramatically changed. A first reason is the increase in knowledge orientation of modern production technology. The necessity to manufacture sophisticated products that do not only compete on a local market, but also on a world market, has called for an 'intellectualization' of all phases of production (ranging from product design to after-sales services). This rise in R & D intensity is in turn induced by new technological developments in areas like computer science, telecommunication and informatics. Consequently, the development potential of a region is co-determined by its access to and use of this modern knowledge network (cf. Giaoutzi and Nijkamp, 1987).

Another reason for a re-orientation has to be sought in the changing production structure of our economies. In contrast with the trend toward mass production and industrial concentration, we observe nowadays a new evolution toward small production units. This is partly due to the fact that the economic stagnation has triggered off the emergence of a small-scale innovative entrepreneurship, and partly due to the decentralization tendencies which have been made possible by modern information technologies (cf. Nijkamp, 1986a). In any case, small- and medium-sized enterprises (SMEs) are likely to play a crucial role in the economic revitalization of lagging regions, as such firms in particular exhibit the features of a Schumpeterian
case study, based on 12 regions of the common market, is presented.

A regional perspective of a set of SWF programs. Finally, in section 3, a
regional importance of a set of SWF programs was presented, which
provided a regional perspective of the industrial development of
SWF programs. These data were analyzed, while in section 2, the
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regional importance of these services and activities. The results of
these were presented in a comprehensive document, the present paper aims at

In light of the comprehensive document, the present paper aims at

From the previous remarks, the coordination can be drawn that

the SWF sector (see also Rapp and Weizen, 1996, and Sorensen, 1993).

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is viability, the industrial development, the attractive perspective
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research on the innovation process has already a long history since
research on the innovation process has already a long history since

A final point regards the need for a formulation of a

been empirically and theoretically neglected.

A final point regards the need for a formulation of a

Weber's quoted by Bowen (1969, p. 7):
2. **A Multidimensional Locational Profile Analysis**

In the current phase of the industrial life cycle, SMEs play an important role in the recovery, restructuring and improvement of a regional economy (cf. De Smidt, 1981). In the framework of an economic revitalization, new and innovative SMEs provide also a stimulus for economic growth in less favoured regions (cf. Aydalot, 1984). An extremely relevant question is: which regional conditions are favourable for the emergence and expansion of SMEs? In other words: which specific regional conditions act as seedbeds for the creation of new SMEs? Clearly, various regional conditions are fixed - at least in the short run - and cannot be directly adjusted to the locational demand profile of SMEs. Examples are: physical and climatological conditions, the locational position of a region, the socio-demographic structure, the employment situation and so forth. In fact, regional resources are relatively spatially fixed and some basic characteristics of single regional environments such as the quality of the labor force, the level of technical and management know-how and the social and institutional structures are relatively stable. Therefore, regional growth as well as sectoral location are largely determined by the endowment and productivity of the stock of regional resources rather than by the external flow of resources.' (Cappellin, 1983, p. 460).

However, various regional conditions can be modified in the medium and long term through a social overhead capital (SOC) policy, that is geared to the specific requirements of a region (see Hirschman, 1958). SOC will be regarded here - in a broad sense - as all (material and immaterial) public capital which is complementary to the available locational (supply) profile of a region and which acts as an incubator function for new socio-economic developments (see Nijkamp, 1986b). Thus, SOC serves to enhance the regional development potential of a region by increasing the efficiency of existing production factors (see also Biehl, 1986, and Buhr and Köppel, 1986). In this context, empirical research on the contribution of SOC to regional development has successfully made use of a so-called quasi-production function approach, in which - in addition to conventional production factors - also SOC was included as a major explanatory factor for the rise in the regional development potential (see for an empirical analysis of the regions in the European Community, Biehl, 1986).

In addition to a regional development policy based on a SOC strategy (an 'external' strategy), one may also try to improve the economic growth potential of development areas by mobilizing their indigenous development resources like the SME sector (an 'internal' strategy). The latter strategy aims at revitalizing a regional economy by employing the internal regional development potential, by favouring
In order to take into account the unique features of a region, it is necessary to consider the regional development and potential. If the region is not yet developed, it may require development and expansion. On the other hand, if the region is already developed, it may require further development and expansion. In this framework, it is important to consider the regional development potential and the existing factories.

