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Towards a European Peripherality Index
User-Manual

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IRPUD

Contents

1. Introduction

1.1 Objectives of the Peripherality Study

The purpose of the Study on Peripherality is to undertake, for the fifteen member states of the European Union and the twelve candidate countries, the calculation of an index of peripherality of the 'potential' type (sometimes also called 'gravity-model' type). The economic potential of a country or region is the total of destinations in all regions weighted by a function of distance from the origin region. In effect, it is assumed that the potential for economic activity at any location is a function both of its proximity to other economic centres and of its economic size or 'mass'. The analogy with the law of gravity is explicit in that the influence of each economic centre on any other centre is assumed to be proportional to its volume of economic activity and inversely proportional to a function of the distance between them. The economic potential of a given location is found by summing the influence on it of all other centres in the system.

1.2 Contents of the User Manual

This User Manual is the second report originating from the Peripherality Study and is the complementary report to the Final Report. Whereas the Final Report (Schürmann and Talaat, 2000) focuses on theoretical concepts of accessibility and peripherality and presents selected results of the peripherality indices calculated, this report focuses on the technical software side, i.e. on the implementation and use of the macros developed.

Chapter 2 addresses hard- and software requirements and describes the installation of the *European Peripherality Index* (E.P.I.) software.

In Chapter 3 the directory structure, which is established during installation, is explained. Explanations focus on the contents and capabilities of the directories.

Chapter 4 describes how to work with the software system. Fundamentally, the system is differentiated into so-called 'core elements' which are used to calculate peripherality indices, and additional tools which are set up to support certain tasks with respect to maintenance and update of the geodatabase.

This geodatabase is described in Chapter 5. The database consists of three ArcInfo coverages and a number of ASCII parameter files and INFO tables developed for specific tasks in the E.P.I. environment.

Chapter 6 describes possibilities for user adjustments and refinements with respect to editing coverages, updating parameter files and default software settings.

Chapter 7 briefly describes errors that may occur during the application of the software and how to solve problems.

The accompanying CD-ROM contains the geodatabase as well as the macros, the Final Report and the User Manual and all figures and output data.

2. Software Installation

The *European Peripherality Index* (E.P.I.) software is set up to be implemented on UNIX or Windows NT / Windows 2000 systems. To run the system, a number of files and directories have to be installed on the computer. It is not possible to run the system from the CD-ROM.

The CD-ROM contains three base directories: `UNIX`, `WINDOWS` and `REPORT`. If the E.P.I. system is going to be installed on a UNIX machine, the files located under the `UNIX` directory are to be used; similarly, the `WINDOWS` directory is used if the software is to be installed under Windows NT or Windows 2000. Additionally, the `REPORT` directory contains the Final Report, the User Manual, a collection of output maps as presented in the Final Report and a number of ASCII, Excel and Access files.

2.1 Hard- and Software Requirements

The E.P.I. system requires free disc space of about 100 MB for data and programme storage. For the application of the software and to generate temporary coverages and files additional disc space of approximately 500 MB is required.

For both UNIX and Windows NT / Windows 2000, workstation ArcInfo version 8.02 has to be installed on the machine. The ArcPress and Network Extensions have to be licensed as well. Additionally, ArcInfo/ArcSDE 8.02 Patch 1 is required to successfully apply the software. If this patch is not yet installed, it can be downloaded from the ESRI homepage free of charge. The URL is http://arconline.esri.com/arconline/downloads/ao_/ai802p1.html. Desktop ArcInfo version 8.02 for Windows NT is not required for programme execution.

It is recommended to have a screen resolution of at least 1024 x 768 and to use Courier New, 8 pt as the standard ArcInfo font and font size (refer to the `ARCINFOFONTNAME` and `ARCINFO-FONTSIZE` system variables) for correct display of the menus invoked.

2.2 UNIX

To install E.P.I. software on a UNIX machine, navigate to the `UNIX` directory of the CD-ROM and copy the `PERIPHER.TAR` file to the hard disc. The *tar* file can be located anywhere on the hard disc. After extraction of this file, the directory system, database and macros for the E.P.I. system are established. A directory called `PERIPHER` including several subdirectories as described in Chapter 3 is generated under the current directory. Move to the `PERIPHER` directory and execute the `INITIAL` macro to start E.P.I. applications.

2.3 Windows NT / Windows 2000

Use any file manager, navigate to the `WINDOWS` directory on the CD-ROM and copy the `PERIPHER.EXE` file to the hard disc. The *exe* file can be located anywhere on the hard disc. The *exe* file is a self-extracting file establishing the directory system, database and macros for the E.P.I. system. After extraction, a folder called `PERIPHER` including several subdirectories

as described in Chapter 3 is generated under the current directory. Move to the `PERIPHER` directory and execute the `INITIAL` macro to start E.P.I. applications.

2.4 Report

The report directory stores the Final Report and this User Manual as Word documents as well as all output ASCII, Excel and Access files and output maps produced in the Peripherality Study, which are incorporated in the Final Report. All contents here will not be accessed by the E.P.I. macros. The directory comprises the following three subdirectories:

MAPS
This directory comprises the output maps included in the Final Report in *gra* format (ArcInfo Graphics File), in *png* format (Portable Network Graphics) and *ai* format (Adobe Illustrator). The latter two file formats can be loaded into every drawing software for further processing. After installation, the following maps are available:

`MAP-149, MAP-150, MAP-151, MAP-152, MAP-163, MAP-165, MAP-167, MAP-168, MAP-191, MAP-191_2016, MAP-2, MAP-26, MAP-50, MAP-53, MAP-61, MAP-69, MAP-72, MAP-74, MAP-93, MAP-93_2016.`

TABLES
This directory comprises the generated ASCII, Excel and Access files which store the results of the Peripherality Study in numeric form. Table 2-1 shows the files available in this subdirectory in alphabetical order. The contents of the ASCII files are explained in Section 4.3.

Six Excel files are available. The `MASS_BASE_DATA` file contains the region base data used for calculating the peripherality indices. The two files prefixed with `PERIP_INDEX` contain the peripherality index values, whereas the remaining three files store the travel time matrices. Because of their large size, they had to be split into three files (one storing NUTS levels 0, 1 and 2, and two files storing level 3), and in these files into a number of self-explaining sheets.

Only one Access file is available. This file comprises all possible outputs in 13 different tables. In principle, four different kinds of tables in the `PERIPHERALITY.MDB` file are accessible: The `BASE_DATE` table contains region basic data to calculate peripherality indices. The `xxxx_INDEX_AVERAGE` tables contain the peripherality indices standardised on the European average, the `xxxx_INDEX_MINMAX` tables contain the peripherality indices standardised between the minimum and maximum and finally the `xxxx_TRAVEL_TIME_MATRICES` tables contain the travel time matrices, where `xxxx` represents the NUTS level.

TEXTS
This directory stores the Final Report and the User Manual as Word documents. These documents are equivalent to the printed hardcopy versions delivered with the E.P.I. CD-ROM.

Table 2-1. Generated ASCII, Excel and Access files.

ASCII files	Excel files	Access file
`NUTS0_RESAV_2000.DAT`	`MASS_BASE_DATA.XLS`	`PERIPHERALITY.MDB`
`NUTS0_RESMM_2000.DAT`	`PERIP_INDEX_AVERAGE.XLS`	
`NUTS0_TIME2000.MAT`	`PERIP_INDEX_MINMAX.XLS`	
`NUTS1_RESAV_2000.DAT`	`TRAV_TIME_MAT012.XLS`	
`NUTS1_RESMM_2000.DAT`	`TRAV_TIME_MAT3_1.XLS`	
`NUTS1_TIME2000.MAT`	`TRAV_TIME_MAT3_2.XLS`	
`NUTS2_RESAV_2000.DAT`		
`NUTS2_RESMM_2000.DAT`		
`NUTS2_TIME2000.MAT`		
`NUTS3_RESAV_2000.DAT`		
`NUTS3_RESMM_2000.DAT`		
`NUTS3_TIME2000.MAT`		

3. Directory Structure

The base directory of the Peripherality Study named `PERIPHER` contains a number of subdirectories each comprising data dedicated to special purposes in the Peripherality Study. The structure of the `PERIPHER` directory is displayed in Figure 3-1.
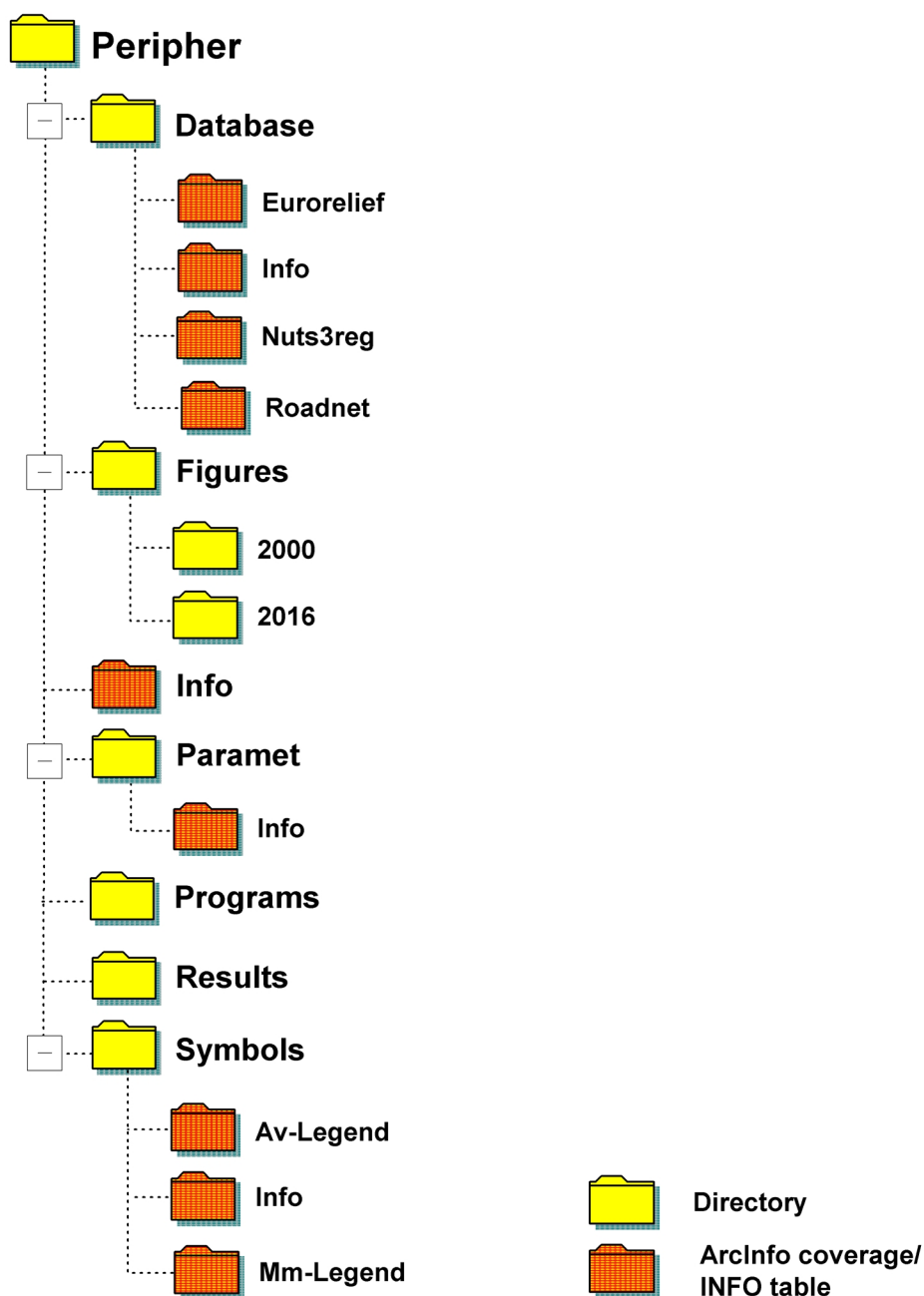
Figure 3-1. Structure of the `PERIPHER` *directory.*

Besides these subdirectories, the `PERIPHER` base directory contains one file only, namely the `INITIAL.AML` being the central starting point for every E.P.I. application.

3.1 DATABASE

This directory stores the geodatabase necessary to perform peripherality indicator calculations. In total, the geodatabase consists of three main coverages:

Table 3-1. Basic ArcInfo coverages.

Coverage name	Contents
NUTS3REG	Polygon coverage containing the system of region and socio-economic data
ROADNET	Network coverage
EURORELIEF	Relief / DTM coverage

Additionally, when processing E.P.I. macros some temporary coverages and INFO tables will also be written into this directory.

3.2 FIGURES

This is the central directory for storing the output graphics files. It consists of two subdirectories, namely **2000** and **2016**. After installation, the two subdirectories are empty.

3.3 INFO

This directory simulates an ArcInfo workspace, which is necessary to run the initialisation macro from the **PERIPHER** base directory. It contains the file **ARC.DIR** only, which contains a list of all INFO tables in the directory Since the base directory does not contain any ArcInfo coverage or INFO tables, this list is empty.

3.4 PARAMET

This directory contains the general input ASCII files required for running the software system. In general, these files are ASCII files to be edited and manually adjusted by the user to satisfy special needs or to enable specific policy scenarios. The following parameter files are available after software installation: **BORDER.DEL**, **CENTROIDS.NUT**, **PARA.PSS** and **SPEED.LIM**.

Beyond these parameter files, a number of ArcInfo INFO tables are also available: **FERRIES.STAT, RELATES.PSS** and **RESTING.ADD.**

Additionally, during application of the E.P.I. macros some temporary ASCII files and INFO tables will be generated by the software in this directory. These files will be automatically overwritten each time the macros are applied.

3.5 PROGRAMS

This is the central directory storing the macros and tools developed for the Peripherality Study. Besides the `INITIAL` macro, all other macros are located here. The following macros and menu files are available after installation (in alphabetical order):

Table 3-2. Macros and menus.

Macros	Menu files
`AGGLO.AML`	`ARCPRESS.MENU`
`CALCUL.AML`	`ENDMESSAGE.MENU`
`CENTROIDS.AML`	`INFO-PLOT.MENU`
`DATA.AML`	`PLOTTING.MENU`
`MAP-NAME.AML`	`SELECTION.MENU`
`NAME-MAP.AML`	`WAIT.MENU`
`PLOT.AML`	`WARNING.MENU`
`POPDENSE.AML`	
`POPUL.AML`	
`SLOPE.AML`	
`TESTER.AML`	

3.6 RESULTS

This directory stores the results of each E.P.I. application in the form of ArcInfo output coverages, INFO tables and ASCII files.

After installation, one ArcInfo coverage called `REGOUT2000` representing the model run used to generate output maps and numeric results as presented in the Final Report is available.

Although after installation this directory is not empty, all coverages, tables and files in it will be overwritten the next time the E.P.I. software is applied. With this contents, it is complementary to the `FIGURES` directory, which stores the output maps.

3.7 SYMBOLS

This directory contains the map tools and symbol sets that are used to compose final maps. There are two coverages stored in this directory: `MM-LEGEND` and `AV-LEGEND`. These coverages contain the legends to be displayed in the final graphics files.

In addition, this directory contains three INFO tables as follows:

- `MM.LUT` contains the peripherality index classes for Peripherality Index 1 (0 = central, 100 = peripheral) associated with their shading symbols and a label for definition.
- `AV.LUT` contains the peripherality index classes for Peripherality Index 2 (European average = 100) associated with their shading symbols and a label for definition.

- **ITEMLIST.LUT** contains the list of items that contain the peripherality index value for each combination of the peripherality indicators together with the corresponding map number.

Two special symbol sets are stored under this directory to symbolise the features in the output graphics files. These symbol sets are named as follows:

(i) **PERIPHER.SHD**   for polygon features

(ii) **PERIPHER.TXT**   for text features

4. Software Applications

ArcInfo implementation

The central task of the *European Peripherality Index* (E.P.I.) software is to calculate different peripherality indices for cars and lorries for different mass terms on the basis of NUTS-3 regions. The full macro system can be run under Windows NT / Windows 2000 or UNIX so that no additional software is needed except ArcInfo.

The calculation of indicator values is divided into the following logical steps:

1. Calculating link travel times
2. Calculating travel times between all NUTS-3 regions
3. Calculating accessibilities based on these matrices for NUTS-3 regions
4. Transforming these accessibilities into peripherality indices for NUTS-3 regions
5. Calculating travel time matrices for NUTS-2, NUTS-1 and NUTS-0 regions as weighted averages of NUTS-3 travel times
6. Aggregating NUTS-3 accessibilities to higher NUTS levels as weighted averages
7. Transforming accessibilities into peripherality indices for NUTS-2, NUTS-1 and NUTS-0 regions.

For each step, standard ArcInfo commands embedded in Arc Macro Language (AML) source code are used.

The results of the calculations will be written to a newly created region coverage and additional INFO tables and ASCII files. The peripherality indices are directly stored in the new coverage, where they can be accessed with standard commands for further analysis or plotting. Since the travel time matrices consist of n-n relations between all regions, they cannot be directly stored in coverages, but in INFO tables only. However, these tables are also accessible with standard analysis or plotting commands.

The European Peripherality Index software

The software consists of several macros designed for specific tasks. A major subdivision of these macros is the differentiation in so-called 'core components' and 'additional tools'.

The core components are required for calculating peripherality indices and comprise three macros: `INITIAL.AML`, `CALCUL.AML` and `PLOT.AML`. These macros have to be applied each time new peripherality indices are calculated.

Beyond these core components, a number of additional tools were developed to support updating of the geodatabase. These macros are only applied in case the database is to be changed. The following macros are subsumed under additional tools: `AGGLO.AML`, `CENTROIDS.AML`, `DATA.AML`, `POPDENSE.AML`, `POPUL.AML`, `SLOPE.AML` and `TESTER.AML`.

The core components can be launched by typing the macro name without arguments. The user is then asked to select options from a selection menu, and the macro is executed. Starting ad-

ditional tools requires a certain number of arguments, but after starting the macro no additional user interaction is required.

For calculating peripherality indices, the following sequence of steps is applied:

1. Start ArcInfo
2. Change the working directory to the **PERIPHER** directory
3. Run the **INITIAL** macro from the Arc prompt
4. Run the **CALCUL** macro from the Arc prompt
5. Run the **PLOT** macro from the Arc prompt

The **INITIAL** macro sets global variables, path names and reads default parameter settings which are required by all subsequent commands and without which the following macros cannot be run. The **CALCUL** macro calculates the travel time matrices and peripherality indices for all spatial levels and generates output files. Finally, the **PLOT** macro is used to generate output plots and graphics files. The type of plot to be generated can be issued using a selection menu.

Once a macro is applied, it writes a number of response messages to the ArcInfo command line indicating its progress. In general, these response lines follow the same template:

First, a header of three records indicate the name of the macro applied, the date, the E.P.I. statement and the starting time. After this, a number of individual messages indicating the actual processing step appear. At the end, the ending time is indicated and the Arc prompt reappears.

```
[NAME].AML
(C) CS, AT IRPUD 2000 .... [date -vfull]
European Peripherality Index Software (E.P.I.)


   Start: [date -time]

....
.... [individual messages]
....

      Ending Time: [date -time]
```

There is no kind of 'emergency exit' or 'interrupt command' in any of the macros. However, the standard key combination **CTR-C** can be used to abort a macro. Since this might lead to severe errors with respect to topology integrity or data storage in the coverages, depending on the macro applied and the actual command executed in the macro, this abortion method is to be used with care and only if backup coverages of the current geodatabase were prepared before.

4.1 Core Components

The first two macros of the core components, i.e. the `INITIAL` and `CALCUL` macros, run automatically, whereas the `PLOT` macro depends on continuous user interaction. The `INITIAL` macro does not require user input at all after the macro is started; the `CALCUL` macro invokes a selection menu after its start, but after all options are set no further user input is requested; in case of the `PLOT` macro, a windows-based selection menu is permanently invoked until the macro is stopped. In the following sections the three macros will be described in more detail.

4.1.1 The `INITIAL` Macro

This macro is used to initialise the E.P.I. software. It has to be run before any other tools of the E.P.I. can be run. It is located in the `PERIPHER` directory and software has to be called from this directory from the Arc prompt.

The macro sets global variables, parameters and path names necessary to perform calculations, reads and initialises ASCII input parameter files and establishes a set of INFO tables. If errors occur (e.g. if a required ASCII parameter file is missing or has been renamed), the initialisation process is terminated with an error message. If the program is terminated, none of the other tools can be executed unless the error is solved and the initialisation macro applied again.