Regional development potential requires new factories. For example, the SWG sector in a certain region requires new factories. In order to develop the region, it is important to consider the existing factories in the region. In addition, it is important to consider the regional development potential and the existing factories in the region.
account the diversity of locational factors in a regional development study. In our paper also, an attempt will be made to take into account the relative importance (i.e., priority) attached to the locational factors for the SME sector, so that one may arrive at an evaluation of the regional production potential for SMEs. For instance, if a specific locational factor for an SME activity is well represented in a given area and if this factor is attached a high priority, then the area concerned may be a favourable location for the SME activity concerned. This may lead to a strength-weakness analysis which may be used for both peripheral development areas and central restructuring areas. Before presenting the formal methodology of our study, we will in the next section pay more explicit attention to the SME sector perse.

3. The SME Sector

The industrial development in the postwar period exhibits various phases (Robert, 1982):

- 1945-1960: concentration and specialization, based on large scale industrialization
- 1960-1974: deconcentration, accompanied by interregional division of labour
- 1974+: reconcentration, followed by a decline in industrial employment, the emergence of high tech activities and a rise in regional inequalities in Europe.

The inertia implied by large scale industrial concentration could partly be removed due to the emergence of the more flexible SME sector. Clearly, the composition of SMEs in peripheral areas (Greece, Southern Italy, Ireland and Southern France, e.g.) is different from that in central areas. SMEs in peripheral regions are usually dependent on branch plants or weakly innovative firms, but an advantage of these SMEs is their flexibility and low dependence on exports. On the other hand, SMEs in central areas are more geared to a highly developed industrial structure, located in large agglomerations.

The interest in the SME sector is a result of a new industrial spirit, in which the self-generating employment capacity of the industrial sector is emphasized. In this context, it is assumed that the SME sector contains many growers and renewers, which may favour technological innovation (Rothwell and Zegveld, 1982). Furthermore, the SME sector has in the recent past demonstrated a remarkable capability to achieve a relatively stable employment level (cf. Hamilton, 1985). Thus, the SME sector is a potentially effective vehicle for creating new jobs, for stimulating a regional revitalization based on indigenous development resources and on greater flexibility, and for favouring industrial innovation. Small size appears to
generate significant economies, especially in case of a favourable RPS and RPE (including an open communication infrastructure; see Duché and Savey, 1985).

This important role of SMEs as triggers of development is often explained from the specific entrepreneurial spirit in this sector, characterized inter alia by independence, responsibility, reaction against public interference, simple organisational structures, rapid decision-making, tailor-made production organisation etc. This is also reflected in the following list of attributes derived from Piatier (1984):

<table>
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<tr>
<th>Characteristics of large and small firms</th>
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<td><strong>Large</strong></td>
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<td>1. Mass-production - sales and - investments</td>
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<td>2. Large share of market</td>
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<td>3. Control of production process and factors through internal and external organization</td>
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<td>4. Benefits from using specialized production factors like research, consultation and staff services</td>
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<td>5. Reduced internal control in case of growth</td>
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<td>6. Power in society in general</td>
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<td>7. Technical complexity</td>
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<td>8. High capital/labour ratio</td>
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<td>9. Output capable of automatic impersonal quality of control</td>
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<td>10. Semi-skilled or unskilled labour</td>
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<td>11. Production/sales on national/ international scale</td>
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</table>

In the framework of our paper SMEs will be defined as enterprises (industry, handicraft) with less than 500 employees. These firms can be further subdivided into:
- very small (≤ 10 employees)
- small (10 - 100 employees)
- medium size (100 - 500 employees)

Clearly, the SME sector as a whole is very heterogeneous.

The advantages of the SME sector are quite diverse, and may be judged on the basis of the following criteria (cf. Alsters and Van der Mark, 1986):

(a) **employment impacts.** In many European countries the rise in the number of jobs in the SME sector has compensated the loss of jobs in the large industrial sectors. In addition, the quality of labour in the SME sector (including various spin-off effects) and the relatively lower wage rates have meant a significant stimulus
for the rise of the SME sector.

(b) new firm creation. Besides the growth of existing firms also new establishments contribute to the employment growth in the SME sector. It is noteworthy, however, that in various cases new establishments are reflecting a branch plant strategy of a large mother company. Finally, it has to be noted that not only the birth rate, but also the death rate of SMEs is in general high.