The initial macro is executed by

```
Arc: &r initial
```

After starting the macro, the following message occurs on the command line:

```
INITIAL.AML
(C) CS, AT, IRPUD 2000 .... [data -vfull]
European Peripherality Index Software (E.P.I.)
```

The initialisation process is finished when the Arc prompt is visible again. If errors are detected, a warning message is displayed on the command line indicating the type of error and giving hints how to solve the problem.

Table 4-1 summarises the global variables and global parameters initialised by the `INITIAL` macro.

Referring to the ArcInfo nomenclature, the names of global variables and parameters are preceded by a period (.). Variables storing default path names are specified with .xxx`$PATH`-characters at the end. Variables for selection menu are preceded by `.FORM$`xxx, for the end message menu by `.MESS$`xxxx. Variables storing coverage names are indicated by .xxx`$COVER` at the end.

Table 4-1. Initialised variable and parameters.

Variable / parameter name	Contents
`.COV$PATH`	Directory name for geodatabase
`.ERROR$VAR`	Storing (internal) error numbers; error handling
`.INITIAL$VAR`	Storing (internal) error numbers; error handling
`.FIG$PATH`	Directory name for output figures
`.FORM$`xxxx	Settings for selection form menu
`.MENU$PATH`	Directory name for selection menu
`.MESS$`xxxx	Settings for end message form menu
`.NC$`xxxx	Option variables for selection form menu
`.NET$COVER`	Stores network coverage name
`.PAR$PATH`	Directory name for parameter files
`.PROGRESS`	Indicates progress of calculation macro
`.RES$PATH`	Initialises directory name for result tables
`.SYM$PATH`	Initialises directory name for plotting symbols
`.WORKS`	Full path name of **PERIPHER** directory
`.ZON$COVER`	Stores region coverage name
`.ACC$BETAC`	Beta for distance function for cars
`.ACC$BETAL`	Beta for distance function for lorries
`.RED$SPEED`	General speed reduction rate
`.SEA$WAIT`	Waiting time at sea port before embarking ferries
`.TUN$CAR`	Waiting times at Eurotunnel boarding stations for cars
`.TUN$LORRY`	Waiting times at Eurotunnel boarding stations for lorries

Besides these variable and parameter settings, several input ASCII files and INFO tables will be initialised. Table 4-2 summarises these files:

Table 4-2. Initialised input files.

Input file name	Contents
`BORDER.DEL`	Border delays file (ASCII)
`CENTROIDS.NUT`	NUTS-3 level regions centroid co-ordinates (ASCII)
`FERRIES.STAT`	Travel times on ferries for A-B-relations (INFO)
`ITEMADD.FIL`	Additional items for join processes (INFO)
`PARA.PSS`	Central parameter file (ASCII)
`RELATES.PSS`	Relate table (INFO)
`RESTING.ADD`	Statutory drivers rest periods (INFO)
`SPEED.LIM`	National speed limits file (ASCII)

These files are stored in the **~/PERIPHER/PARAMET** subdirectory. If one of them is missing or renamed, the initialisation process fails and is terminated by an error message.

4.1.2 The `CALCUL` Macro

This is the central core macro for calculation of the peripherality indices. It calculates all values for all indicators, modes, levels, territories and masses in one run. After the `INITIAL` macro is applied, this macro is launched from the Arc prompt by typing

```
Arc: &r calcul
```

The execution of this macro does not require any arguments, since after its start a selection menu is called at which the input coverages and additional options are selected (Figure 4-1) This figure and all following figures are taken from the Windows NT version; under UNIX they appear slightly different. The following choices must be made:

- Region and network input coverages
- Year
- Output options

When all choices are made, the calculation of the peripherality indices starts after pushing the `START` button. When clicking the `END` button, the macro is stopped and no calculations are performed.
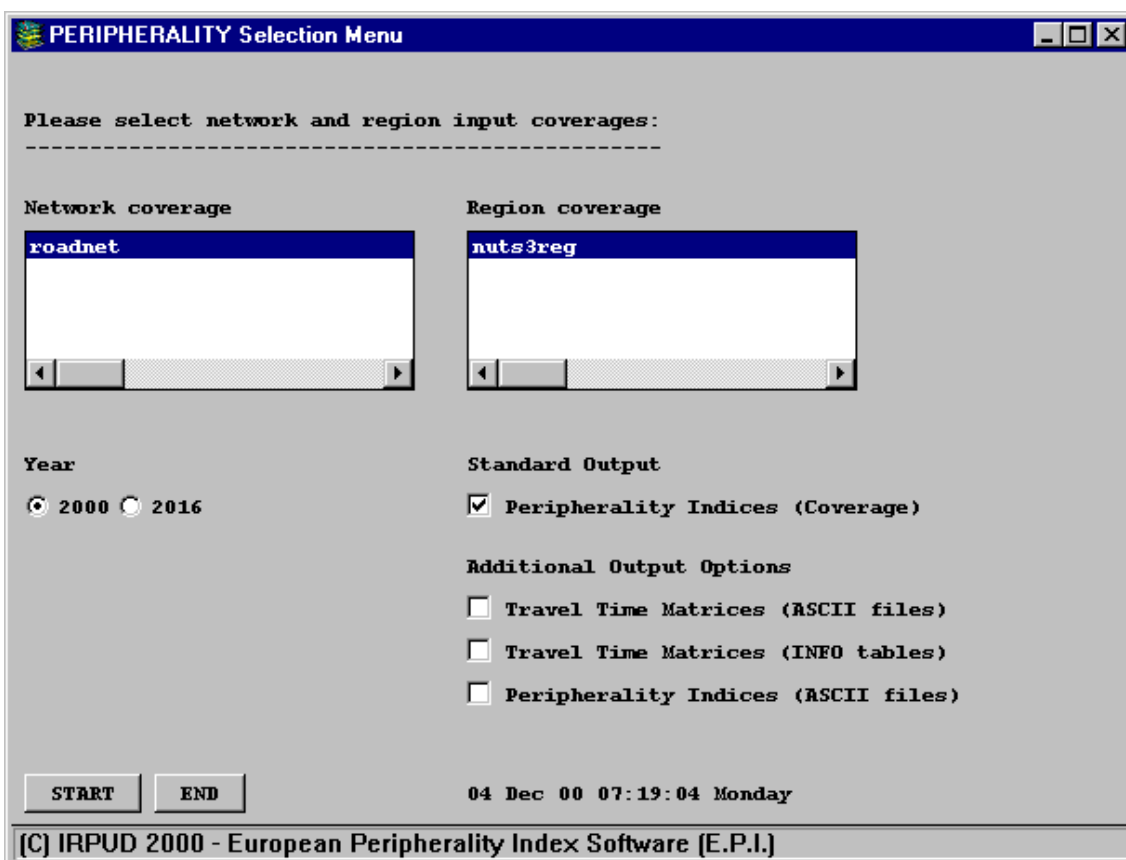
Figure 4-1. `CALCUL` *macro selection menu.*

Region and network input coverages

As indicated in Figure 4-1, first of all the input coverages must be selected. Two lists offer the names of all region and network coverages available in the `~/PERIPHER/DATABASE` directory. The list of network coverages comprises all coverages available which contain arc and node topology. The list of region coverages comprises coverages with polygon and region topologies. After installation of the E.P.I. database, one network coverage, namely `ROADNET`, and one region coverage, `NUTS3REG`, are available in the listboxes. One coverage must be selected from each listbox.

Years

After coverage selection, the years must be selected. The default year is 2000, but also a future scenario for 2016 is available. The selection of this parameter determines parameter values in the `CALCUL` macro and, beyond that, names of the output coverages, output INFO tables and output ASCII files.

Output options

A third selection field contains the output options. Output options refer to the way the results of the E.P.I. calculations are stored and presented to the user. There is one standard output option, namely presenting the peripherality indices as ArcInfo coverage. The coverage will always be generated and this option cannot be unchecked.

Additionally, there are three output options available which can be checked or unchecked in any combination:

- *Travel time matrices (ASCII files):* If this option is checked, the travel time matrices are exported to ASCII files. The execution time of the macro then extends by approximately one hour. The output files have a considerable size depending on the NUTS level (e.g. the matrix for NUTS-3 level amounts to approximately 55 MB disc space under Windows NT).

- *Travel time matrices (INFO tables):* As outlined, travel time matrices are the prerequisite for calculating accessibilities and so for generating peripherality indices. This means that the INFO tables are generated in any case, whether the option is checked or not. However, the checkbox here asks whether that INFO table is to be maintained and saved after finishing of the calculations or not. If the option is checked, the travel time matrices are maintained as INFO tables. These tables are of considerable size, e.g. the matrix for NUTS-3 level amounts to some 350 MB.

- *Peripherality indices (ASCII files):* In addition to the standard output coverage, this option offers the possibility to write the peripherality indices to comma-separated ASCII files which can be imported by other software environments. This option is neither very time consuming nor storage intensive, so that software or hardware performance is not affected.

In general, these options enable or disable output of the travel time matrices and peripherality indices, depending on which results are of interest and the way they are going to be further processed. The standard output coverage enables full ArcInfo capabilities with respect to fur-

ther analysis or way of presentations. Also the INFO tables storing the travel time matrices offer full analytical power of the GIS. However, if the results are to be integrated into a document or into further analysis using other software, the internal ArcInfo formats might not be appropriate. In that case, ASCII files should be generated which enable data exchange between different hardware platforms and software systems.

Section 4-3 gives further information on the naming conventions of the output files.

Running the macro

After clicking the **START** button, calculation of the peripherality indices start. After accessing the selection menu (Figure 4-1), no further user input is necessary. Since all indicators will be calculated in one run, processing time of the macro is rather long. Depending on the machine available and the output formats chosen, average duration is between three and four hours. During calculations, the following messages occur on the command line indicating progress:

```
CALCUL.AML
(C) CS, IRPUD 2000 .... [date -vfull]
European Peripherality Index Software (E.P.I.)


   Start: [date -time]

   Testing Input Coverages
   Link Travel Times
   Writing Info Files
   Generating Node Delays
   Joining Info Files
   Calculating Travel Time Matrices
   ... for passenger traffic
   ... for freight transport
   ... altering item names (I)
   Merging Travel Time Matrices
   ... joining itemadd.fil
   ... altering item names (II)
   ... joining info files
       ... xxcent.code
       ... xxcent2.code
   ... joining travel time matrices
   ... re-ordering items
   Statutory Driver Rest periods
   ... subtracting travel times on ferries
   ... ferry adjustments
   ... adding rest periods
   Aggregating Travel Time Matrices
   ... for NUTS-2 level
   ... for NUTS-1 level
   ... for NUTS-0 level
   ... redefining items
   Calculating Accessibilities
   ... for passenger traffic and freight transport
   ... self potential
   ... destinations
   ... statistics
```

```
Joining Accessibility To Region Coverage
Peripherality Indices For NUTS-3 Level
... generating info file
... adding items
... Group C12
    ... statistics
    ... standardisation (0=best,100=worst)
    ... standardisation (average)
... Group C5
    ... statistics
    ... standardisation (0=best,100=worst)
    ... standardisation (average)
... Group EU
    ... statistics
    ... standardisation (0=best,100=worst)
    ... standardisation (average)
Aggregating Accessibility Indicators
... Group C12
    ... for NUTS-2 level
    ... for NUTS-1 level
    ... for NUTS-0 level
    ... altering item names
    ... dropping items
    ... joining results NUTS-3 level to PAT
... Group C5
    ... for NUTS-2 level
    ... for NUTS-1 level
    ... for NUTS-0 level
    ... altering item names
    ... dropping items
    ... joining results NUTS-3 level to PAT
... Group EU
    ... for NUTS-2 level
    ... for NUTS-1 level
    ... for NUTS-0 level
    ... altering item names
    ... dropping items
    ... joining results NUTS-3 level to PAT
Peripherality Indices For Levels 2, 1 and 0
... for c12_acc_nuts2.tab
... for c12_acc_nuts1.tab
... for c12_acc_nuts0.tab
... for c5_acc_nuts2.tab
... for c5_acc_nuts1.tab
... for c5_acc_nuts0.tab
... for eu_acc_nuts2.tab
... for eu_acc_nuts1.tab
... for eu_acc_nuts0.tab
[Exporting Peripherality Indices From Coverage To ASCII Files]
... NUTS-3 regions
... NUTS-2 regions
... NUTS-1 regions
... NUTS-0 regions
[Exporting Travel Time Matrices From INFO Tables To ASCII Files]
... NUTS-3 regions
... NUTS-2 regions
... NUTS-1 regions
... NUTS-0 regions
Adjusting Output INFO Tables
```

The macro calculates the peripherality indices in a stepwise fashion which comprises the following milestones (words in brackets represent the messages displayed on the command line):

[Link Travel Times] Link travel times for all links in the input network coverage are calculated or updated based on national speed limits as initialised by the **INITIAL** macro.

[Writing Info Files] Selection of centroid, border and seaport nodes from all network nodes for which time penalties are to be added (e.g. waiting times at borders or ferry seaports) based on penalties initialised by the **INITIAL** macro.

[Generating Node Delays] For this selected set of nodes, node delay times are added.

[Calculating Travel Time Matrices] After calculation of link travel times and introduction of time penalties for network nodes, travel time matrices between all 1,302 NUTS-3 regions are calculated for cars and lorries separately. At that point, running time of the macro is about 15 minutes. The travel times calculated are net travel times without rest periods for drivers. These times are those travel times written out to the output files at the end of this macro.

[Merging Travel Time Matrices] The next step merges the separate travel time matrices for cars and lorries into one single matrix and assigns further information on region codes and mass data required for the following steps. Since each of the two matrices consists of about 1.7 million records (1,302 x 1,302 regions), this step is the most time-consuming part of the macro and, depending on the processor of the machine, lasts about one hour.

[Statutory Driver Rest periods] Once the travel time matrices for both cars and lorries are established, statutory driver rest periods are calculated and added to the lorry net travel times. Special concern is given to that portion of the overall travel time that might be spent on ferries. Since times spent on ferries can substitute driver rest periods, these times are subtracted from the overall travel time before adding rest periods. This is the second most time-consuming process of the macro.

[Aggregating Travel Time Matrices] The net travel times between NUTS-3 regions are then aggregated to travel times between NUTS-2, 1 and 0 regions as weighted averages over NUTS-3 regions. The results are written to INFO tables named

$$\text{TIME\_NUTSx\_yyyy.MAT}$$

where **x** indicates the NUTS level [0,1,2,3] and **yyyy** represents the year, i.e. 2000 or 2016.

[Calculating Accessibilities] Based on the travel time matrices, accessibilities are calculated for NUTS-3 regions. For lorries, travel times including statutory driver rest periods are used to calculate accessibilities. At this point the results are stored in temporary INFO tables.

[Joining Accessibility To Region Coverage] The temporary INFO tables are joined to the polygon attribute table of the region coverage.

[Peripherality Indices For NUTS-3 Level] Peripherality indices for the three different spatial scopes for standardisation are calculated for the NUTS-3 level.

[Aggregating Accessibilities] Accessibility indicators for the NUTS-2, 1 and 0 levels are calculated by aggregating NUTS-3 accessibilities differentiated by the three spatial scopes for standardisation.

[Peripherality Indices For Levels 2, 1 and 0] Peripherality indices for the NUTS-2, 1 and 0 levels are calculated based on the accessibilities calculated before.

[Exporting Peripherality Indices From Coverage To ASCII Files] The peripherality indices for all NUTS levels considered are exported to ASCII files, if this option is checked in the selection menu at the beginning of the macro. If the option is unchecked, this message will not be displayed.

[Exporting Travel Time Matrices From Coverage To ASCII Files] The travel time matrices for all NUTS levels are exported to ASCII files if this option is checked. If the option is unchecked, this message will not be displayed.

[Adjusting Output INFO Tables] If the appropriate checkbox is checked, the INFO tables containing travel time matrices will be maintained and the item structure will be modified as indicated in Section 4.3. If this option is unchecked, the INFO tables will be deleted to save disc storage. Additionally, ASCII files will be created if the option is checked.

Ending the macro

When the index calculations finish, a report is displayed (Figure 4-2) which summarises input and output coverages as well as the output ASCII files located in the **~/PARAMET/RESULTS** directory. Finally, the macro is ended by clicking the **OK** button.
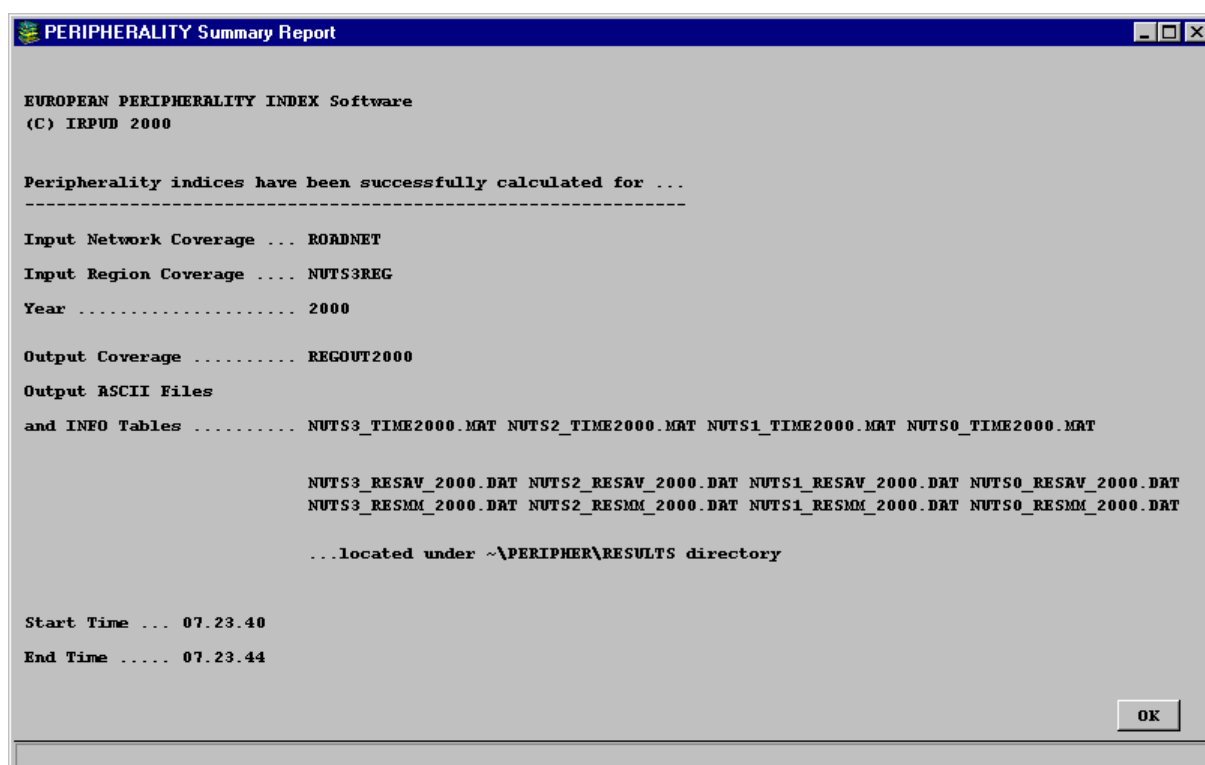
Figure 4-2. **CALCUL** *macro summary report menu.*

4.1.3 The `PLOT` Macro

The `PLOT` macro displays the final results of peripherality indices and draws output maps. It invokes the `PLOTTING` menu which enables the user to specify a variety of combinations of map parameters, compose the final map and send it to the plotter or save it to disk.

Running the macro

The `PLOT` macro is run after the `INITIAL` macro (and – if the `CALCUL` macro was not run in previous sessions – after running the `CALCUL` macro). The `PLOT` macro is started by

```
Arc: &r plot
```

The macro requires no arguments as input since it invokes a window-based selection menu (Figure 4-3) which permits to switch between different peripherality indices. However, the macro expects that there exists either a coverage `REGOUT2000` or a coverage `REGOUT2016` in the directory `~/PERIPHER/RESULTS`. After issuing this command, the following messages appear on the command lines:

```
PLOT.AML
(C) AT, IRPUD 2000 .... [data -vfull]
European Peripherality Index Software (E.P.I.)
```

Then the `PLOTTING` menu and the display screen are invoked as in Figure 4-3.

Using the menu

The `PLOTTING` menu, Figure 4-3, allows the user to set the combinations of peripherality parameters to be displayed (map parameters) or to select a map by its number according to the naming convention described in Table A-9 of the Appendix. It also allows the user to choose the size of the printout and the output format and to send the composed map to the printer or plotter.

Setting map parameters

Map parameters are the parameters used to calculate peripherality indices. There are five parameters which determine peripherality index calculations. For each parameter several options exist. Each combination of options produces a different peripherality index map. In total, it is possible to produce 192 different maps based on 192 parameter combinations. The five parameters, as they appear in the `PLOTTING` menu (Figure 4-3), and their options are described below:
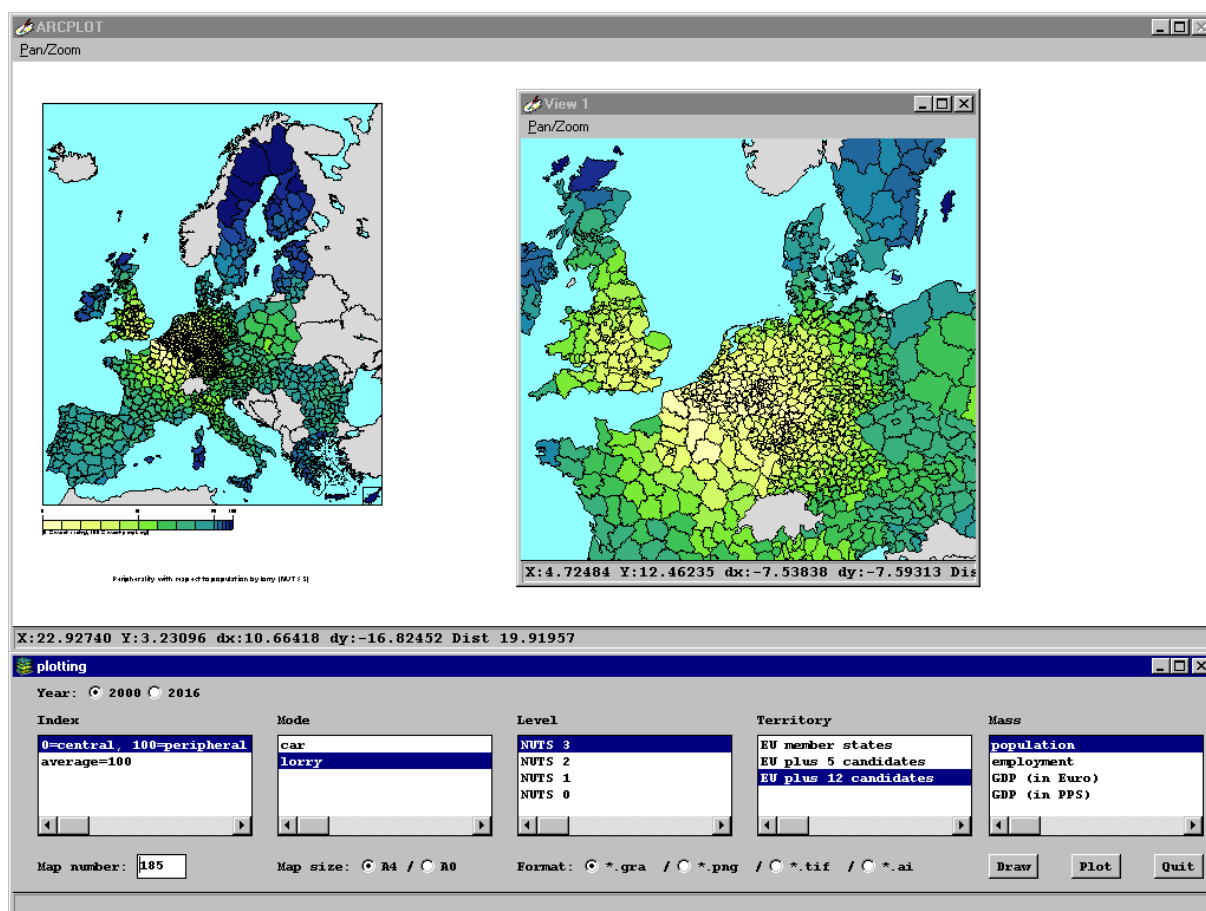
Figure 4-3. Main screen of the **PLOT** *macro.*

- **Index:** All peripherality indices are derivates of potential accessibility. Two different types of peripherality indices are defined, which are offered in the **PLOTTING** menu as two variables under the index section as follows:

  - *0=central, 100=peripheral* (Peripherality Index 1): The region with the highest potential accessibility, i.e. the most central region, is defined to have a peripherality index of zero. The region with the lowest potential accessibility, i.e. the most remote region, is defined to have a peripherality index of one hundred. The peripherality index of all other regions is a linear interpolation between zero and one hundred proportional to their potential accessibility. The higher the peripherality index, the higher the peripherality.

  - *average=100* (Peripherality Index 2): The average potential accessibility of all regions weighted by regional population is defined to be one hundred. The peripherality index of all regions is calculated as potential accessibility expressed in percent of average accessibility. The higher the peripherality index, the lower the peripherality. Peripherality Index 2 is therefore in fact a standardised accessibility indicator.

- **Mode**: All indicators are calculated for cars and lorries.

- **Level** (Spatial aggregation): Every calculation is done for NUTS-3 regions, and indicator values for higher-level regions are derived by aggregating results of NUTS-3 regions to NUTS-2, NUTS-1 and NUTS-0 regions.

- **Territory** (Spatial scope of standardisation): Standardisation is done for the three different territories covered: EU member states only, EU plus five candidates and EU plus twelve candidates:

  (1) *EU member states*: The current fifteen member states of the European Union.

  (2) *EU plus 5 candidates*: The current fifteen member states of the European Union plus the following candidate countries: Estonia, Poland, Czech Republic, Hungary and Slovenia.

  (3) *EU plus 12 candidates*: The current fifteen member states of the European Union plus the twelve candidate countries: Estonia, Poland, Czech Republic, Hungary, Slovenia, Slovakia; Latvia, Lithuania, Romania, Bulgaria, Cyprus and Malta.

- **Mass** (Mass term): All indicators are calculated for four different mass terms (or destination activities): population, employment, GDP in Euro, GDP in PPS.

- **Year**: To offer the possibility to define and run future scenarios, the user can select the year 2000 or the year 2016. The macro expects the existence of output coverages `REGOUT2000` or `REGOUT2016` in directory `~/PERIPHER/RESULTS`. If the coverage for the chosen year does not exists, an error message will be displayed.

Setting map numbers

The production of all 192 maps is feasible via the `PLOTTING` menu. To identify the graphics files that contain each map, a naming convention system was established based on sequential numbers ranging from 1 to 192. Table A-9 in the Appendix summarises the output indicators and the associated number of each map.

The produced graphics file have the name `MAP-nnn`, where `nnn` represents the number entered in the `Map number` field of the menu. The graphics files are stored in the `~/PERIPHER/FIGURES/yyyy` directory where `yyyy` is either 2000 or 2016 depending on the chosen year.

To summarise, two methods are offered by the `PLOTTING` menu to set the map:

1. If the user selects the combination of options of the five parameters described earlier, the system will automatically set the associated map number in the `Map number` input box. Every time the user selects another option, the map number changes accordingly. The chosen combination of options is not displayed until the user presses the `DRAW` button.

2. If the user knows the map he may alternatively type the number directly in the `Map number` input box. Then the system automatically sets the combination of options of the parameters which match that map number. It is required to press the `ENTER` button after typing the map number for the changes in the options to take effect. The system only accepts numeric entries of numbers in the range 1 to192. If any number greater than 192 or less than 1 is entered, the system refuses the entry with an error message.

Setting the map size

The `PLOTTING` menu allows to define the size of final map. Two sizes are offered, A4 (the default) and A0. The user simply marks the radio button associated with the desired size before pressing the `PLOT` button. When A4 is selected, the graphics file `map-nnn.gra` is created. If A0 is selected, the graphics file `map-nnn_a0.gra` is created. If another file format than `*.gra` is selected, the graphics file is converted into the desired format and the produced file has the name `map-nnn.frm` or `map-nnn_a0.frm`, where `frm` is an extension that indicates the chosen file format. In both cases the `PRINT` menu is invoked to send the graphics file to the printer or plotter.

Setting the output file format

The output file that contains the final map can be produced in four different formats. One format must be selected before pressing the `PLOT` button. The produced graphics file has the extension of the chosen format. It is stored under the `~/PERIPHER/FIGURES/yyyy` directory, where `yyyy` is either 2000 or 2016 depending on the chosen year. A message is displayed showing the file name and where it is saved indicating that the file was successfully created. The following formats can be selected:

- **.gra (Standard ArcInfo graphics file)*: This is the ArcInfo default device-independent graphics format. All output files are created in this format and then converted to the selected format.

- **.png (Portable Network Graphics format)*: This is a hardware and platform independent raster-based graphics format. It can be inserted into MS Office applications such as Word.

- **.tif (Tagged Image File Format (TIFF))*: This is a raster-based industry standard for data storage and data transfer across operating systems and applications.

- **.ai (Adobe Illustrator)*: This is a vector-based ASCII file that can be read by Adobe Illustrator graphics software.

For the generation of *png* or *tif* format files an ArcPress license is required. If ArcPress is not licensed, a message is displayed indicating that the specified file format cannot be generated.

Drawing the map

To compose and display the map, the user presses the `DRAW` button. The user can zoom in and out, roam, create a new sub-window or refresh the drawing using the standard `PAN/ZOOM` menu of ArcInfo. To activate this menu, the user presses the `PAN/ZOOM` button at the upper left corner of the display window (Figure 4-4).
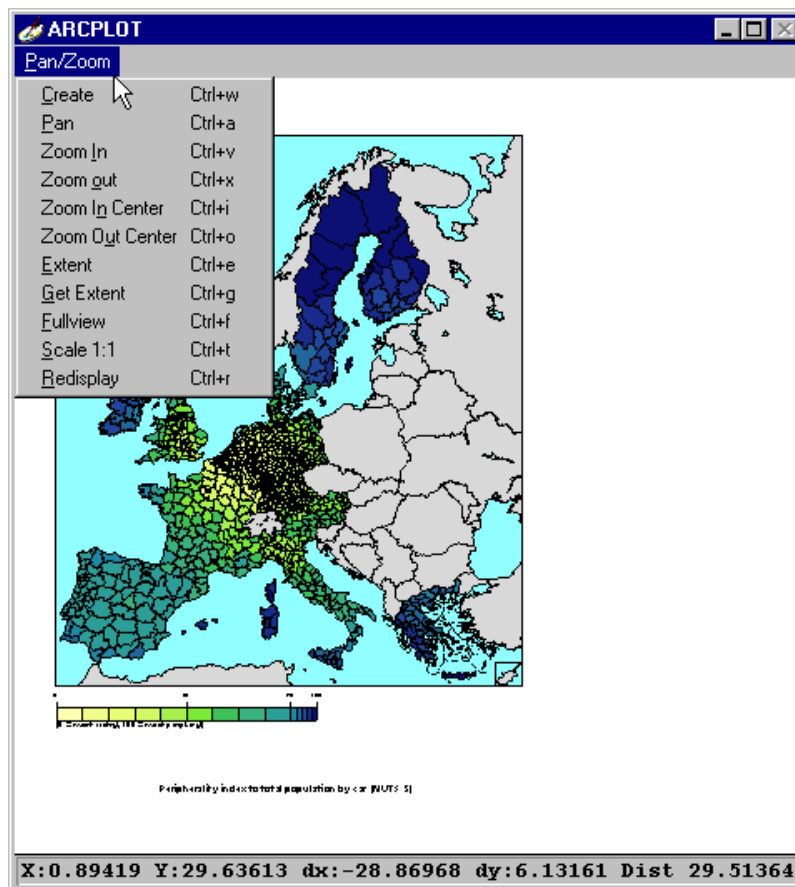
Figure 4-4. **PAN/ZOOM** *menu in the main display window.*

Plotting the map

The **PLOT** button allows the user to plot, print or convert the composed map to any plotter, printer or other file format. If the *gra* format is selected, the produced graphics file is saved and the **PRINT** menu (Figure 4-5) is invoked to allow the user to send the file to the plotter or printer. If any other format is selected, the graphics file is converted to the selected format and a message is displayed indicating that the file was successfully converted to the required format. That is followed by the **PRINT** menu that enables the user to print the graphics file. If the user does not want to print the graphics file, he presses the **QUIT** button in the **PRINT** menu (Figure 4-5). All produced files are stored under the **~/PERIPHER/FIGURES/yyyy** directory. If the A0 size is selected before pressing the **PLOT** button, the size of the graphics file is converted from A4 (the default size) to A0 and the file name gets the **_a0** extension after the map number. If the map is not displayed, the **PLOT** button displays the map first on the screen before plotting it. The **PRINT** menu appears only if there is a printer or plotter configured to the computer. If no printer or plotter is configured, the menu will not appear and the following message will be displayed:

Arc: Unable to open plot queue file.
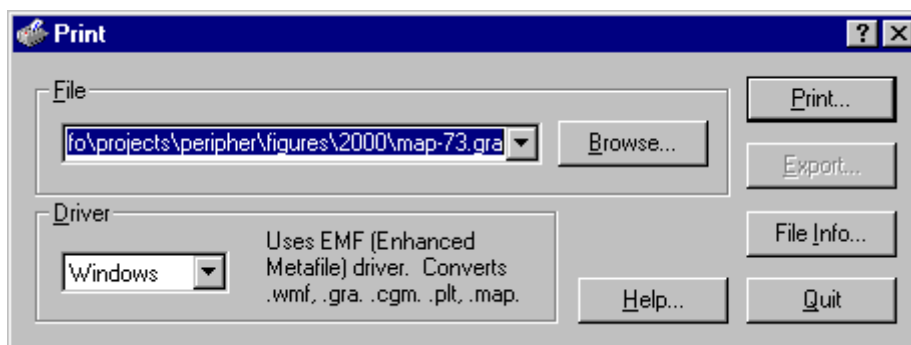
*Figure 4-5. **PRINT** menu under Windows NT.*

Getting help

The **PLOTTING** menu allows the user to get help about any features of the menu (button or input field). By pressing the right button of the mouse over any feature of the menu, a message is displayed at the bottom bar of the menu indicating the functionality of the feature (Figure 4-6).
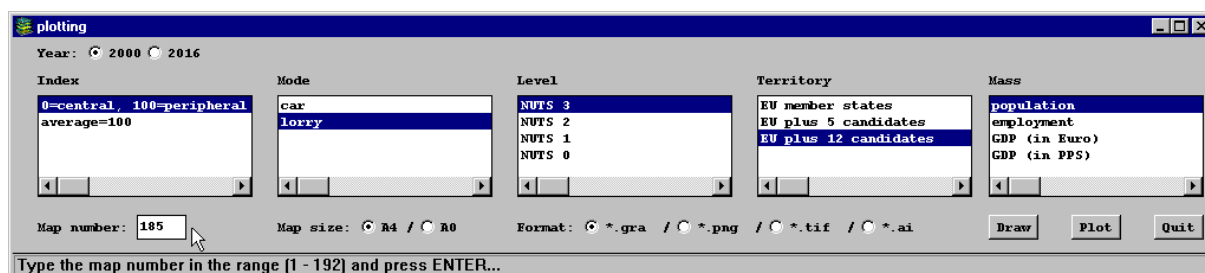
*Figure 4-6. Help message displayed in the bottom bar of the **PLOTTING** menu.*

Exiting the Menu

To leave the **PLOTTING** menu, the user presses the **QUIT** button. All plots produced during the **PLOT** session are saved.

Supporting plot tools

There are a set of additional macros and form menus that are used by the **PLOT** macro in the map composition and plotting process. Those macros and menus are only called from the **PLOT** macro and cannot be run separately. These supporting tools are: **PLOTTING.MENU**, **MAP-NAME.AML**, **NAME-MAP.AML**, **INFO-PLOT.MENU**, **WAIT.MENU** and **ARCPRESS.MENU**.

4.2 Additional Tools

The additional tools are designed to support updating of the geodatabase. These macros are applied if the road network is edited, new centroids are chosen or new region data are introduced to the region coverage. In all cases the different ArcInfo coverages have to be updated. The application of all macros follows the same order:

1. Start ArcInfo
2. Change the working directory to the **PERIPHER** directory
3. Run the **INITIAL** macro from the Arc prompt
4. Run the additional macro from the Arc prompt
5. [Run other additional macros or core components from the Arc prompt]

In any case, the **INITIAL** macro must be run first. For example, if new centroids are to be added to the road network stored in the subdirectory **DATABASE**, navigating to the **DATABASE** directory and launch the **CENTROIDS** macro there would cause error messages like

```
Arc: Cannot find directory DATABASE!
```

since the macro expects a subdirectory named **DATABASE** in the **PERIPHER** directory.

The usage of the additional tools is explained in the following section.

4.2.1 The AGGLO Macro

If new links are added to the road network, or if population data in the region coverage is updated, the agglomeration density item in the arc attribute table of the road coverage has to be updated. This task is performed by the **AGGLO** macro. It overlays the road network with the region systems, evaluates the population density of the from- and to-node locations and calculates or updates the agglomeration indicator in the arc attribute table. This indicator is used during travel time matrix calculations to reduce average speeds in agglomerations in order to simulate congestion.

The macro is applied from the Arc prompt by

```
Arc: &r agglo <region coverage> <network coverage>
```

where

>   **<region coverage>** is the name of the region coverage, and

>   **<network coverage>** is the name of the network coverage to be updated.

Both coverages must be located in the directory **~/PERIPHER/DATABASE**; if they are not, the macro is aborted.

After starting the macro, the following messages are displayed indicating the progress made:

```
AGGLO.AML
(C) CS, IRPUD 2000 .... [data -vfull]
European Peripherality Index Software (E.P.I.)

  Start: [data -time]

  Testing Coverages
  Converting Network Nodes Into Points
  Overlaying Points and Region Coverages
  Joining Agglomeration Factors To Network AAT
  Agglomeration Indicator

  Ending Time: [date -time]
```

The macro has finished successfully when the `ARC` prompt appears again. If errors are detected, a warning message is displayed on the command line indicating the type of error and giving hints how to solve the problem.

After application of the `AGGLO` macro, a new item named `AGGLO_IND` is added to the arc attribute table of the road network, or – if it was already existing – it is updated.

The agglomeration factor stored in the `AGGLO_IND` item of the arc attribute table has a range of values between 1.0 and 1.4 as shown in Table 4-3. During the calculation of the travel time matrices, the 'uncongested' individual link travel times are multiplied with this factor to simulate congestion.

Table 4-3. Population density and agglomeration factors.

Population density (population/km^2)	Network agglomeration factor
... < 300	1.0
300 – 800	1.1
800 – 1500	1.2
1500 – 2200	1.3
2200 < ...	1.4

4.2.2 The CENTROIDS Macro

This tool updates the centroids and access links for the network coverage according to the ASCII file `CENTROIDS.NUT` in directory `~/PERIPHER/ PARAMET`. The macro is applied if (i) the location of the centroids has changed, or if (ii) the network itself was changed which requires new access links. Although this macro updates network topology as well as region data, the macro should not be used if only the region data are to be updated. For this purpose a macro named `DATA.AML` has been developed (see Section 4.2.3).

The macro first checks if centroids and access links already exist, and if they exist, deletes them. Afterwards, the ASCII file will be initialised, new centroids will be generated and new access links calculated and added to the network coverage. The name of the input network coverage will be maintained.

This macro requires two arguments for execution:

```
Arc: &r centroids <region coverage> <network coverage>
```

where

> `<region coverage>` is the region coverage, and

> `<network coverage>` is the name of the network coverage to be updated.

Both coverages must be located in the directory `~/PERIPHER/DATABASE`; if they are not, the macro is aborted.

Once the macro is started, the following messages are displayed:

```
CENTROIDS.AML
(C) CS, IRPUD 2000 .... [data -vfull]
European Peripherality Index Software (E.P.I.)

    Start: [data -time]

    Testing Prerequisites
    Generating Centroid Coverage
    Overlaying Centroid Cover With Region Cover
    Searching For Nearest Network Node
    Writing Access Links Info File
No more records to fetch for Feature cursor CUR
No more records to fetch for Feature cursor CUR2
    Access Links
    Updating Items

    Ending Time: [data -time]
```

If the input coverages do not exist or lack arc or polygon topology, the macro is aborted with an error message.

The following steps are performed to update centroids:

[Testing Prerequisites] It is checked if centroids and access links exist in the input network coverage. If they do, they will be dropped.

[Generating Centroid Coverage] The ASCII file **CENTROIDS.NUT** is read and new centroids are generated in a temporary point coverage.