(c) innovation potential. The flexible manufacturing in SMEs leads to a high innovativeness of SMEs, especially in central favourable locations. New ventures based on large spin-off effects and various buy-outs induce an innovative climate in areas with a good knowledge and R & D infrastructure.

(d) flexibility. In contrast with bureaucratic management of large-scale companies, SMEs have a high degree of flexibility, so that they can easily adjust themselves to new management and organisation patterns, new production methods, new scale techniques or new marketing strategies, mainly because of their low overhead infrastructure.

(e) variation in production systems. SMEs are able to operate on small and specialized markets by providing competitive tailor-made goods.

The abovementioned list of potential advantages of SMEs in a regional development strategy will be fully realized only if the region concerned has an optimal development potential. The elements in the RPE which favour the specific regional development potential geared to the SME sector are the following:

(1) accessibility. The regional availability of an efficient communication and transportation infrastructure is of crucial importance for SMEs, in particular because SMEs need in general backward and forward linkages with other firms and/or markets.

(2) centrality. The centrality (or peripherality) of a region refers to its relative position in a larger set of regions. The distance (including transport costs and lagged innovation diffusion) to the economic heartland(s) of these regions determines to a large extent the development potential of a region, as is also demonstrated by the economic position of various regions in the Common Market.

(3) agglomeration size. Up to a certain critical threshold level, large agglomerations do provide economies of scale for the SME sector, due to close functional linkages and direct access to relevant information systems.

(4) institutional and policy framework. In this context, various forms of financial support for SMEs (including venture capital), various policy measures fostering innovations and new technolo-
gies in the SME sector (by favouring R & D infrastructure, e.g.), and information and advice to SMEs (via technology transfer points or science parks, e.g.) may be mentioned.

(5) **educational facilities.** Educational facilities and specialized personnel are extremely important locational conditions for new SMEs. Bottlenecks in terms of skilled employees reduce the regional development potential with respect to the SME sector.

(6) **residential climate.** Various studies have demonstrated the relevance of a favourable residential climate, especially for highly skilled employees in the SME sector.

(7) **energy costs.** Low regional energy costs favour the creation of SMEs in those regions.

(8) **wage rates.** Low wage rates may give a region a stronger (interregional or international) competitive position.

(9) **labour force.** The composition and growth of the regional labour force (especially in the economically active age) are two important determinants of its development potential.

(10) **employment perspectives.** Unacceptable unemployment levels may be coped with by means of effective migration policies, educational programmes, reductions in labour time, specific industrial sector policies, participation policies for the labour market etc.

(11) **regional opportunities for SMEs.** This element refers both to the contribution of the SME sector to promising industrial activities and to the benefits of promising industrial activities for the SME sector.

The abovementioned 11 attributes of an RPE will be used in the next section in order to assess an operational multidimensional profile for the development potential of a set of regions in regard to the SME sector.

4. **Methodology**

In the present section the analysis framework for assessing the profiles of RPEs will be described.

First, the concept of an RPE matrix will be introduced. This matrix denoted by $E$ contains the numerical values of the abovementioned 11 attributes (see section 3) across all regions ($R$) under study. Thus this matrix can be represented as:

$$E = \begin{bmatrix}
e_{11} & \cdots & e_{1R} \\
\vdots & \ddots & \vdots \\
e_{1} & \cdots & e_{R}
\end{bmatrix}$$
where $I = 11$. The assessment of the values of $e_{ir}$ ($i=1,\ldots,I$; $r=1,\ldots,R$) requires an operational definition of each of the successive development potential factors, which is consistent and compensable across all regions via appropriate standardisations. Thus $E$ represents the multidimensional profiles of each of the $R$ regions concerned.

In addition to the RPE matrix, we construct a so-called RSE (regional sector evaluation) matrix. This matrix denoted by $S$ represents for each relevant branch (subsector) of the SME sector the relative importance of each of the factors included in the RPE matrix. Thus this matrix has the following shape:

$$S = \begin{bmatrix} s_{11} & \cdots & s_{1J} \\ \vdots & \ddots & \vdots \\ s_{I1} & \cdots & s_{IJ} \end{bmatrix}$$

where $J$ is the number of relevant branches in the SME sector. Each entry $s_{ij}$ ($i=1,\ldots,I$; $j=1,\ldots,J$) represents the relative weight attached to factor $i$ for branch $j$. These weights are regarded as score points and satisfy the usual additivity condition:

$$\sum_{i=1}^{I} s_{ij} = 1, \forall j$$

In the framework of this study, the following branches of the industrial SME sector are distinguished, based on a distinction between final-market oriented, intermediate, export-oriented, innovative and high-tech firms (see for more details Alsters and Van der Mark, 1986):