[Overlaying Centroid Cover With Region Cover] Overlaying the newly created point coverage with the region coverage to transfer attributes.

[Searching For Nearest Network Node] Each point in the point coverage is connected to the nearest network node. It is checked whether this node represents a border node or a motorway interchange, since centroids must not connect to such nodes.

[Writing Access Links Info File] Based on the search for the nearest network node in the previous step, the co-ordinates of the starting and ending nodes of the access links are

written to a temporary ASCII file `TEMPFILE.GEN`. Two cursors are declared for which the end of cursor loops are indicated:

```
No more records to fetch for Feature cursor CUR
No more records to fetch for Feature cursor CUR2
```

[Access Links] The new access links are added to the network coverage using the `GENER-ATE` command.

[Updating Items] The attributes of the centroids are updated with the latest region data as stored in the region coverage.

After application of the macro, the centroids and access links of the network coverage are updated, arc and node topology are re-built and the coverage is ready for the calculation of new peripherality indices.

4.2.3 The `DATA` Macro

Similar to the `CENTROIDS` macro, the `DATA` macro updates centroids in the network coverage. However, this macro updates attribute values only, i.e. the number and location of centroids is maintained. Further information on the attribute structure of the input coverages are given in the Appendix.

Consequently, the call of this macro is similar to the call of the `CENTROIDS` macro:

`Arc: &r data <region coverage> <network coverage>`

where

    `<region coverage>` is the name of the region coverage, and

    `<network coverage>` is the name of the network coverage to be updated.

Both coverages must be located in the directory `~/PERIPHER/DATABASE`; if they are not, the macro is aborted.

If both input coverages exists with arc, node and polygon topology, the macro proceeds with the following messages:

```
DATA.AML
(C) CS, IRPUD 2000 .... [date -vfull]
European Peripherality Index Software (E.P.I.)


   Start: [date -time]

   Work Environment
   Previous Items Settings
   Info File
   Relate
   Updating Centroid Nodes

   Ending Time: [date -time]
```

[Previous Items Settings] Before the attributes of the centroid nodes in the network coverage are updated, they are set to zero.

[Info File] Region data are extracted from the region coverage and written to an INFO table.

[Relate] Based on this INFO table, a relate is established which accesses new region data.

[Updating Centroid Nodes] The items in the network coverage are updated with the new region data.

After application of this macro, the attribute values of the region data items in the network coverage (**POP_TOT**, **EMPLOY**, **GDP_EURO**, **GDP_PPS**) are updated according to the region coverage.

4.2.4 The **POPUL** Macro

If region data, in particular population data for NUTS-3 level regions, were updated, the corresponding population totals for NUTS level 2, 1 and 0 must also be updated. This task is performed by the **POPUL** macro. The macro takes account of the fact that NUTS 2, 1 or 0 regions consist of several NUTS-3 level regions and that one NUTS-3 region might consist of several polygons.

The **POPUL** macro is called from the Arc prompt with

```
Arc: &r popul <region coverage>
```

where

> **<region coverage>** is the name of the region coverage to be updated.

The coverage must be located in the directory `~/PERIPHER/DATABASE`; if it is not, the macro is aborted.

If the indicated region coverage exists and polygon topology is properly built and the required attributes are available, the following messages appear:

```
POPUL.AML
(C) CS, IRPUD 2000 .... [date -vfull]
European Peripherality Index Software (E.P.I.)


   Start: [date -time]

   Testing Coverages
   Extracting Data From Coverage PAT
   Statistics
      ... NUTS-2
      ... NUTS-1
      ... NUTS-0
   Sorting Statistics Files
```

```
                    Duplicating Statistics Files
                    Joining Statistics Files To Region Coverage

                    Ending Time: [date -time]
```

The macro first extracts the required data from the polygon attribute table (items **NUTS1_CODE, NUTS2_CODE, NUTS3_CODE, POP_TOT**), detects NUTS-3 level regions consisting of several polygons, calculates population totals for NUTS-2, 1 and 0 regions and joins the results of the calculation to the region attribute tables.

The INFO tables storing population for NUTS-2, 1 and 0 regions are also copied to the **~\PERIPHER\PARAMET** directory as a prerequisite for the application of the **CALCUL** macro.

4.2.5 The **POPDENSE** Macro

This is another tool dedicated to update population data. Unlike the **POPUL** macro, the **POP-DENSE** macro updates the **POP_DENSE** item in the region coverage after new region data have been added or the **POP_TOT** item has been edited.

This calculation assumes that the population figures stored in the **POP_TOT** attribute of the region coverage is given in 1,000 people, and that the coverage units of the region coverage is set to meters, so the area is given in square meters. If the indicated region coverage does not meet these criteria, unreliable results for population density are yielded.

The programme is executed in the following way:

Arc: &r popdense <region coverage>

where

> **<region coverage>** is the name of the region coverage to be updated.

The coverage must be located in the directory **~/PERIPHER/DATABASE**; if it is not, the macro is aborted.

After start of the macro, the following messages appear:

```
            POPDENSE.AML
            (C) CS, IRPUD 2000 .... [date -vfull]
            European Peripherality Index Software (E.P.I.)


               Start: [date -time]

               Testing Coverages
               Writing Info Files
               Calculating areas
               Joining Info File
               Calculating Population Density
```

```
                      Ending Time: [date -time]
```

[**Writing Info Files**] Information on area and population are written to an INFO table.

[**Calculating areas**] Regional area is calculated.

[**Joining Info File**] This information is written to the region coverage.

[**Calculating Population Density**] New population densities are calculated.

4.2.6 The **SLOPE** Macro

This macro updates the **SLOPE_IND** item in the network coverage if the network topology was edited, e.g. new arcs were added. If a network coverage is edited in which only links were deleted, this macro does not need to be applied.

The **SLOPE** macro is started by

```
Arc: &r slope <network coverage> <dtm coverage>
```

where

> **<network coverage>** is the name of the network coverage to be updated, and

> **<dtm coverage>** is the name of the coverage of the digital terrain model.

Both coverages must be located in the directory **~/PERIPHER/DATABASE**; if they are not, the macro is aborted.

If the macro is successfully applied, the following messages appear:

```
            SLOPE.AML
            (C) CS, IRPUD 2000 .... [date -vfull]
            European Peripherality Index Software (E.P.I.)


               Start: [date -time]

               Testing Coverages
               Converting Network Nodes Into Points
               Overlaying Point and DTM Coverages
               Joining Slope To Network AAT
               Slope Indicator

               Ending Time: [date -time]
```

[**Converting Network Nodes Into Points**] All network nodes are transferred to a temporary point coverage.

[Overlaying Point and DTM Coverages] This point coverage is overlaid with the DTM coverage to update the standard deviation values representing the relief energy in the raster cells.

[Joining Slope To Network AAT] These updated standard deviation values are joined back to the network coverage.

[Slope Indicator] Based on the slope information of the from- and to-nodes of each arc, the **SLOPE_IND** attribute of each arc is updated as indicated in Table 4-4.

The **SLOPE_IND** attribute works as a time penalty. In the **CALCUL** macro link travel times are multiplied with this indicator to incorporate the impeding effects of slope. Table 4-4 shows the impeding indicator values.

Table 4-4. Impeding indicator values for slope effects.

Standard deviation of from- or to-node (in meters)	Impedance factor	Standard deviation of from- or to-node (in meters)	Impedance factor
50 – 100	1.05	550 – 600	1.55
100 – 150	1.10	600 – 650	1.60
150 – 200	1.15	650 – 700	1.65
200 – 250	1.20	700 – 750	1.70
250 – 300	1.25	750 – 800	1.75
300 – 350	1.30	800 – 850	1.80
350 – 400	1.35	850 – 900	1.85
400 – 450	1.40	900 – 950	1.90
450 – 500	1.45	950 – 1000	1.95
500 – 550	1.50	1000 – < ...	2.00

4.2.7 The **TESTER** Macro

This macro is developed to test default settings of the E.P.I. software. It is useful to apply the macro after major updates of the database to search for errors or inconsistencies in the directory structure, naming conventions and item definitions of the coverages.

Like the other additional tools, the **INITIAL** macro has to be executed before the test macro can be started. The macro is started by

```
Arc: &r tester <region coverage> <network coverage> <dtm coverage>
```

where

> **<region coverage>** is the name of the region coverage to be tested,
>
> **<network coverage>** is the name of the network coverage to be tested,
>
> **<dtm coverage>** is the name of the DTM coverage to be tested.

All coverages must be located in the directory `~/PERIPHER/DATABASE`; if they are not, the macro is aborted.

Once the macro is started, the following messages are displayed:

```
TESTER.AML
(C) CS, IRPUD 2000 .... [data -vfull]
European Peripherality Index Software (E.P.I.)


    Start: [date -time]

    Preparing Test Environment
    Comparing Projections
    DTM Coverage
    Region Coverage
    Network Coverage
    Support Coverages
    E.P.I. Macro Existence
    E.P.I. Menus Existence
    Parameter Files Existence
    Parameter Info Tables Existence
    Symbol sets
    Centroids
    Node Valence
    Access Links
No more records to fetch for Feature cursor AP3#CONTROL
    Comparing Mass Data
No more records to fetch for Feature cursor AP#CONTROL
No more records to fetch for Feature cursor AP#CONTROL
No more records to fetch for Feature cursor AP#CONTROL
No more records to fetch for Feature cursor AP#CONTROL

    Ending Time: [date -time]
```

The following software settings are tested:

[`Comparing Projections`] Comparing projections of the three input coverages, which must match.

[`DTM Coverage`] The DTM coverage is tested with respect to topology (arcs, nodes, polygons) and items structure of the polygon attribute table.

[`Region Coverage`] The region coverage is tested with respect to topology (arcs, nodes, polygons) and items structure of the polygon, arc and region attribute tables. Additionally, item values for polygon, arc and region attributes are tested. However, only logical attribute tests can be performed. It cannot be tested whether a particular item value for a particular region is correct.

[`Network Coverage`] The network coverage is tested with respect to topology (arcs and nodes) and items structure of the arc and node attribute tables. Additionally, item values of the attribute tables are tested. However, only logical attribute tests can be performed. It cannot be tested whether a particular item value for a particular link or node is correct.

[`Support Coverages`] The existence of the support coverages is tested.

[E.P.I. Macro Existence] The existence of the core and additional macros is tested.

[E.P.I. Menus Existence] The menus launched during E.P.I. processing are checked.

[Parameter Files Existence] The existence of the required parameter files is tested.

[Parameter Info Tables Existence] The existence of the required parameter INFO tables is tested.

[Shadesets] The existence of the shade-, line- and markersets required for plotting is tested.

[Centroids] The number and location of the centroids in the network coverage are tested against the number and location of centroids in the centroids ASCII input file. If the numbers and locations do not match, the missing or wrong located centroids are indicated. During this test the following message appears at the command line:

```
No more records to fetch for Feature cursor AP3#CONTROL
```

This message indicates that an **CURSOR** was opened and processed properly.

[Node Valence] Since every centroid must be linked to the network by one access link only, the number of access links for each centroid is tested. If a centroid has more than one access link, this centroid is indicated.

[Access Links] Even if every centroid is properly linked to the network, this link could have wrong attribute values, which is tested in this step. During this test the following message appears at the command line:

```
No more records to fetch for Feature cursor AP3#CONTROL
```

This message indicates that an **CURSOR** was opened and processed properly.

[Comparing Mass Data] The region data population, employment, GDP in Euro and GDP in PPS in the node attribute table of the network coverage are tested against the respective entries of items of the region coverage. If both do not match, the regions / centroids detected will be indicated. During this test the following messages appear at the command line:

```
No more records to fetch for Feature cursor AP#CONTROL
No more records to fetch for Feature cursor AP#CONTROL
No more records to fetch for Feature cursor AP#CONTROL
No more records to fetch for Feature cursor AP#CONTROL
```

The results of the tests are written to a log file, which can be opened by a text editor. The log file is located in the **~\PERIPHER\PARAMET** directory and is called

EPITESTyymmdd.LOG

where

> **yy** indicates the year,
>
> **mm** indicates the month, and
>
> **dd** indicates the day when the **TESTER** macro was applied.

For example, if a test is performed on 24 December 2000, the generated log file is named **EPITEST001224.LOG**. If the test macro is applied several times a day, the already existing log file of that day is overwritten Appendix A.3 shows a sample log file.

The test macro does not terminate if one of the tests fails. The failures are recorded to the log file, and, if possible, suggestions how to solve the problem(s) are offered.

4.3 Output Formats

The **CALCUL** macro produces four kinds of output. All output files are written to the **~/PERIPHER/RESULTS** directory. The different formats enable different possibilities for further processing. The formats are:

Output coverages

The output coverages are named **REGOUTxxxx**, where **xxxx** represents the year, i.e. 2000 or 2016. They are generated in any case and enable further analysis or plotting using standard ArcInfo commands. The coverages contain the peripherality indices only, whereas travel time matrices cannot be stored in coverage form.

The item structures of the attribute tables of the output coverages are explained in Appendix A.1.4.

Travel time INFO tables

Travel time INFO tables store the travel time matrices for the different NUTS levels:

- **TIME_NUTS3_xxxx.MAT** contains matrices for NUTS-3 level
- **TIME_NUTS2_xxxx.MAT** contains matrices for NUTS-2 level
- **TIME_NUTS1_xxxx.MAT** contains matrices for NUTS-1 level
- **TIME_NUTS0_xxxx.MAT** contains matrices for NUTS-0 level

where **xxxx** represents the year, i.e. 2000 or 2016. The output INFO tables are generated only if they were checked in the selection menu at the beginning of the **CALCUL** macro (see Section 4.1.2).

Using the INFO tables is the only way to store travel time matrices in ArcInfo. This format enables further analysis or presentation in ArcInfo using standard commands (e.g. **SPIDER**).

The structure of the INFO tables storing the travel time matrices is as follows: Each record represents one relation of the total number of all n:n relations. The total number of records in the INFO table therefore depends on the NUTS level considered. The record format is

```
From-region, To-region, travel time by car, travel time by lorry
```

Both travel times are given in minutes.

Travel time ASCII files

Travel time ASCII files store travel time matrices:

- **NUTS3_TIMExxxx.MAT** contains matrices for NUTS-3 level
- **NUTS2_TIMExxxx.MAT** contains matrices for NUTS-2 level
- **NUTS1_TIMExxxx.MAT** contains matrices for NUTS-1 level
- **NUTS0_TIMExxxx.MAT** contains matrices for NUTS-0 level

where **xxxx** represents the year, i.e. 2000 or 2016. The output files are generated only if they were checked in the selection menu.

The structure of these files is similar to the corresponding INFO tables. The records also contain the origin and destination region and the travel times by car and lorry (in minutes). However, the items are comma-separated and the two character items are in quotes so that they can be imported to Excel sheets or Word documents.

Peripherality indices ASCII files

Peripherality indices ASCII files store the peripherality indices calculated:
- **NUTS3_RESMM_xxxx.DAT** contains *Peripherality Index 1* for NUTS3-level
- **NUTS3_RESAV_xxxx.DAT** contains *Peripherality Index 2* for NUTS3-level
- **NUTS2_RESMM_xxxx.DAT** contains *Peripherality Index 1* for NUTS2-level
- **NUTS2_RESAV_xxxx.DAT** contains *Peripherality Index 2* for NUTS2-level
- **NUTS1_RESMM_xxxx.DAT** contains *Peripherality Index 1* for NUTS1-level
- **NUTS1_RESAV_xxxx.DAT** contains *Peripherality Index 2* for NUTS1-level
- **NUTS0_RESMM_xxxx.DAT** contains *Peripherality Index 1* for NUTS0-level
- **NUTS0_RESAV_xxxx.DAT** contains *Peripherality Index 2* for NUTS0-level

where **xxxx** represents the year, i.e. 2000 or 2016. The output files are generated only if they were checked in the selection menu.

The two types of indicator, i.e. *Peripherality Index 1* (standardisation between 0-100) and *Peripherality Index 2* (standardisation on the European average) are separated into two different files. Separate files for each NUTS level are generated. The number of records in each file depends on the NUTS level. The record structures of all these files is

$$\text{Nuts0\_code, 2, 3, ...,24, 25 (for NUTS 0)}$$
$$\text{Nuts1\_code, 2, 3, ...,24, 25 (for NUTS 1)}$$
$$\text{Nuts2\_code, 2, 3, ...,24, 25 (for NUTS 2)}$$
$$\text{Nuts3\_code, 2, 3, ...,24, 25 (for NUTS 3)}$$

where **2, 3, ... 24, 25** give the column numbers explained in Table 4-5.

The item names in Table 4-5 refer to the *Peripherality Index 1* (standardisation between 0-100); for the *Peripherality Index 2*, the '**MM**' letters in the item names are replaced by '**AV**'. Like the travel time ASCII files, also these files are comma-separated, and the **NUTSx_CODE** item is quoted, so they can be imported by Excel and Word.

Table 4-5. Column description of peripherality indices ASCII files.

No.	Item name	Contents
1	**NUTSx_CODE**	Region code (x in {0,1,2,3})
2	**C12STMMCPOPTOT**	Peripherality with respect to population by car for EU and 12 candidates
3	**C5STMMCPOPTOT**	Peripherality with respect to population by car for EU and 5 candidates
4	**EUSTMMCPOPTOT**	Peripherality with respect to population by car for EU member states
5	**C12STMMCEMPLOYP**	Peripherality with respect to employment by car for EU and 12 candidates
6	**C5STMMCEMPLOY**	Peripherality with respect to employment by car for EU and 5 candidates
7	**EUSTMMCEMPLOY**	Peripherality with respect to employment by car for EU member states
8	**C12STMMCGDPEURO**	Peripherality with respect to GDP by car for EU and 12 candidates
9	**C5STMMCGDPEURO**	Peripherality with respect to GDP by car for EU and 5 candidates
10	**EUSTMMCGDPEURO**	Peripherality with respect to GDP by car for EU member states
11	**C12STMMCGDPPPS**	Peripherality with respect to GDP in PPS by car for EU and 12 candidates
12	**C5STMMCGDPPPS**	Peripherality with respect to GDP in PPS by car for EU and 5 candidates
13	**EUSTMMCGDPPPS**	Peripherality with respect to GDP in PPS by car for EU member states
14	**C12STMMLPOPTOT**	Peripherality with respect to population by lorry for EU and 12 candidates
15	**C5STMMLPOPTOT**	Peripherality with respect to population by lorry for EU and 5 candidates
16	**EUSTMMLPOPTOT**	Peripherality with respect to population by lorry for EU member states
17	**C12STMMLEMPLOY**	Peripherality with respect to employment by lorry for EU and 12 candidates
18	**C5STMMLEMPLOY**	Peripherality with respect to employment by lorry for EU and 5 candidates
19	**EUSTMMLEMPLOY**	Peripherality with respect to employment by lorry for EU member states
20	**C12STMMLGDPEURO**	Peripherality with respect to GDP by lorry EU and 12 candidates
21	**C5STMMLGDPEURO**	Peripherality with respect to GDP by lorry EU and 5 candidates
22	**EUSTMMLGDPEURO**	Peripherality with respect to GDP by lorry EU member states
23	**C12STMMLGDPPPS**	Peripherality with respect to GDP in PPS by lorry EU and 12 candidates
24	**C5STMMLGDPPPS**	Peripherality with respect to GDP in PPS by lorry EU and 5 candidates
25	**EUSTMMLGDPPPS**	Peripherality with respect to GDP in PPS by lorry EU member states

5. Geodatabase Structure

This chapter describes the geodatabase established to calculate peripherality indices. The following sections give general descriptions on the coverages and files. Detailed descriptions of the attribute tables of the coverages are contained in the Appendix.

5.1 Projection and Co-ordinate System

The projection used for the geodatabase is a Lambert Conformal Conic Projection with the two standard parallels at 27° and 63° North, the central meridian at 10° East and the map origin at 10° East and 52° North.

5.2 Region Coverage

The default name of the region coverage is `NUTS3REG`. This coverage contains the system of regions on which all calculations are based. The system of regions is based on NUTS-3 level regions for the member states of the European Union and on NUTS-3 equivalent regions for the EFTA and candidate countries as laid down in Eurostat (1999a; 1999b). A detailed description of the system of regions used in tabular format is given in Appendix A-10.

The coverage `NUTS3REG` contains arc, polygon and region topologies. Usually, one NUTS-3 level region is equivalent to one polygon in the coverage. However, in case of islands or in special circumstances, one NUTS-3 region consists of several polygons. Upon the polygon feature class, several ArcInfo region systems are implemented to represent the hierarchical system of regions consisting of NUTS-2, NUTS-1 and NUTS-0 level regions (A distinction should be made here between the term `REGION` in ArcInfo terminology which refers to an area consisting of more than one polygon and the NUTS regions as official ststistical units). Moreover, since the peripherality indices are calculated for certain groups of countries, these country groups are represented by three additional region subclasses, namely the EU, CAND5 and CAND12 subclasses. Altogether, the following region subclasses are available in `NUTS3REG`:

Table 5-1. Region subclasses in region coverage.

Subclass name	Contents
NUTS-2	NUTS-2 level regions
NUTS-1	NUTS-1 level regions
NUTS-0	NUTS-0 level regions, i.e. country level
EU	15 EU member states
CAND5	EU member states plus Estonia, Poland, Czech Republic, Hungary, Slovenia
CAND12	CAND5 plus Latvia, Lithuania, Slovakia, Romania, Bulgaria, Cyprus, Malta

Each feature (sub-)class is associated with an attribute table. The polygon attribute table contains the official NUTS-3 level region code as laid down in Eurostat (1999a; 1999b), the name of the region and the name of the centroid of the region, as well as the basic region data with

respect to population, employment and gross domestic product (in Euro and PPS). Additionally, an item representing population density is available. The NUTS2 and NUTS1 region subclasses contain a two-character ISO country code, the respective NUTS level code and the population. The EU, CAND5 and CAND12 subclasses contain the country code only. Appendix A.1.1 gives a detailed description of the attribute tables.

The arc attribute table contains one user-defined attribute item only that represents the type of the link, i.e. differentiates between NUTS-3-, NUTS-2-, NUTS-1 and NUTS-0 region boundaries or coast lines.

5.3 Network Coverage

The default name of the coverage storing the pan-European road network for the year 2000 is **ROADNET**. It comprises arc and node feature classes, each associated with attribute tables containing internal and user items.

The road network comprises the trans-European road links specified in Decision 1692/96/EC of the European Parliament and of the Council (European Communities, 1996), the TINA networks as identified by the TINA Secretariat (1999), the Helsinki Corridors as well as selected additional links in eastern Europe and other links to guarantee connectivity of regions and centroids (IRPUD, 1999). The coverage contains access links to/from NUTS-3 region centroids. The centroids of this road coverage match the labels of the polygons of the region coverage. In total, the coverage contains some 11,000 arcs and 13,000 nodes.

Each link is associated with information with respect to country code, speed limit, road type, European and national road identifier, inclusion in the TEN or TINA programme, slope and agglomeration impedance. Each node is associated with information on country code, location, region code and node type (see Tables A-6 and A-7 in the Appendix for a full list of attributes).

All arcs included in the coverage are used to calculate travel time matrices, accessibilities and peripherality indicators, i.e. no selection sets of this coverage are generated during execution of the **CALCUL** macro.

5.4 Digital Terrain Model

The default name of the coverage storing the Digital Terrain Model (DTM) is **EURORELIEF**. This coverage contains regular polygons representing cells of 10 x 10 kilometres size covering the whole of Europe. An arc feature class is available with which only internal ArcInfo attributes are associated, whereas additional user-defined items are available for the polygon feature class. These items represent the minimum, mean and maximum spot value that can be found in one raster cell based on U.S. Geological Survey (2000), and also the standard deviation of all elevation points that fall into that cell.

5.5 Socio-Economic Data

Four different kinds of region data, which are compiled from Eurostat (1997), are distinguished:

- population
- employment
- gross domestic product (GDP) in Euro
- gross domestic product (GDP) in Purchasing Power Standards (PPS)

They are directly stored as user-items in the region coverage, i.e. in the polygon attribute table of the **NUTS3REG** coverage (see Table A-2 in the Appendix). The data are accessed by the macros directly from this coverage. If the region data have to be updated or changed, the respective polygon entries of the **NUTS3REG** coverage have to be edited.

5.6 Parameter Files

Parameters used for calculating peripherality indices are stored in a number of ASCII files to allow parameter changes in an easy way. The parameter files are initialised by the **INITIAL** macro.

The following files are used:

- **BORDER.DEL**
- **CENTROIDS.NUT**
- **PARA.PSS**
- **SPEED.LIM**

All these files are located in the **~/PERIPHER/PARAMET** directory.

5.6.1 Border Delays

This file contains waiting times at border crossings between all neighbouring countries across Europe differentiated by mode (car, lorry) for 2000 and 2016 compiled from IRU (1998). This file is initialised by the **INITIAL** macro each time the E.P.I. software is applied.

The structure of the file is as follows:

>   CountryA, CountryB, Car2000, Car2016, Lorry2000, Lorry2016

Where **CountryA** represent a two-character ISO country code for origin country, **CountryB** represents the respective code for the destination country, **Car2000** indicates border waiting time for cars in 2000 in minutes, **Car2016** indicates a border waiting time scenario for 2016, followed by two numbers representing waiting time for lorries in 2000 and 2016. Figure 5-1 represents an excerpt from this file.

As evident from the excerpt, waiting times for lorries are multiples of those for cars. Moreover, there are relations where a significant reduction of waiting times until 2016 can be as-

sumed, in particular between EU member states and candidate countries. However, there are also relations where the waiting times are assumed to remain stable until 2016.

```
AL,BA,45,45,180,180
BA,AL,45,45,180,180
AL,GR,45,45,180,180
GR,AL,45,45,180,180
AL,MK,45,45,180,180
MK,AL,45,45,180,180
AL,YU,90,90,300,300
YU,AL,90,90,300,300
AT,CH,10,10,30,30
CH,AT,10,10,30,30
AT,CZ,15,5,20,15
CZ,AT,19,5,40,20
AT,DE,5,5,5,5
DE,AT,5,5,5,5
AT,HU,41,5,90,15
HU,AT,23,5,90,20
AT,IT,10,10,20,10
IT,AT,10,10,20,10
AT,SI,15,15,60,30
SI,AT,30,15,120,60
AT,SK,17,17,60,10
SK,AT,21,10,84,15
BA,HR,25,25,100,60
HR,BA,25,25,100,60
BA,MK,45,45,180,70
MK,BA,45,45,180,70
BA,YU,120,120,300,250
YU,BA,120,120,300,250
BE,DE,5,5,10,5
DE,BE,5,5,10,5
...
...
```

Figure 5-1. Border delays ASCII file (excerpts).

5.6.2 Centroid Co-ordinates

This file contains the co-ordinates of the centroids of the NUTS-3 regions. They are based on the Eurostat STEU database (GISCO 2000). These centroids are part of the road network coverage. However, if it is planned to use another network coverage or if the location of the centroids is to be changed, this file is loaded by the **CENTROIDS** macro to establish a new system of access links in the specified network coverage.

The structure of the ASCII file represents the standard ASCII file format required by ArcInfo for the **GENERATE** command.

To use an input ASCII file to generate a point coverage in ArcInfo requires a block of records, where each records represents one point identified by a unique point number followed by a pair of co-ordinates representing the spatial location of that point. The x- and y-co-ordinates can be given in any co-ordinate system supported by ArcInfo. However, this co-ordinate system should match the co-ordinate system used in the input coverages.

In principle, the number of points in the ASCII file is not limited. In this study their number has to match the number of NUTS-3 regions, i.e. 1,302 centroids. The last record of this file must have an 'END' statement.

```
3,1640785.625,693612.500
4,786963.063,2106792.250
5,712165.313,1656833.125
7,368636.969,1973505.125
12,-1525802.875,1625664.875
16,199518.344,1685873.000
18,735536.875,1489970.375
19,848805.875,1445403.625
22,74384.469,1308570.875
23,1005418.625,1276062.625
24,890533.188,1278115.000
25,646337.875,1340629.750
28,583115.938,1243014.625
29,809147.063,1189173.500
30,661208.375,1215985.500
33,11192.954,1241386.250
34,900331.063,1142511.750
35,-184085.953,1147943.375
41,722860.125,1088071.875
43,961592.188,1088190.875
44,619931.250,1070112.500
46,59051.215,946906.438
47,832325.813,1048999.625
51,27100.609,982704.563
53,-168193.125,996988.188
54,884297.250,1045618.000
55,766198.563,1037038.125
...
...
END
```

Figure 5-2. Centroid co-ordinates ASCII file (excerpts).

5.6.3 General Parameters

This is the central parameter file comprising betas for accessibility calculations (differentiated by mode), intrazonal average trip lengths, general speed reduction rates, waiting times at ferry seaport terminals (differentiated by mode) and Eurotunnel boarding delays (differentiated by mode). These parameters are used in the **CACLUL** macro to calculate accessibilities.

The file comprises records representing parameters as well as records representing comments. Comments are prefixed with the standard ArcInfo comments symbol for macro programming,

i.e. with **/***, whereas records representing parameter fields are prefixed with the indicative '**para**' phrase.

Each parameter record has a similar structure: The '**para**' phrase is followed by one blank, followed by a four-letter keyword indicating the kind of parameter, followed by a four-digit real number representing the default parameter value. Figure 5-3 displays the overall parameter file.

This file is initialised by the **INITIAL** macro each time the E.P.I. software is applied. This macro automatically excerpts the parameter records, detects the parameter keyword and parameter value and assigns these values to global variables, which are then accessed by the other macros.

```
/* PARA.PSS
/*
/* (C) IRPUD 2000
/* Author(s): Carsten Schuermann (CS), Ahmed Talaat (AT)
/* European Peripherality Index Software (E.P.I.)
/* ASCII parameter file
/*
/*
/* Accessibility Calculations - Beta
para betc .007      /* Cars
para betl .003      /* Lorries
/*
/* Region internal average trip length in km
para trip 10.0
/*
/* Reduction rate of national speed limits to actual speeds
para sred 0.20
/*
/* Access speeds for cars/lorries for intrazonal trips and access links
/* in km/h
para spca 50.0      /* Cars
para splo 30.0      /* Lorries
/*
/* Waiting times at ferry seaport terminals in minutes for cars and
/* lorries
para seac 50.0
para seal 70.0
/*
/* Delay times at Eurotunnel boarding stations for cars and trucks in
/* minutes
para etca 30.0      /* Cars
para etlo 50.0      /* Lorries
end
```

Figure 5-3. General parameter ASCII file.

5.6.4 Speed Limits

The `SPEED.LIM` file stores the national speed limits for cars and lorries for urban roads, major roads, expressways and motorways compiled from ADAC (2000), IRU (2000) and UBA (1998). This file is initialised by the `INITIAL` macro each time the E.P.I. software is applied. The values are stored in a temporary INFO table which itself is related to the network coverage during the calculation of peripherality indices.

The structure of the ASCII file is as follows:

```
Country, Car-A, Car-B, Car-C, Car-D, Lorry-A, Lorry-B, Lorry-C, Lorry-D
```

where `A` represents national speed limits in urban areas, `B` indicates speed limits on major roads outside urban areas, `C` gives speed limits for expressways, i.e. dual-carriageway roads which are not designated as motorways, and `D` represents speed limits for motorways. The `Country` code represents a two-letter ISO country code.

Figure 5-4 presents the entire ASCII file.

5.6.5 Relates Table

Unlike the other parameter files described in the previous sections, this `RELATE` table is not an ASCII file but an INFO table stored in the `PARAMET` subdirectory.

Although by default this table contains no records, it must not be deleted or renamed, otherwise initialisation and eventually the whole software system cannot be applied. Throughout initialisation, this table is filled with a number of relates which can be accessed from every macro. The item structure of the table is indicated in Table 5-2.

Table 5-2. Item structure of the `RELATES.PSS` *INFO table.*

Column	Item Name	Width	Output	Type	Contents
1	**RELATION**	8	8	C	Name of the relate
9	**TABLE-ID**	128	128	C	Database name of the related file
137	**DATABASE**	8	8	C	Name of the database system, i.e. INFO
145	**ITEM**	16	16	C	Item name in an INFO table from which the relate is performed
161	**COLUMN**	32	32	C	Field in the related table which is related with the INFO Item
193	**TYPE**	16	16	C	Type of relate (linear, ordered, link)
209	**ACCESS**	4	4	C	Access rights (RW, RO)
213	**ASDBASE#**	4	5	B	*(empty)*
217	**ASLCKID#**	4	5	B	*(empty)*
221	**WHERE**	320	320	C	*(empty)*

```
AL,50,70,70,100,30,45,60,60
AT,50,100,100,130,50,70,70,80
BA,50,80,80,110,50,80,80,100
BE,50,90,90,120,50,60,90,90
BG,60,90,90,120,50,80,80,100
BY,60,90,90,90,60,70,90,90
CH,50,80,80,120,50,80,80,80
CY,50,80,80,100,50,65,80,100
CZ,60,90,90,110,50,80,80,80
DE,50,100,130,130,50,60,80,80
DK,50,80,80,110,50,70,70,70
EE,60,90,90,90,50,90,90,90
ES,50,90,90,120,50,70,80,90
FI,50,80,100,120,50,80,80,80
FR,50,90,90,130,50,60,80,90
GR,50,90,90,120,50,80,90,90
HR,60,90,90,130,50,70,70,70
HU,50,80,100,120,50,70,70,80
IE,48,96,96,112,48,64,64,64
IS,50,80,90,90,50,90,90,90
IT,60,90,90,130,50,70,80,80
LT,60,90,90,90,50,80,80,80
LU,50,90,90,120,50,75,75,90
LV,60,90,90,90,60,70,70,90
MA,50,80,80,100,50,80,80,100
MD,60,90,90,90,60,70,70,70
MK,60,80,80,110,60,70,70,70
NL,50,80,80,120,50,80,80,80
NO,50,80,80,90,50,80,80,80
PL,50,80,80,110,50,70,70,70
PT,50,90,100,120,50,70,70,80
RO,60,70,90,90,50,70,70,90
RU,60,90,90,90,60,70,70,90
SE,50,70,90,110,50,70,80,90
SI,60,80,100,120,50,70,70,70
SK,60,90,90,110,60,80,80,80
TR,50,90,90,130,50,80,80,80
UA,60,90,90,90,60,70,70,90
UK,48,96,96,112,48,64,80,96
YU,60,80,80,110,60,70,70,70
```

Figure 5-4. National speed limits ASCII file.

6. User adjustments

Sometimes it may be desirable to change default settings or base data to meet specific user requirements or to run different policy scenarios. The E.P.I. system is flexible enough to offer a number of possibilities to adjust parameter settings and basic data information to specific needs. This flexibility is maintained throughout all software components.

To adjust default settings, it is only necessary to modify a number of ASCII input files. This principle ensures faultless applicability of the macros in the future and offers flexibility in editing data.

Table 6-1 summarises all files available in the E.P.I. system and indicates which file can or cannot be edited.

Table 6-1. File adjustments.

Directory	File name	File type	Edit	Kind of editing
DATABASE	**EURORELIEF**	Coverage	No	---
	NUTS3REG	Coverage	Yes	Items
	ROADNET	Coverage	Yes	Topology, items
PARAMET	**BORDER.DEL**	ASCII	Yes	Border delay values
	CENTROIDS.NUT	ASCII	Yes	Co-ordinates
	FERRIES.STAT	INFO table	No	---
	ITEMADD.FIL	INFO table	No	---
	PARA.PSS	ASCII	Yes	Default parameter settings
	RELATES.PSS	INFO table	No	---
	RESTING.ADD	INFO table	No	---
	SPEED.LIM	ASCII	Yes	National speed limits
SYMBOLS	**AV.LUT**	INFO table	No	---
	AV-LEGEND	Coverage	No	---
	ITEMLIST.LUT	INFO table	No	---
	MM.LUT	INFO table	No	---
	MM-LEGEND	Coverage	No	---
	PERIPHER.SHD	FILE	No	---
	PERIPHER.TXT	FILE	No	---

All macros and menu files located under the **PROGRAMS** directory are not to be edited.

The following sections describe how the files are to be modified to change default settings or to import new region data and to establish different network or region data scenarios.

6.1 Projection

The projection of the coverages can be changed and adjusted to specific user needs. Changing the projection and co-ordinate system does not affect the applicability of the E.P.I. software in general, as long as all coverages are transformed in the same manner and the **CENTROIDS.NUT** input ASCII file is changed accordingly. One restriction to this general rule is that the units

should always remain 'meters' since this is required by the `POPDENSE` macro.

If the projection of the geodatabase is to be changed, one of the two standard ArcInfo commands can be used in the Arc prompt (ESRI, 2000), `PROJECT` and `TRANSFORM`.

6.2 Base Coverages

The base region and network coverages included in the E.P.I. database comprise all information necessary to calculate peripherality indices. However, it might be necessary to update region or link attributes or edit topology.

The following actions for updating the geodatabase are allowed and do not affect the applicability of the E.P.I. software:

- Renaming and copying of the input coverage.
- Changing coverage projection (see Section 6.1)
- Editing attribute values of the attributes indicated in Appendix A.1 from the Tables or ArcEdit prompt.
- Adding or deleting features in ArcEdit for the road coverage and creating new topologies in Arc. In principle, the network coverage can contain as many arcs and nodes as necessary. Their total number does not affect the applicability of the software.

The attribute items as indicated in Appendix A.1 must not be deleted. However, new items may be added.

Each time the input coverages are edited with respect to attributes or topology, the E.P.I. software must be updated before a new calculation of peripherality indices can be performed. For this, the additional tools (`AGGLO, CENTROIDS, DATA, POPUL, POPDENSE or SLOPE`) must be applied before the `CALCUL` macro can be applied again (see Section 6.8).

6.3 Socio-Economic Data

If region data with respect to population, employment, GDP in Euro or GDP in PPS are to be updated, this has to take place in the region coverage. The data can either manually be adjusted or by using lookup tables or joining INFO tables to the coverage containing the new updated data. However, after the region coverage is updated, the `POPDENSE` macro has to be applied to update the `POP_DENSE` item in the region coverage. All these changes require updating of the node attribute table of the network coverage, since the items there have to contain exactly the same values as in the polygons of the region coverage (see also Appendix A.1). This task is automated by the `DATA` macro (see Section 4.2.3) or, if also locations of the centroids are to be changed, by the `CENTROIDS` macro. After updating of the region coverage, one of these two macros has to be applied to update the road network. Moreover, as a third step, also the `POPUL` macro has to be applied to update a number of INFO tables required in the calculation.

6.4 Border Delays

For special policy scenarios or to evaluate the impacts of changes of waiting times at border crossings, it might be desirable to edit the waiting times stored in the `BORDER.DEL` ASCII file. However, the first two ISO country codes should not be changed. Similarly, the separation sign, i.e. the comma, should also not be deleted. The new waiting times will be initialised after the `INITIAL` macro is applied.

6.5 Centroid Co-ordinates

The `CENTROIDS.NUT` ASCII file can also be edited. Every co-ordination system and projection supported by ArcInfo can be used here. However, it is important that the co-ordinates match the system used for the input coverages. Manually adjustments of that file is useful if locations of only few centroids are to be changed, but the co-ordinate system is to be maintained. If the overall co-ordinate system is to be changed, the ArcInfo standard `PROJECT` command should be applied.

Also the point identification numbers given in the first column can be changed. In that case it is important that these numbers are unique. Besides this restriction, the identification numbers can be changed in any direction, they even need not to be in ascending or descending order.

In any case it is important that the last record of the file indicating an '`END`' statement must be maintained, since this ASCII file represents an input point file required by the ArcInfo `GEN-ERATE` command.

6.6 General Parameters

Probably the most important file for user adjustments is the general parameter file `PARA.PSS`. As stated in Section 5.6.3, this file can be differentiated into comment records and those records storing default parameter values. The comment records are indicated with `/*`, whereas the parameter records are prefixed with '`para`', followed by a blank. Each parameter record is introduced with a descriptive record explaining the contents of the following parameter. For example, the record

```
/* Accessibility Calculations - Beta
```

indicates that the following two parameter records define default values for betas for cars and lorries used in the impedance function.

```
para betc .007      /* Cars
para betl .003      /* Lorries
```

The two records are indicated by the '`para`' phrase and the parameter keyword. Both should not be changed since they are essential for correct parameter initialisation. However, the four-digit values field (in this example .007 and .003) may be edited.

The file is initialised by the `INITIAL` macro to update E.P.I. software settings. These new settings represent the new 'default' settings.

6.7 Speed Limits

Similar to the border delay ASCII file, also the ASCII file **speed.lim** storing national speed limits can be edited. It is important not to change the first column, i.e. the two-letter ISO country code. Moreover, also the column separation sign, i.e. the comma, should not be deleted and it should be ensured that the number of value fields is also maintained.