1. final-market oriented
2. intermediate
3. intermediate innovative
4. final-market export oriented
5. intermediate export oriented
6. intermediate high-tech oriented
7. final-market export oriented and innovative
8. intermediate, export oriented and innovative
9. intermediate, innovative and high-tech oriented
10. final-market innovative
11. intermediate, export oriented, innovative and high-tech oriented

It is clear that firms in each of these branches will attach a different priority to the factors of the locational profile in the RSE.
matrix. These priority weights can in principle be assessed by means of expert judgements of persons who are familiar with the SME sector.

The resulting problem is essentially a multi-criteria evaluation problem. We have a set of performance scores (incorporated in the RPE matrix) and a set of weights (incorporated in the RSE matrix). For the sake of simplicity, we will employ here only the simplest multi-criteria techniques available, viz. the weighted summation technique. Clearly, other more sophisticated techniques may be used as well, but for illustrative purposes we prefer here the use of the weighted summation technique.

This technique provides then an evaluation of the regional development potential of each of the branches of the SME sector in three steps. First, for each region \( r (r=1, \ldots, R) \) a compound sector evaluation matrix \( C_r \) can be constructed which is defined as follows:

\[
C_r = \begin{bmatrix}
e_{1i}^{s_1} & \cdots & e_{1i}^{s_J} \\
e_{2i}^{s_1} & \cdots & e_{2i}^{s_J} \\
\vdots & \ddots & \vdots \\
e_{ri}^{s_1} & \cdots & e_{ri}^{s_J}
\end{bmatrix}
\]

Each \( i \)th row of \( C_r \) represents the weighted regional development potential for factor 1 with respect of all \( J \) branches, while each \( j \)th column represents the weighted regional development potential across all attributes for SME branch \( j \).

Next, one may calculate the total regional development potential across all SME branches in region \( r \) by means of the following \( J \)-dimensional profile:

\[
C_r = \left[ \sum_{i=1}^{I} e_{ir}^{s_1}, \ldots, \sum_{i=1}^{I} e_{ir}^{s_J} \right]^T
\]

In the final step, the overall growth potential of region \( r \) (in terms of the weighted development potential of all relevant attributes for all SME branches) is calculated as:

\[
c_r = \sum_{j=1}^{J} \sum_{i=1}^{I} e_{ir}^{s_ij}
\]

The various elements \( c_r \) can for all regions \( r (r=1, \ldots, R) \) be included in an \( R \times 1 \) multiregional profile vector \( c \). The results from these steps can be used to make a systematic typology of the development potential for the SME sector in a system of regions.
Finally, we will use a regional performance indicator (RPI) matrix, which comprises for each region a set of relevant growth indicators. This matrix denoted by $G$ has the following shape:

$$
G = \begin{bmatrix}
    g_{11} & \cdots & g_{1R} \\
    \vdots & \ddots & \vdots \\
    g_{K1} & \cdots & g_{KR}
\end{bmatrix},
$$

where $K$ is the number of performance indicators. The following indicators will be used here:

1. Growth in gross regional product
2. Growth in value added
3. Growth in regional employment
4. Relative change in industrial employment
5. Relative change in employment share of SME sector (by size of establishment).

It is of course an interesting analytical question whether the RPI matrix bears a correspondence with the multiregional profile vector $q$. In the next section, the abovementioned analysis framework will be further clarified on the basis of a study in the development potential for the SME sector in various regions of the Common Market.

5. A Case Study

In the present case study 18 different regions from the European Community will be taken into consideration. These regions are standard regions (so-called level II regions), except Greece (level I) and Twente (level III). These 18 regions are:

1. Greece
2. Sicily
3. Puglia
4. Ireland
5. Midi-Pyrénées
6. Aquitaine
7. Languedoc-Roussillon
8. Northern Ireland
9. Cleveland, Durham, Cumbria, and Tyne and Wear
10. Yorkshire and Humberside
11. Lorraine
12. Luxembourg
13. Saarland
14. Twente
15. Liège
16. Limburg
17. East-Flanders
18. Nord-Pas de Calais

Regions (1)-(7) from this list are peripheral areas, while the remaining regions are restructuring areas. For each of these regions the data on the 11 profile elements making up the regional development potential (accessibility, centrality, etc., see section 3) have been
gathered. Instead of presenting all details we will present here only the main trends in the form of a strength-weakness table (see Table 1).

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Table 1. A strength-weakness table for 18 regions in terms of 11 factors representing the regional production environment (RPE).

Legend: x: higher than average value.

If we would only be interested in the overall development potential of these regions, without regarding the specific relevance of these factors for the SME sector, we might calculate the unweighted average of the 11 RPE factors (see Figure 1).

Figure 1. Unweighted representation of the development potential of 18 regions.
The next step of the analysis is the assessment of the RSE matrix for each of the 11 SME branches (see section 4) and for all 11 profile factors (see section 3). Based on expert judgements this weight matrix could be quantified (see Table 2).

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<th>SME branches</th>
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Table 2. Expert assessment of the RSE matrix.

By using next the methodology outlined in section 4 the regional development potential can be gauged. The main results for each type of SMEs is given in Table 3.

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Table 3. A strength-weakness table of the development potential of 18 regions with respect to 11 SME branches.
Legend: x : higher than average value over all regions and higher than average SME value in own region.
0 : higher than average SME value in own region.

It is interesting to see that from the peripheral regions (1)-(7) only Aquitaine and Languedoc-Roussillon have a slightly more favourable development potential. The perspectives of all others are relatively unfavourable. On the other hand, Northern Ireland is the only restructuring area from the list (8)-(18), which has less than average favourable perspectives.

It is also noteworthy that the SME branches (2), (6), (8), (10) and (11) do not have a strong position in the peripheral regions. Only category (9) has a slightly higher score in peripheral areas. Besides, branches (5) and (7) appear to perform relatively well in all regions (except in Belgium). Finally, branches (8) and (10) appear to have a strong position almost exclusively in Belgian and Dutch regions.

The overall development potential of all regions (see section 4) can now also easily be calculated (see Figure 2).
A comparison of the results from Figure 2 with those from Figure 1 shows that both figures to a large extent present a similar pattern. However, from the peripheral areas only Aquitaine scores now higher than average, while from the restructuring areas — besides Northern Ireland — also Liège and Luxembourg have a less than average score.

Finally, we may confront the results from Figure 2 with the RPI matrix. This confrontation is given in Table 4.

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Table 4. Confrontation of regional development potential with regional performance indicators.

Legend: - less than regional average
+ more than regional average

The overall picture from Table 4 is extremely interesting. Peripheral areas (categories (1)-(7)) appear to have relatively a fairly favourable regional performance in terms of: growth in gross regional product, growth in gross value added, less growth in unemployment, and rise in industrial employment. Furthermore, the SME sector appears to perform relatively well in peripheral areas, for almost all size classes.

The restructuring areas do in general not show favourable results in terms of regional product, gross value added, unemployment, and industrial employment. Various SME size classes appear to perform slightly better, while especially the size class with more than 500
employees leads to better results than those in the peripheral areas.

The conclusion from this analysis is that - despite a relatively lower development potential of peripheral European areas - the relative growth performance of these areas, especially for the SME sector, is fairly favourable in comparison with other European restructuring areas.

6. Retrospect

This study aimed at analyzing the indigenous development potential of SMEs for a regional revitalisation, based on global regional data and expert views on the SME sector. Problems of perception and image (cf. Peilenbarg, 1986) were not taken into consideration, as this would require survey techniques or interviews. Clearly, the results obtained in this study are codetermined by the geographical scale of the analysis. Another limitation of this study is that the impact of the whole regional sectoral mix upon the SME sector could not be taken into account due to lack of input-output data. The approach adopted in this paper has focused attention mainly on the locational supply side and less on the requested demand profile of SMEs. This would no doubt be a fruitful area for future research. Despite these limitations however, the present study has revealed - by means of a strength-weakness analysis - the importance of a diversity of locational factors for enhancing the regional development potential of the SME sector in various European regions. Also the method of multiple criteria analysis has proven to provide an operational research tool for industrial locational analysis.
Literature


Pellenbarg, P., Ruimtelijke Cognitie, Ph.D. Diss., Dept. of Geography, State University, Groningen, 1986.


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