6.8 Procedures for updating the geodatabase

There are three main options to update the geodatabase: (i) updating region data, (ii) changing and updating centroid locations, and (iii) editing the network by adding new links or changing link or node attribute values.

The additional tools developed are to support these tasks. If the geodatabase is going to be updated, the following rules have to be observed:

Updating region data

If region data population, employment, GDP in Euro or GDP in PPS have been updated by editing the region coverage, the network coverage and INFO tables need also to be updated. The **POPDENSE** macro has to be applied to update the **POP_DENSE** attribute in the polygon attribute table of the region coverage. Afterwards, the **POPUL** macro has to be applied to update the associated INFO tables. The **DATA** macro is used to update the centroids in the network coverage, and finally the **AGGLO** macro is run to update the agglomeration impedance factor in the arc attribute table of the network coverage. The whole process can be summarised as follows:

1. Updating region coverage from the Tables or ArcEdit prompts,
2. Applying **POPDENSE** macro to the region coverage,
3. Applying **POPUL** macro to the region coverage,
4. Applying **DATA** or **CENTROIDS** macro to region and network coverages,
5. Applying **AGGLO** macro to region and network coverages.

At the end of this process, the whole geodatabase is updated.

Changing and updating centroid locations

The location of centroids in the road coverage can be changed in two different ways: either by moving them manually in ArcEdit, or by editing the **CENTROIDS.NUT** file (see Section 6.5). In the latter case, the **CENTROIDS** macro has to be applied to assign the new centroid locations to the network. After that, also the **SLOPE** and **AGGLO** macros should e applied to fully update the slope and agglomeration impedance items.

Editing the topology of the network

If the topology of the road network was edited in ArcEdit (adding, deleting or moving of links), the **SLOPE** and **AGGLO** macros should be applied to fully update the slope and agglomeration impedance items.

6.9 Scenario Definition

All user adjustment possibilities explained in the previous sections can be used to define alternative or future scenarios for both network and region data. For example, one might be interested in developing alternative scenarios with respect to different road networks combined with different assumptions on population or economic performance. Usually, each scenario will be implemented in different coverages, i.e. a number of different network and/or region coverages will be generated, which will be accessed using the listboxes of the selection menu at the beginning of the `CALCUL` macro. The only requirement is that all coverages are stored in the `~/PERIPHER/DATABASE` directory.

A certain combination of network and socio-economic scenarios can be applied by selecting the specific coverages from the selection menu (see Section 4.1.2). If scenarios with different assumptions on region data stored in different region coverages are to be run, the `POPUL` and `DATA` macros have to be applied after each model run to update the geodatabase.

If different alternative or future scenarios are to be run, also the appropriate selection of the year plays an important role. If alternative scenarios to the default model run are to be applied, i.e. scenarios also reflecting the year 2000 but with different assumptions, the year must be set to 2000. If any future scenario with a future target year is to be accessed, the year should be set to 2016.

However, the name of the output coverage storing the results of peripherality calculations is always `REGOUT2000` or `REGOUT2016`. Similarly, the names of the output INFO tables and ASCII files as indicated in Section 4.3 are also fixed. All output files are always stored in the `~/PERIPHER/RESULTS` directory. If the output coverage or the INFO tables or ASCII files already exist, they are overwritten. This means, that if several scenarios are to be tested which are going to be compared after model runs, the output files have either to be renamed or to be copied to other directories before the `INITIAL` macro is started again.

7. Trouble Shootings

In the following sections three main fields for errors and error handling will be explained. These fields are ranked according to growing severity of errors ranging from initialisation failure to embedded error routines. A fourth section called 'Bailing Out' tries to give hints how to behave in case undocumented errors occur.

7.1 Initialisation Failures

Since every E.P.I. application starts with the execution of the `INITIAL` macro from the `PERIPHER` directory, errors will be caused if any other macro of the E.P.I. software is applied before the `INITIAL` macro was executed or if the `INITIAL` or any other macro is called from another directory than the `PERIPHER` directory.

In both cases, the following error message is displayed:

```
Arc: AML ERROR - Unable to run file XX
```

where `XX` indicates the name of the macro the application of which failed. The user should make sure that

(i)   the actual workspace is the `PERIPHER` base directory, and
(ii) the `INITIAL` macro has been run successfully before any other macro is applied.

7.2 ArcInfo Prompt

Since every macro developed must be called from the Arc prompt, at the beginning of each programme it is tested whether the actual prompt is Arc or not. If this test fails (e.g. if a macro is called from the ArcEdit prompt), the macro is aborted and the following message appears:

```
Arc: Usage: Program must be executed from the ARC prompt!
```

A similar error message appears when the `INITIAL` macro is properly run but any other macro is not launched from the `PERIPHER` directory but from another directory. The following warning occurs:

```
Arc: Usage: Program can only be started from PERIPHER directory!
```

The solution to both error messages is to move to the Arc prompt of the `PERIPHER` workspace, execute the `INITIAL` macro and run the desired macro once again.

A third important test refers to the arguments specified when launching the additional tools. All these macros require one, two or three input arguments specifying input coverages. If one of the arguments is a wildcard ('`#`'), the macro will not start with the following message:

```
Arc: [NAME] macro does not accept #-wildcards!
```

where **[NAME]** is the name of the macro accessed. In this case a correct coverage name must be used for the argument(s). If the number of arguments does not match the required number, the following usage message appears:

```
Arc: Usage: [NAME] <argument 1> <argument 2> ...
```

7.3 Error Messages

At the beginning of each macro, a number of error routines are applied to test the applicability of the input coverages required and the workspace environment. If one of these tests fails, the macro is aborted with an error message indicating the type of error and trying to give suggestions how to solve the problem.

These routines test existence of the coverages as specified in the arguments or check whether the coverage has arc, node or polygon topology. Also existence and operability of required input ASCII files and INFO tables are checked.

The error messages look like this:

```
        Warning:
        ========
        XX
        XX
        XX
        European peripherality index software settings failed!
        Program interrupted

        .................................... at [date -time]



        Runtime Failure 1!
        Arc:
```

Where **XX** describes the error detected and gives instructions on how to tackle the problem, which is indicated as runtime failure 1. If the instructions are followed, the macro should run properly. However, if several default settings for a macro application are not fulfilled, it might be that the macro is aborted several times until all settings match requirements.

Unlike the **TESTER** macro which checks consistency of the overall E.P.I. system, the error routines incorporated at the beginning of each macro refer only to those tests which are necessary to run that particular macro.

7.4 Bailing Out

Not every possible source of error can be addressed beforehand. If severe errors occur during macro runs, the **BAIL_OUT** routine of the macro is called and the macro is immediately aborted. Usually, a number of internal error messages produced by ArcInfo appear on the

command line. It is not possible to address all possible errors here. Possible causes for such errors could be:

- One or several coverages, INFO tables, ASCII files or directories are write-protected.
- No space left on device (i.e. on disc).
- A previous E.P.I. session was aborted and temporary files were left on disc and were not deleted.
- Required attributes are not available in the input coverage or unexpected attribute values occur.
- ASCII parameter files or INFO tables are not available in `~/PERIPHER/PARAMET` or `~/PERIPHER/DATABSE`.
- Specified input coverages lacking arc, node or polygon topology.
- Coverage projections for the input coverages do not agree.

All these are possible sources for errors and should be checked if severe errors and abnormal program terminations occur. They should be checked first also in cases when ArcInfo responses that an error occurred in macro `xxxx` at line `yyy`. The last four cases of the above list could be checked using the `TESTER` macro. Sometimes it might also be necessary to delete temporary aborted files manually.

For example, the `CALCUL` macro might terminate with the following error message:

```
Error opening BORDER.DELAY
An error occurred at line 270
Time [date .-time]
```

This message pretends an error in the code line 270 of the `CALCUL` macro, but in fact the `BORDER.DELAY` INFO table was either not available in the `~/PERIPHER/PARAMET` directory or could not be accessed or opened properly. The solution to this error is to re-run the `INITIAL` macro, which re-generates the INFO table, and run the `CALCUL` macro once again.

8. References

Allgemeiner Deutscher Automobil Club (ADAC) (2000): *Tempolimits.* http://www.adac.de.

Environmental Systems Research Institute (ESRI) (2000): *ARC/INFO Workstation Online Documentation, Version 8.0.* Redlands, CA, USA. (http://www.esri.com).

European Communities (1996): Decision No. 1692/96/CE of the European Parliament and of the Council of 23 July 1996 on the Community guidelines for the development of the trans-European transport networks. *Official Journal of the European Communities* 39, L 228, 9 September 1996, 1-104.

Eurostat (1997): *New Chronos Database.* Tables d3pop, xe_gdp, pvd0e. Luxembourg: Office for Official Publications of the European Communities.

Eurostat (1999a): *Regions. Nomenclature of territorial units for statistics - NUTS.* Luxembourg: Office for Official Publications of the European Communities.

Eurostat (1999b): *Statistical regions in the EFTA countries and the Central European Countries (CEC).* Luxembourg: Office for Official Publications of the European Communities.

GISCO (2000): STEU - Urban centers Pan-Europe Data Layer. Eurostat Datashop. http://www.datashop.org/, Luxembourg.

IRPUD (1999): *European Transport Networks.* Dortmund: Institute for Spatial Planning, http://irpud.raumplanung.uni-dortmund.de/irpud/pro/ten/ten_e.htm

International Road Union (IRU) (ed.) (1998): *Waiting Times at Border Crossings.* http://www.iru.org/IRU_NEW/Services/Waiting.E.html, July 1998.

International Road Union (IRU) (ed.) (2000): *Speed Limits, Goods Transport.* IRU Information Center. http://www.iru.org/IRU_NEWS/IRU-E.Commerce/Main/Ecommerce.E. asp, October 2000.

Schürmann, C. and Talaat, A. (2000): *Towards a European Peripherality Index. Final Report.* Report for General Directorate XVI Regional Policy of the European Commission. Dortmund: Institute for Spatial Planning.

TINA Secretariat (1999): *TINA Transport Infrastructure Needs Assessment. Identification of the Network Components for a Future Trans-European Transport Network in Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.* Final Report. Vienna: TINA Secretariat.

Umweltbundesamt (UBA) (1998): *Geschwindigeitsbegrenzungen.* http://www.umweltbundes amt.de/uba-info-daten/daten/geschwindigkeitsbegrenzung. htm. Last updated May 09 1998, Berlin: UBA.

U.S. Geological Survey (2000): *GTOPO30 Digital Terrain Model.* EROS Data Center. http://edcdaac.usgs.gov/gtopo30/gtopo30.html

Appendix

The following information is available in the Appendices:

A.1   Coverage Attribute Tables

A.2   Output File Names

A.3   Test Macro Log File

A.4   System of Regions

A.1 Coverage Attribute Tables

This section presents the default standard attributes stored in the attribute tables of the input coverages delivered with the E.P.I. software. These items, the item names, the item descriptions and the range of item values must be maintained. However, new items may be added to the attribute tables.

A.1.1 Region Coverage

The region coverage **NUTS3REG** contains the following feature (sub-)classes:

- Arc
- Polygons
- Regions with subclasses
    - NUTS2
    - NUTS1
    - NUTS0
    - EU
    - CAND5
    - CAND12

An attribute table is available for each feature (sub-)class. The structure of these attribute tables is presented in the following tables

Table A-1. Region cover - arc attribute table.

Column	Item name	Width	Output	Type	Dec.	Contents
1	**FNODE#**	4	5	B	---	From node number
5	**TNODE#**	4	5	B	---	To node number
9	**LPOLY#**	4	5	B	---	Left polygon number
13	**RPOLY#**	4	5	B	---	Right polygon number
17	**LENGTH**	4	12	F	3	Length (m)
21	**NUTS3REG#**	4	5	B	---	Arc number
25	**NUTS3REG-ID**	4	5	B	---	Arc user-id
29	**BOUNDARY**	*4*	*4*	*I*	---	*Boundary Type:* 1 = Coverage box 2 = Coastline 3 = NUTS-0 boundary 4 = NUTS-1 boundary 5 = NUTS-2 boundary 6 = NUTS-3 boundary

Table A-2. Region cover - polygon attribute table.

Column	Item name	Width	Output	Type	Dec.	Contents
1	**AREA**	4	12	F	3	Polygon area (sqm)
5	**PERIMETER**	4	12	F	3	Polygon perimeter (m)
9	**NUTS3REG#**	4	5	B	---	Polygon number
13	**NUTS3REG-ID**	4	5	B	---	Polygon user-id
17	**COUNTRY**	4	6	C	---	ISO country code
21	**NUTS1_CODE**	3	3	C	---	ISO NUTS-1 code
24	**NUTS2_CODE**	4	4	C	---	ISO NUTS-2 code
28	**NUTS3_CODE**	6	6	C	---	ISO NUTS-3 code
34	**NUTS3_NAME**	25	25	C	---	NUTS-3 region name
59	**NUTS3_CENTROID**	20	20	C	---	NUTS-3 centroid name
79	**STATUS**	*10*	*10*	*C*	---	*Status* INTERNAL = region in EU CAND5 = region in five candidate countries CAND12 = region in remaining candidate countries. EXTERNAL = region located neither in EU nor in candidate country
89	**POP_TOT**	12	12	N	5	Population (in 1,000)
101	**EMPLOY**	12	12	N	5	Employment (in 1,000
113	**GDP_EURO**	12	12	N	5	GDP
125	**GDP_PPS**	12	12	N	5	GDP (in PPS)
137	**POP_DENSE**	12	12	N	5	Population density (in inhab./sqkm)

Table A-3. Region cover - Region subclass NUTS2 attribute table.

Column	Item name	Width	Output	Type	Dec.	Contents
1	**AREA**	4	12	F	3	Region area (sqm)
5	**PERIMETER**	4	12	F	3	Region perimeter (m)
9	**NUTS2#**	4	5	B	---	Region number
13	**NUTS2-ID**	4	5	B	---	Region user-id
17	**COUNTRY**	4	6	C	---	ISO country code
21	**NUTS1_CODE**	3	3	C	---	ISO NUTS-1 code
24	**NUTS2_CODE**	4	4	C	---	ISO NUTS-2 code
28	**STATUS**	*10*	*10*	*C*	---	*Status* (blank) = Sea INTERNAL = EU CAND5 = 5 candidates CAND12 = 12 candidates EXTERNAL = external regions
38	**POP_TOT**	8	18	F	6	Population (in 1,000)

Table A-4. Region cover - Region subclass NUTS1 attribute table.

Column	Item name	Width	Output	Type	Dec.	Contents
1	AREA	4	12	F	3	Region area (sqm)
5	PERIMETER	4	12	F	3	Region perimeter (m)
9	NUTS1#	4	5	B	---	Region number
13	NUTS1-ID	4	5	B	---	Region user-id
17	COUNTRY	4	6	C	---	ISO country code
21	NUTS1_CODE	3	3	C	---	ISO NUTS-1 code
24	STATUS	*10*	*10*	*C*	---	*Status*
						(blank) = Sea
						INTERNAL = EU
						CAND5 = 5 candidates
						CAND12 = 12 candidates
						EXTERNAL = external regions
34	POP_TOT	8	18	F	6	Population (in 1,000)

Table A-5. Region cover - Region subclass NUTS0 attribute table.

Column	Item Name	Width	Output	Type	Dec.	Contents
1	AREA	4	12	F	3	Region area (sqm)
5	PERIMETER	4	12	F	3	Region perimeter (m)
9	NUTS0#	4	5	B	---	Region number
13	NUTS0-ID	4	5	B	---	Region user-id
17	COUNTRY	4	6	C	---	ISO country code
21	STATUS	*10*	*10*	*C*	---	*Status*
						(blank) = Sea
						INTERNAL = EU
						CAND5 = 5 candidates
						CAND12 = 12 candidates
						EXTERNAL = external regions
31	POP_TOT	8	18	F	6	Population (in 1,000)

The region subclasses contain items storing the respective NUTS level codes as well as items storing the higher NUTS level and country codes; in addition, two other items are available. The STATUS item gives information whether a region is located in an EU member state, is part of the five or twelve candidate countries or belongs to an external country. The POP_TOT item indicates the total population for the region calculated as the sum over the respective NUTS-3 regions population. In case of the NUTS 0 region subclass this item represents the total population of the country (with the exception of the three countries Russia, Ukraina and Turkey, where only those people are included which live in the area considered in this study). This item will be updated each time the POPUL macro is applied.

The region attribute tables for the subclasses EU, CAND5 and CAND12 have the same item structure as indicated in Table A-5 with the difference that the item names NUTS0# and NUTS0-ID are replaced by EU# and EU-ID, CAND5# and CAND5-ID and CAND12# and CAND12-ID, respectively and that the STATUS and POP_TOT items are missing.

A.1.2. Network Coverage

The coverage containing the road network comprises arc and node feature classes. An attribute table is available for both feature classes. Table A-6 represents the arc and the following Table A-7 represents the node attribute table.

Table A-6. Network cover - arc attribute table.

Column	Item name	Width	Output	Type	Dec.	Contents
1	`FNODE#`	4	5	B	---	From node number
5	`TNODE#`	4	5	B	---	To node number
9	`LPOLY#`	4	5	B	---	Left polygon number
13	`RPOLY#`	4	5	B	---	Right polygon number
17	`LENGTH`	4	12	F	3	Length (m)
21	`ROADNET#`	4	5	B	---	Arc number
25	`ROADNET-ID`	4	5	B	---	Arc user-id
29	`COUNTRY`	*4*	*4*	*C*	*----*	*ISO country code* 'YY' = ferry
33	`LINKCAT`	*4*	*4*	*I*	*---*	*Link category* 0 = Access link 1 = Motorway 2 = Dual-carriageway road 3 = Other road 4 = Car ferry 5 = Eurotunnel
37	`EURID`	*12*	*12*	*C*	*---*	*European road identifier* e.g. E40 E45
49	`NATID`	*12*	*12*	*C*	*---*	*National road identifier* e.g. A12, M1, B456
61	`SPEED`	*4*	*4*	*I*	*---*	*National speed limits (km/h)* 0 = Ferries, Eurotunnel
65	`FERRY_TIME`	*4*	*4*	*I*	*---*	*Ferry travel times (in min)* 0 = roads
69	`TENCAT`	*4*	*4*	*I*	*---*	*TEN categories* 0 = No TEN/TINA link 1 = Existing TEN/TINA link 2 = Planned TEN/TINA link
73	`TENALIGN`	*4*	*4*	*I*	*---*	*TEN alignment* 0 = No TEN/TINA link 1 = TEN/TINA link with precise alignment 2 = TEN/TINA link with unknown precise alignment
77	`CATEGORY`	*4*	*4*	*I*	*---*	*Road category* 0 = No link of strategic network 1 = TEN road link 2 = TINA road link - backbone 3 = TINA road link - additional 4 = Helsinki corridors 5 = Additional link of strategic network

Table A-6. Network cover - arc attribute table (cont.).

Column	Item name	Width	Output	Type	Dec.	Contents
81	**PRIORITY**	*4*	*4*	*I*	*---*	*Priority projects*
						0 = No TEN priority project
						7 = Greek motorways
						8 = Motorway Lisboa-
						Valladolid
						11 = Øresund road/rail link
						12 = Nordic triangle
						13 = Ireland/UK/Benelux
85	**SLOPE_IND**	6	6	N	3	Slope impedance factor
91	**AGGLO_IND**	6	6	N	3	Agglomeration impedance fact.
97	**TIME_CAR**	12	12	N	4	Link travel time by car
109	**TIME_LORRY**	12	12	N	4	Link travel time by lorry

The arc attribute table of the network coverage contains all items requested to calculate peripherality indices. These items are: **COUNTRY**, **LINKCAT**, **SPEED**, **FERRY_TIME**, **SLOPE_IND**, **AGGLO_IND**, **TIME_CAR** and **TIME_LORRY**. The **COUNTRY** item is required to identify in which country the link is located; **LINKCAT** differentiates types of roads, **SPEED** contains the national speed limits; since **SPEED** contains road speed limits in kilometres per hour, which is not useful for ferries and the Eurotunnel, the item **FERRY_TIME** gives ferry travel times and the travel time using the Eurotunnel in minutes. For regular roads, this item shows zero values. **SLOPE_IND** and **AGGLO_IND** represent the slope and agglomeration impedance factors.

The other items are additional items to identify links and to give useful information. These items are not accessed in the E.P.I. system. The four items **TENCAT**, **TENALIGN**, **CATEGORY** and **PRIORITY** indicate the inclusion of the specified link in the TEN and TINA programmes. **TENCAT** indicates whether the link is part of the TEN or TINA programme or not (**TENCAT=0**); if so, it is distinguished between existing links on which no plannings take place and planned links which are to be updated or newly constructed. **TENALIGN** differentiates whether the precise alignment of those links which are included in the TEN or TINA programmes is known or unknown. This is important especially for planned links and links under study. **CATEGORY** differentiates the links into links which are

- neither included in the TEN nor in the TINA outline plans nor serve as additional strategic links (**CATEGORY=0**),
- part of the TEN programme (**CATEGORY=1**),
- part of the backbone net of the TINA programme (**CATEGORY=2**),
- part of additional links of the TINA programme (**CATEGORY=3**),
- part of the Helsinki Corridors in the 'external' countries (**CATEGORY=4**), and which are
- part of additional strategic links, which are not included in any outline plan but are important to guarantee connectivity of regions and centroids and are therefore included in the strategic network (**CATEGORY=5**).

The **CATEGORY** item can be used to differentiate outline plans across Europe for the road network. The fourth important attribute providing information on the TEN programme is called **PRIORITY** and is designed to give information on the priority projects for the road network. All these items are not used in the macros, nevertheless, they provide useful information to

identify and distinguish certain kinds of road links and enable the user to define own scenarios, e.g. to extract subsets of links such as all TEN roads without TINA roads.

The default node attributes of the network coverage as delivered are as follows:

Table A-7. Network cover - node attribute table.

Column	Item name	Width	Output	Type	Dec.	Contents
1	ARC#	4	5	B	---	Arc number
5	ROADNET#	4	5	B	---	Node number
9	ROADNET-ID	4	5	B	---	Node user-id
13	COUNTRY1	2	2	C	---	ISO country code
15	COUNTRY2	2	2	C	---	ISO country code
17	NODETYPE	*3*	*3*	*I*	---	*Node type*
						0 = Centroid
						1 = Border node
						2 = Road node
						3 = Ferry seaport
						4 = Motorway interchange
						5 = Motorway exit
						6 = Eurotunnel stations
20	NUTS1_CODE	3	3	C	---	NUTS1 code
23	NUTS2_CODE	4	4	C	---	NUTS2 code
27	NUTS3_CODE	6	6	C	---	NUTS3 code
33	NUTS3_NAME	25	25	C	---	Name of NUTS3 region
58	NUTS3_CENTROID	20	20	C	---	Name of NUTS3 centroid
78	X-COORD	4	12	F	3	x-co-ordinate
82	Y-COORD	4	12	F	3	y-co-ordinate
86	POP_TOT	12	12	N	5	Population
98	EMPLOY	12	12	N	5	Employment
110	GDP_EURO	12	12	N	5	GDP
122	GDP_PPS	12	12	N	5	GDP in PPS

The items available in the node attribute table of the road coverage are all required to perform peripherality index calculations. COUNTRY1 gives the two-letter ISO country code for all nodes, whereas COUNTRY2 gives an additional ISO country code for border nodes only (NODE-TYPE=1), indicating that border nodes belong to two neighbouring countries. If a node is not a border node, COUNTRY2 will not be set. NODETYPE differentiates the type of node. The following items prefixed with 'NUTS' give information on the regions in which the node is located with respect to the NUTS level. These attributes are only set for nodes representing centroids (NODETYPE=0), for the other nodes these items are empty. X-COORD and Y-COORD give the node co-ordinates for all nodes. The following four items POP_TOT, EMPLOY, GDP_EURO and GDP_PPS store the region data used as the masses in accessibility calculations. Again, these attributes are only set for centroid nodes (NODETYPE=0), whereas they are not set for the other nodes. The data stored in these items are similar to the ones stored in the respective items of the region coverage.

A.1.3 Digital Terrain Model Coverage

The coverage containing the Digital Terrain Model comprises arc and polygon feature classes. An attribute table is available for each of the two classes. However, for the arc feature class only standard ArcInfo attributes are available. The polygon feature class contains a number of additional user-defined items as indicated in Table A-8.

Table A-8. DTM coverage - polygon attribute table.

Column	Item name	Width	Output	Type	Dec.	Contents
1	AREA	4	12	F	3	Polygon area (sqm)
5	PERIMETER	4	12	F	3	Polygon perimeter (m)
9	EURORELIEF#	4	5	B	---	Polygon number
13	EURORELIEF–ID	4	5	B	---	Polygon-ID
17	MIN-SPOT	8	18	F	6	Minimum spot value
25	MEAN-SPOT	8	18	F	6	Mean spot value
33	MAX-SPOT	8	18	F	6	Maximum spot value
41	STD-SPOT	8	18	F	6	Standard deviation

Since each grid cell of this polygon coverage covers several spot points of the original DTM from which these statistics were derived, the different spot values represent no absolute values for that area but represent the minimum spot values of all elevation points that fell into that cell; similarly the mean spot value is calculated as the average over all these elevation points, and the maximum spot value represents the maximum spot value of those elevation points. The standard deviation is calculated on the basis of all the elevation points.

A.1.4 Output Coverage

The CALCUL macro generates a new output coverage called REGOUTxxxx each time the macro is applied, where xxxx represents the year, i.e. 2000 or 2016. This cover is located in the RE-SULTS directory and comprises all peripherality indices calculated. Since this coverage is based on the input region coverage, it includes the same feature classes. So the following feature classes are available:

- Arc
- Polygons
- Regions with subclasses
  - NUTS2
  - NUTS1
  - NUTS0
  - EU
  - CAND5
  - CAND12

For all these feature classes, attribute tables are available. The items in the arc attribute table are similar to the ones in the region coverage NUTS3REG (see Tables A-1). The region sub-

classes EU, CAND5 and CAND12 contain only one user-defined item called `COUNTRY` giving the ISO country code.

The polygon attribute table contains the input polygon attributes as available in the region coverage (see Table A-2) and the following results of the peripherality index calculations:

1. Eight attributes storing accessibility of the region, i.e.
   - `CPOPTOT`   = Accessibility by car to population
   - `CEMPLOY`   = Accessibility by car to employment
   - `CGDPEURO`   = Accessibility by car to GDP in Euro
   - `CGDPPPS`   = Accessibility by car to GDP in PPS
   - `LPOPTOT`   = Accessibility by lorry to population
   - `LEMPLOY`   = Accessibility by lorry to employment
   - `LGDPEURO`   = Accessibility by lorry to GDP in Euro
   - `LGDPPPS`   = Accessibility by car lorry GDP in PPS

   These attributes store the accessibilitiy values which are the basis for standardisation of peripherality indices. Since also regions in countries indicated as 'EXTERNAL' are taken into consideration when calculating accessibilities, values for these attributes for externa regions are set. However, external regions are excluded from calculating peripherality indices.

2. 48 attributes storing different peripherality indices, the item names of which are composed as follows:

   $$xxxSTyymjjjjjj$$

   where

   `xxx` represents the territory covered and has one of these values: `EU` (EU member states), `C5` (EU member states plus the five candidate countries Estonia, Poland, Czech Republic, Hungary, Slovenia), `C12` (EU member states plus all twelve candidate countries: Estonia, Poland, Czech Republic, Hungary, Slovenia, Latvia, Lithuania, Slovakia, Romania, Bulgaria, Cyprus and Malta),

   `ST` is a fixed component indicating that this is an item representing standardisation,

   `yy` gives the way standardisation is performed, either `MM` representing *Peripherality Index 1* or `AV` representing *Peripherality Index 2*,

   `m` indicates the mode, i.e. `C` for cars or `L` for lorries, and

   `jjjjjj` indicates the mass term, i.e. `POPTOT` (population), `EMPLOY` (employment), `GDPEURO` (GDP in Euro) or `GDPPPS` (GDP in PPS).

For example, the item `EUSTAVCGDPPPS` contains the peripherality index with respect to GDP in PPS for cars for *Peripherality Index 2* for the territory of the European Union, whereas `C12STMMLEMPLOY` contains the peripherality index with respect to employment for lorries for *Peripherality Index 1* for the territory of the European Union and all other candidate countries.

All these attributes are calculated for the EU member states and the twelve candidate countries only. Values for external regions are not set.

A.2 Output File Names

As described in Section 4.1.3, the `PLOT` macro offers two possibilities for specifying output maps:

(i) by selecting the requested options of the five parameters (Index, Mode, Level, Territory, Mass),

(ii) by directly typing the graphics file number into the `Map number` input text field.

Using the second alternative, one has to know the graphics file numbers of the 192 possibilities which are offered by the system. These graphics file numbers (map numbers) are given in Table A-9.

Table A-9. Graphics file numbers.

Mode	NUTS level	Standardisation	EU member states				EU plus 5 candidates				EU plus 12 candidates			
			Population	Employ-ement	GDP in Euro	GDP in PPS	Poplation	Employ-ment	GDP in Euro	GDP in PPS	Population	Employ-ment	GDP in Euro	GDP in PPS
Car	0	PI1	1	2	3	4	9	10	11	12	17	18	19	20
		PI2	5	6	7	8	13	14	15	16	21	22	23	24
	1	PI1	25	26	27	28	33	34	35	36	41	42	43	44
		PI2	29	30	31	32	37	38	39	40	45	46	47	48
	2	PI1	49	50	51	52	57	58	59	60	65	66	67	68
		PI2	53	54	55	56	61	62	63	64	69	70	71	72
	3	PI1	73	74	75	76	81	82	83	84	89	90	91	92
		PI2	77	78	79	80	85	86	87	88	93	94	95	96
Lorry	0	PI1	97	98	99	100	105	106	107	108	113	114	115	116
		PI2	101	102	103	104	109	110	111	112	117	118	119	120
	1	PI1	121	122	123	124	129	130	131	132	137	138	139	140
		PI2	125	126	127	128	133	134	135	136	141	142	143	144
	2	PI1	145	146	147	148	153	154	155	156	161	162	163	164
		PI2	149	150	151	152	157	158	159	160	165	166	167	168
	3	PI1	169	170	171	172	177	178	179	180	185	186	187	188
		PI2	173	174	175	176	181	182	183	184	189	190	191	192

A.3 Test Macro Log File

This is an example of a log file produced by the **TESTER** macro. For this example, the following errors have intentionally been introduced to the database to illustrate error messages:

- no projection was defined for the **EURORELIEF** coverage representing the DTM;
- in the **NUTS3REG** region coverage, a number of polygons lack region data;
- in the **NUTS3REG** region coverage, a number of regions lack population values;
- in the **ROADNET** network coverage, a number of centroids lack region data;
- the **CALCUL** macro is missing in the **~/PERIPHER/PROGRAMS** directory;
- the **AV.LUT** parameter file is not available in the **~/PERIPHER/SYMBOLS** directory.

Depending on the number of errors encountered, the length of the log file varies:

```
E.P.I. Test  --------------------------------------------------------
E.P.I. Test  [date -vfull]
TESTER.AML
(C) CS, IRPUD 2000
European Peripherality Index Software (E.P.I.)

DIRECTORY STRUCTURE
===================
Detected directory structure meets default requirements!

--------------------------------------------------------------------------

COMPARING PROJECTIONS
=====================
Parameters coverage         ROADNET              NUTS3REG             EURORELIEF
--------------------------------------------------------------------------
Projection name         - LAMBERT              LAMBERT
Datum                   - NONE
Units                   - METERS               METERS
Spheroid                - CLARKE1866           CLARKE1866
Quadrant                -
1st standard parallel   - 27 00 00.0000        27 00 00.0000
2nd standard parallel   - 63 00 00.0000        63 00 00.0000
Central meridian        - 10 00 00.0000        10 00 00.0000
Latitute of origin      - 52 00 00.0000        52 00 00.0000
Longitude of origin     -
False easting (meters)  - 0                    0
False northing (meters) - 0                    0
Projection failure with respect to : Projection names
Projection failure with respect to : Datums
Projection failure with respect to : Units
Projection failure with respect to : Spheroid
Projection failure with respect to : 1st standard parallels
Projection failure with respect to : 2nd standard parallels
Projection failure with respect to : Central meridians
Projection failure with respect to : Latitudes of origin
Projection failure with respect to : False eastings
Projection failure with respect to : False northings
-> Please adjust projections of input coverages before continuing.
*** Projections of the three input coverages NUTS3REG, ROADNET and EURORE-
LIEF do not match. ***
```

*** This might lead to severe errors when spatially overlaying coverages, e.g. when updating coverages against each other! ***

DTM-COVERAGE
============
Number of Arcs: 274220
Number of Nodes: -not built-
Number of Polygons: 136742
Polygon Topology? - Yes, topology built.
Coverage has not been edited since the last BUILD or CLEAN
User defined items required in PAT:
.   POLYID - available
.   FREQUENCY - available
.   MIN-SPOT - available
.   MEAN-SPOT - available
.   MAX-SPOT - available
.   STD-SPOT - available
(Note: Item values have not been checked on reliability!)
*** No error detected in DTM coverage EURORELIEF. Coverage ready to use.
***

REGION COVERAGE
===============
Number of Arcs: 4277
Number of Nodes: -not built-
Number of Polygons: 1581
Number of Regions.EU: 15
Number of Regions.CAND5:   20
Number of Regions.CAND12:   27
Number of Regions.NUTS0:   41
Number of Regions.NUTS1:   115
Number of Regions.NUTS2:   294
Polygon Topology? - Yes, topology built.
Coverage has not been edited since the last BUILD or CLEAN
All region subclasses required are available!
User defined items required in PAT:
.   COUNTRY - available
.   NUTS1_CODE - available
.   NUTS2_CODE - available
.   NUTS3_CODE - available
.   NUTS3_NAME - available
.   NUTS3_CENTROID - available
.   STATUS - available
.   POP_TOT - available
.   EMPLOY - available
.   GDP_EURO - available
.   GDP_PPS - available
.   POP_DENSE - available
Polygon item value test:
Number of no COUNTRY entries: 1
Number of wrong COUNTRY values: 1
Number of no STATUS entries: 0
Number of wrong STATUS values: 0
Number of wrong STATUS entries - EXTERNAL: 0
Number of wrong STATUS entries - INTERNAL: 0
Number of wrong STATUS entries – CAND5:   0

```
Number of wrong STATUS entries - CAND12:      0
Number of no NUTS1_CODE entries:              0
Number of no NUTS2_CODE entries:              0
Number of no NUTS3_CODE entries:              0
Number of no POP_TOT entries:                62
Number of no EMPLOY entries:                 84
Number of no POP_DENSE entries:              62
Number of no GDP_EURO entries:               69
Number of no GDP_PPS entries:                69
```

(Note: In polygon feature class are 51 features having no entries in mass items, since they represent islands, seas etc. They are not considered in this test!)
-> Please adjust specified item values before continuing!
User defined items required in AAT:
.   BOUNDARY - available
Arc item value test:
```
Number of no BOUNDARY entries:        0
Number of wrong BOUNDARY values:      0
```
-> Item values okay.
User defined items required in Region.cand12:
.   COUNTRY - available
Region.cand12 item value test:
```
Number of no COUNTRY entries:         0
Number of wrong COUNTRY values:       0
```
-> Item values okay.
User defined items required in Region.cand5:
.   COUNTRY - available
Region.cand5 item value test:
```
Number of no COUNTRY entries:         0
Number of wrong COUNTRY values:       0
```
-> Item values okay.
User defined items required in Region.eu:
.   COUNTRY - available
Region.eu item value test:
```
Number of no COUNTRY entries:         0
Number of wrong COUNTRY values:       0
```
-> Item values okay.
User defined items required in Region.nuts2:
.   COUNTRY - available
.   NUTS1_CODE - available
.   NUTS2_CODE - available
.   STATUS - available
.   POP_TOT - available
Region.nuts2 item value test:
```
Number of no COUNTRY entries:         1
Number of wrong COUNTRY values:       1
Number of no NUTS1_CODE entries:      0
Number of no NUTS2_CODE entries:      0
Number of no STATUS entries:          0
Number of wrong STATUS entries:       0
Number of no POP_TOT entries:        18
```
(Note, that no population data are associated with the Isle of Man and Northern Africa in the region subclasses and that for those polygons representing seas or lakes the STATUS item is not set, i.e. is blank.)
-> Please adjust specified item values before continuing!
User defined items required in Region.nuts1:
.   COUNTRY - available
.   NUTS1_CODE - available
.   STATUS - available
.   POP_TOT - available

Region.nuts1 item value test:
Number of no COUNTRY entries: 1
Number of wrong COUNTRY values: 1
Number of no NUTS1_CODE entries: 0
Number of no STATUS entries: 0
Number of wrong STATUS entries: 0
Number of no POP_TOT entries: 18
(Note, that no population data are associated with the Isle of Man and
Northern Africa in the region subclasses subclasses and that for those
polygons representing seas or lakes the STATUS item is not set, i.e. is
blank.)
-> Please adjust specified item values before continuing!
User defined items required in Region.nuts0:
.   COUNTRY - available
.   STATUS - available
.   POP_TOT - available
Region.nuts0 item value test:
Number of no COUNTRY entries: 0
Number of wrong COUNTRY values: 0
Number of no STATUS entries: 0
Number of wrong STATUS entries: 0
Number of no POP_TOT entries: 5
(Note, that no population data are associated with the Isle of Man and
Northern Africa in the region subclasses subclasses and that for those
polygons representing seas or lakes the STATUS item is not set, i.e. is
blank.)
-> Please adjust specified item values before continuing!
*** Region coverage lacks required user item(s) or shows up wrong item val-
ues! ***
*** Please use backup copy of coverage for further calculations! ***

NETWORK COVERAGE
================
Number of Arcs: 12640
Number of Nodes: 10747
Coverage has not been edited since the last BUILD or CLEAN
User defined items required in AAT:
.   COUNTRY - available
.   LINKCAT - available
.   EURID - available
.   NATID - available
.   SPEED - available
.   FERRY_TIME - available
.   TENCAT - available
.   TENALIGN - available
.   CATEGORY - available
.   PRIORITY - available
.   SLOPE_IND - available
.   AGGLO_IND - available
Arc item value test:
Number of no COUNTRY entries: 0
Number of wrong COUNTRY values: 0
Number of wrong LINKCAT values: 0
Number of no SPEED entries, although regular link: 0
Number of no FERRY_TIME entries, although ferry/Eurotunnel: 0
Number of SPEED entries, although ferry/Eurotunnel: 0
Number of FERRY_TIME entries, although regular link: 0
Number of no SLOPE_IND entries: 0

```
Number of no AGGLO_IND entries:                         0
-> Item values okay.
User defined items required in NAT:
.                                   NODETYPE - available
.                                   COUNTRY1 - available
.                                   COUNTRY2 - available
.                                   NUTS1_CODE - available
.                                   NUTS2_CODE - available
.                                   NUTS3_CODE - available
.                                   NUTS3_NAME - available
.                                   NUTS3_CENTROID - available
.                                   POP_TOT - available
.                                   EMPLOY - available
.                                   GDP_EURO - available
.                                   GDP_PPS - available
Node item value test:
Number of no COUNTRY1 entries:                          0
Number of wrong COUNTRY1 values:                        0
Number of no NODETYPE entries:                          0
Number of no POP_TOT entries, although centroid:        5
Number of no EMPLOY entries, although centroid:         9
Number of no GDP_EURO entries, although centroid:       7
Number of no GDP_PPS entries, although centroid:        7
Number of no NUTS1_CODE entries, although centroid:     0
Number of no NUTS2_CODE entries, although centroid:     0
Number of no NUTS3_CODE entries, although centroid:     0
Number of no NUTS3_NAME entries, although centroid:     0
Number of no NUTS3_CENTROID entries, although centroid: 0
Number of wrong POP_TOT entries, since no centroid:     0
Number of wrong EMPLOY entries, since no centroid:      0
Number of wrong GDP_EURO entries, since no centroid:    0
Number of wrong GDP_PPS entries, since no centroid:     0
Number of wrong NUTS1_CODE entries, since no centroid:  0
Number of wrong NUTS2_CODE entries, since no centroid:  0
Number of wrong NUTS3_CODE entries, since no centroid:  0
Number of wrong NUTS3_NAME entries, since no centroid:  0
Number of wrong NUTS3_CENTROID entries, since no centroid:  0
Number of no COUNTRY2 entries, although border node:    0
Number of wrong COUNTRY2 values, although border node:  0
Number of wrong COUNTRY2 entries, since no border node: 0
-> Please adjust specified item values before continuing!
```

*** Network coverage lacks required user item(s) or shows up wrong item values! ***
*** Please correct item values or use backup copy of coverage for further calculations! ***

SUPPORT COVERAGES
=================
The following Support Coverages should be available in directory D:/PERIPHER/SYMBOLS:
AV-LEGEND coverage - available
MM-LEGEND coverage - available
*** All support coverages required are available! ***

E.P.I. AML MACROS
=================

The following AML Macros should be available in directory
D:/PERIPHER/PROGRAMS:
AGGLO.AML - available
CALCUL.AML - not available
CENTROIDS.AML - available
DATA.AML - available
MAP-NAME.AML - available
NAME-MAP.AML - available
PLOT.AML - available
POPDENSE.AML - available
POPUL.AML - available
SLOPE.AML - available
*** At least one of the required AML macros is missing! ***
*** Please use backup copy of the missing macro(s) before continuing! ***

E.P.I. AML MENUS
================
The following AML Menus should be available in directory
D:/PERIPHER/PROGRAMS:
ARCPRESS.MENU - available
ENDMESSAGE.MENU - available
INFO-PLOT.MENU - available
PLOTTING.MENU - available
SELECTION.MENU - available
SLIDERBAR.MENU - available
WAIT.MENU - available
*** All E.P.I. AML Menus required are available! ***

PARAMETER FILES
===============
The following Parameter Files should be available in directory
D:/PERIPHER/PARAMET:
BORDER.DEL - available
CENTROIDS.NUT - available
PARA.PSS - available
SPEED.LIM - available
*** All parameter files required are available! ***

PARAMETER INFO TABLES
=====================
The following Parameter Info Tables should be available in directory
D:/PERIPHER/PARAMET:
BORDER.DELAY - available
FERRIES.STAT - available
ITEMADD.FIL - available
POPULATION.NUTS0 - available
POPULATION.NUTS1 - available
POPULATION.NUTS2 - available
RELATES.PSS – available
RESTING.ADD - available
SPEED.LIMITS - available
The following Parameter Info Tables should be available in directory
D:/PERIPHER/SYMBOLS:
AV.LUT – not available

MM.LUT - available
ITEMLIST.LUT - available
*** At least one of the required parameter info tables is missing! ***
*** Please use backup copy of the missing info table(s) before continuing!
***

SYMBOL SETS
===========
The   following   symbol   sets   should   be   available   in   directory
D:/PERIPHER/SYMBOLS:
PERIPHER.SHD - available
PERIPHER.TXT - available
*** All shade-, marker- , text- or linesets required are available! ***

CENTROIDS
=========
Number of centroids available in network coverage: 1302
Number of centroids available in ASCII input file CENTROIDS.NUT: 1302
*** Centroids in network coverage ROADNET match number and location of
those centroids indicated in ASCII file CENTROIDS.NUT! ***

CENTROID NODE VALENCES
======================
Number of centroids: 1302
... with 1 arc attached: 1302
... with more than 1 arc attached: 0
*** All centroids are appropriately connected to regular network with one
arc each!! ***

ACCESS LINKS
============
All centroids appropriately connected to regular network via functional ac-
cess links!
*** Centroid - Access Link Test okay! ***

COMPARING REGION DATA
=====================
Comparing region data between network coverage ROADNET and region coverage
NUTS3REG:
Item POP_TOT : all item values are matching between both coverages!
Item EMPLOY : all item values are matching between both coverages!
Item GDP_EURO : all item values are matching between both coverages!
Item GDP_PPS : all item values are matching between both coverages!
*** Values for mass items fully match for network coverage ROADNET and re-
gion coverage NUTS3REG! ***

E.P.I. Test ---
(C) CS, IRPUD 2000

A.4 System of Regions

The system of regions used for this study is based on the *Nomenclature of Territorial Units for Statistics* as defined by Eurostat (1999a) and equivalent regions for the accession and EFTA countries as also defined by Eurostat (1999b). Table A-10 gives a detailed tabular description of the regions with their official NUTS code, region name and name of the main city ('centroid').

Table A-10. Peripherality study regions.

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Österreich	1	Mittelburgenland	AT111	Internal	Güssing
	2	Nordburgenland	AT112	Internal	Eisenstadt
	3	Südburgenland	AT113	Internal	Oberwart
	4	Mostviertel-Eisenwurzen	AT121	Internal	Amstetten
	5	Niederöstereich-Süd	AT122	Internal	Wiener Neustadt
	6	Sankt-Pölden	AT123	Internal	St. Pölten
	7	Waldviertel	AT124	Internal	Zwettl
	8	Weinviertel	AT125	Internal	Poysdorf
	9	Wiener Umland/Nordteil	AT126	Internal	Klosterneuburg
	10	Wiener Umland/Südteil	AT127	Internal	Mödling
	11	Wien	AT13	Internal	Wien
	12	Klagenfurt-Villach	AT211	Internal	Klagenfurt
	13	Oberkärnten	AT212	Internal	Spittal
	14	Unterkärnten	AT213	Internal	St. Veit
	15	Graz	AT221	Internal	Graz
	16	Liezen	AT222	Internal	Liezen
	17	Östliche Obersteiermark	AT223	Internal	Kapfenberg
	18	Oststeiermark	AT224	Internal	Fürstenfeld
	19	West-Und Südsteiermark	AT225	Internal	Wolfsberg
	20	Westliche Obersteiermark	AT226	Internal	Murat
	21	Innviertel	AT311	Internal	Riet
	22	Linz-Wels	AT312	Internal	Linz
	23	Mühlviertel	AT313	Internal	Freistadt
	24	Steyr-Kirchdorf	AT314	Internal	Kirchdorf
	25	Traunviertel	AT315	Internal	Gmunden
	26	Lungau	AT321	Internal	Tamsweg
	27	Pinzgau-Pongau	AT322	Internal	Saalfelden
	28	Salzburg Und Umgebung	AT323	Internal	Salzburg
	29	Ausserfern	AT331	Internal	Reute
	30	Innsbruck	AT332	Internal	Innsbruck
	31	Osttirol	AT333	Internal	Lienz
	32	Tiroler Oberland	AT334	Internal	Landeck
	33	Tiroler Unterland	AT335	Internal	Kufstein
	34	Bludenz-Bregenzer Wald	AT341	Internal	Bludenz
	35	Rheintal-Bodenseegebiet	AT342	Internal	Dornbirn
Belgique/ Belgïe	36	Bruxelles/Brussel	BE1	Internal	Bruxelles
	37	Antwerpen	BE211	Internal	Antwerpen
	38	Mechelen	BE212	Internal	Mechelen
	39	Turnhout	BE213	Internal	Turnhout
	40	Hasselt	BE221	Internal	Hasselt
	41	Maaseik	BE222	Internal	Maaseik
	42	Tongeren	BE223	Internal	Tongeren
	43	Aalst	BE231	Internal	Aalst
	44	Dendermonde	BE232	Internal	Dendermonde
	45	Eeklo	BE233	Internal	Eeklo
	46	Gent-Arrondissement	BE234	Internal	Gent
	47	Oudenaarde	BE235	Internal	Oudenaarde
	48	Sint-Niklaas	BE236	Internal	St.Niklaas
	49	Halle-Vilvoorde	BE241	Internal	Halle
	50	Leuven	BE242	Internal	Leuven
	51	Brugge	BE251	Internal	Brugge

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
	52	Diksmuide	BE252	Internal	Diksmuide
	53	Ieper	BE253	Internal	Ieper
	54	Kortrijk	BE254	Internal	Kortrijk
	55	Oostende	BE255	Internal	Oostende
	56	Roeselare	BE256	Internal	Roeselare
	57	Tielt	BE257	Internal	Tielt
	58	Veurne	BE258	Internal	Veurne
	59	Brabant Wallon	BE31	Internal	Wavre
	60	Ath	BE321	Internal	Ath
	61	Charleroi	BE322	Internal	Charleroi
	62	Mons	BE323	Internal	Mons
	63	Mouscron	BE324	Internal	Mouscron
	64	Soignies	BE325	Internal	La Louviere
	65	Thuin	BE326	Internal	Thuin
	66	Tournai	BE327	Internal	Tournai
	67	Huy	BE331	Internal	Huy
	68	Liege Arrondissement	BE332	Internal	Liege
	69	Verviers	BE333	Internal	Verviers
	70	Waremme	BE334	Internal	Waremme
	71	Arlon	BE341	Internal	Arlon
	72	Bastogne	BE342	Internal	Bastogne
	73	Marche-En-Famenne	BE343	Internal	Marche-En-Famenne
	74	Neufchateau	BE344	Internal	Neufchateau
	75	Virton	BE345	Internal	Virton
	76	Dinant	BE351	Internal	Dinant
	77	Namur Arrondissement	BE352	Internal	Namur
	78	Philippeville	BE353	Internal	Philippeville
Deutschland	79	Stuttgart	DE111	Internal	Stuttgart
	80	Böblingen	DE112	Internal	Böblingen
	81	Esslingen	DE113	Internal	Esslingen am Neckar
	82	Göppingen	DE114	Internal	Göppingen
	83	Ludwigsburg	DE115	Internal	Ludwigsburg
	84	Rems-Murr-Kreis	DE116	Internal	Waiblingen
	85	Heilbronn	DE117	Internal	Heilbronn
	86	Heilbronn	DE118	Internal	Heilbronn
	87	Hohenlohekreis	DE119	Internal	Künzelsau
	88	Schwäbisch Hall	DE11A	Internal	Schwöbisch Hall
	89	Main-Tauber-Kreis	DE11B	Internal	Tauberbischofsheim
	90	Heidenheim	DE11C	Internal	Heidenheim an der Br
	91	Ostalbkreis	DE11D	Internal	Aalen
	92	Baden-Baden	DE121	Internal	Baden-Baden
	93	Karlsruhe	DE122	Internal	Karlsruhe
	94	Karlsruhe, Landkreis	DE123	Internal	Karlsruhe
	95	Rastatt	DE124	Internal	Rastatt
	96	Heidelberg	DE125	Internal	Heidelberg
	97	Mannheim	DE126	Internal	Mannheim
	98	Neckar-Odenwald-Kreis	DE127	Internal	Mosbach
	99	Rhein-Neckar-Kreis	DE128	Internal	Heidelberg
	100	Pforzheim	DE129	Internal	Pforzheim
	101	Calw	DE12A	Internal	Calw
	102	Enzkreis	DE12B	Internal	Pforzheim
	103	Freudenstadt	DE12C	Internal	Freudenstadt
	104	Freiburg im Breisgau	DE131	Internal	Freiburg im Breisgau
	105	Breisgau-Hochschwarzwald	DE132	Internal	Freiburg
	106	Emmendingen	DE133	Internal	Emmendingen
	107	Ortenaukreis	DE134	Internal	Offenburg
	108	Rottweil	DE135	Internal	Rottweil
	109	Schwarzwald-Baar-Kreis	DE136	Internal	Villingen-Schwenning
	110	Tuttlingen	DE137	Internal	Tuttlingen
	111	Konstanz	DE138	Internal	Konstanz
	112	Lörrach	DE139	Internal	Lörrach
	113	Waldshut	DE13A	Internal	Waldshut-Tiengen
	114	Reutlingen	DE141	Internal	Reutlingen
	115	Tübingen, Landkreis	DE142	Internal	Tübingen
	116	Zollernalbkreis	DE143	Internal	Balingen
	117	Ulm	DE144	Internal	Ulm

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Deutschland (cont.)	118	Alb-Donau-Kreis	DE145	Internal	Ulm
	119	Biberach	DE146	Internal	Biberach
	120	Bodenseekreis	DE147	Internal	Friedrichshafen
	121	Ravensburg	DE148	Internal	Ravensburg
	122	Sigmaringen	DE149	Internal	Sigmaringen
	123	Ingolstadt	DE211	Internal	Ingolstadt
	124	München	DE212	Internal	München
	125	Rosenheim	DE213	Internal	Rosenheim
	126	Altötting	DE214	Internal	Altötting
	127	Berchtesgadener Land	DE215	Internal	Bad Reichenhall
	128	Bad Tölz-Wolfratshausen	DE216	Internal	Bad Tölz
	129	Dachau	DE217	Internal	Dachau
	130	Ebersberg	DE218	Internal	Ebersberg
	131	Eichstätt	DE219	Internal	Eichstätt
	132	Erding	DE21A	Internal	Erding
	133	Freising	DE21B	Internal	Freising
	134	Fürstenfeldbruck	DE21C	Internal	Fürstenfeldbruck
	135	Garmisch-Partenkirchen	DE21D	Internal	Garmisch-Partenkirchen
	136	Landsberg a. Lech	DE21E	Internal	Landsberg a.Lech
	137	Miesbach	DE21F	Internal	Miesbach
	138	Mühldorf am Inn	DE21G	Internal	Mühldorf amInn
	139	München, Landkreis	DE21H	Internal	München
	140	Neuburg-Schrobenhausen	DE21I	Internal	Neuburg a.d. Donau
	141	Pfaffenhofen a. d. Ilm	DE21J	Internal	Pfaffenhofen
	142	Rosenheim.	DE21K	Internal	Rosenheim
	143	Starnberg	DE21L	Internal	Starnberg
	144	Traunstein	DE21M	Internal	Traunstein
	145	Weilheim-Schongau	DE21N	Internal	Weilheim
	146	Landshut.	DE221	Internal	Landshut
	147	Passau	DE222	Internal	Passau
	148	Straubing	DE223	Internal	Straubing
	149	Deggendorf	DE224	Internal	Deggendorf
	150	Freyung-Grafenau	DE225	Internal	Freyung
	151	Kelheim	DE226	Internal	Kelheim
	152	Landshut, Landkreis	DE227	Internal	Landshut
	153	Passau, Landkreis	DE228	Internal	Passau
	154	Regen	DE229	Internal	Regen
	155	Rottal-Inn	DE22A	Internal	Pfarrkirchen
	156	Straubing-Bogen	DE22B	Internal	Straubing
	157	Dingolfing-Landau	DE22C	Internal	Dingolfing
	158	Amberg	DE231	Internal	Amberg
	159	Regensburg	DE232	Internal	Regensburg
	160	Weiden i. d. Opf.	DE233	Internal	Weiden i.d. Opf
	161	Amberg-Sulzbach	DE234	Internal	Amberg
	162	Cham	DE235	Internal	Cham
	163	Neumarkt i.d. Opf	DE236	Internal	Neumarkt i.d. Opf.
	164	Neustadt a.d Waldnaab	DE237	Internal	Neustadt a.d. Waldnaab
	165	Regensburg, Landkreis	DE238	Internal	Regensburg
	166	Schwandorf	DE239	Internal	Schwandorf
	167	Tirschenreuth	DE23A	Internal	Tirschenreuth
	168	Bamberg	DE241	Internal	Bamberg
	169	Bayreuth	DE242	Internal	Bayreuth
	170	Coburg	DE243	Internal	Coburg
	171	Hof	DE244	Internal	Hof
	172	Bamberg, Landkreis	DE245	Internal	Bamberg
	173	Bayreuth, Landkreis	DE246	Internal	Bayreuth
	174	Coburg, Landkreis	DE247	Internal	Coburg
	175	Forchheim	DE248	Internal	Forchheim
	176	Hof, Landkreis	DE249	Internal	Hof
	177	Kronach	DE24A	Internal	Kronach
	178	Kulmbach	DE24B	Internal	Kulmbach
	179	Lichtenfels	DE24C	Internal	Lichtenfels
	180	Wunsiedel i. Fichtelgebirge	DE24D	Internal	Wunsiedel
	181	Ansbach	DE251	Internal	Ansbach
	182	Erlangen	DE252	Internal	Erlangen
	183	Fürth	DE253	Internal	Fürth
	184	Nürnberg	DE254	Internal	Nürnberg
	185	Schwabach	DE255	Internal	Schwabach

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Deutschland (cont.)	186	Ansbach, Landkreis	DE256	Internal	Ansbach
	187	Erlangen-Höchstadt	DE257	Internal	Erlangen
	188	Fürth, Landkreis	DE258	Internal	Fürth
	189	Nürnberger Land	DE259	Internal	Lauf a.d. Pegnitz
	190	Neustadt a. d. Aisch-Bad	DE25A	Internal	Neustadt a. d. Aisch
	191	Roth	DE25B	Internal	Roth
	192	Weissenburg-Gunzenhausen	DE25C	Internal	Weissenburg in Bayern
	193	Aschaffenburg	DE261	Internal	Aschaffenburg
	194	Schweinfurt	DE262	Internal	Schweinfurt
	195	Würzburg	DE263	Internal	Würzburg
	196	Aschaffenburg, Landkreis	DE264	Internal	Aschaffenburg
	197	Bad Kissingen	DE265	Internal	Bad Kissingen
	198	Rhön-Grabfeld	DE266	Internal	Bad Neustadt a. d. S.
	199	Hassberge	DE267	Internal	Hassfurt
	200	Kitzingen	DE268	Internal	Kitzingen
	201	Miltenberg	DE269	Internal	Miltenberg
	202	Main-Spessart	DE26A	Internal	Karlstadt
	203	Schweinfurt, Landkreis	DE26B	Internal	Schweinfurt
	204	Würzburg, Landkreis	DE26C	Internal	Würzburg
	205	Augsburg	DE271	Internal	Augsburg
	206	Kaufbeuren	DE272	Internal	Kaufbeuren
	207	Kempten (Allgäu)	DE273	Internal	Kempten
	208	Memmingen	DE274	Internal	Memmingen
	209	Aichach-Friedberg	DE275	Internal	Aichach
	210	Augsburg, Landkreis	DE276	Internal	Augsburg
	211	Dillingen a.d. Donau	DE277	Internal	Dillingen a. d. Donau
	212	Günzburg	DE278	Internal	Günzburg
	213	Neu-Ulm	DE279	Internal	Neu-Ulm
	214	Lindau (Bodensee)	DE27A	Internal	Lindau
	215	Ostallgäu	DE27B	Internal	Marktoberdorf
	216	Unterallgäu	DE27C	Internal	Mindelheim
	217	Donau-Ries	DE27D	Internal	Donauwörth
	218	Oberallgäu	DE27E	Internal	Sonthofen
	219	Berlin-West, Stadt	DE301	Internal	Berlin
	220	Berlin-Ost, Stadt	DE302	Internal	Berlin
	221	Brandenburg a. d. Havel	DE401	Internal	Brandenburg a. d. Havel
	222	Cottbus	DE402	Internal	Cottbus
	223	Frankfurt (Oder)	DE403	Internal	Frankfurt/ Oder
	224	Potsdam	DE404	Internal	Potsdam
	225	Barnim	DE405	Internal	Eberswalde
	226	Dahme-Spreewald	DE406	Internal	Löbben-Spreewald
	227	Elbe-Elster	DE407	Internal	Herzberg-Elster
	228	Havelland	DE408	Internal	Rathenow
	229	Märkisch-Oderland	DE409	Internal	Seelow
	230	Oberhavel	DE40A	Internal	Oranienburg
	231	Oberspreewald-Lausitz	DE40B	Internal	Senftenberg
	232	Oder-Spree	DE40C	Internal	Beeskow
	233	Ostprignitz-Ruppin	DE40D	Internal	Neuruppin
	234	Potsdam-Mittelmark	DE40E	Internal	Belzig
	235	Prignitz	DE40F	Internal	Perleberg
	236	Spree-Neisse	DE40G	Internal	Forst-Lausitz
	237	Teltow-Fläming	DE40H	Internal	Luckenwalde
	238	Uckermark	DE40I	Internal	Prenzlau
	239	Bremen	DE501	Internal	Bremen
	240	Bremerhaven	DE502	Internal	Bremerhaven
	241	Hamburg	DE6	Internal	Hamburg
	242	Darmstadt	DE711	Internal	Darmstadt
	243	Frankfurt am Main	DE712	Internal	Frankfurt am Main
	244	Offenbach am Main	DE713	Internal	Offenbach am Main
	245	Wiesbaden	DE714	Internal	Wiesbaden
	246	Bergstrasse	DE715	Internal	Heppenheim-Bergstrasse
	247	Darmstadt-Dieburg	DE716	Internal	Darmstadt
	248	Gross-Gerau	DE717	Internal	Gross-Gerau
	249	Hochtaunuskreis	DE718	Internal	Bad Homburg v. d. Höh
	250	Main-Kinzig-Kreis	DE719	Internal	Hanau
	251	Main-Taunus-Kreis	DE71A	Internal	Hofheim am Taunus
	252	Odenwaldkreis	DE71B	Internal	Erbach
	253	Offenbach, Landkreis	DE71C	Internal	Offenbach

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Deutschland (cont.)	254	Rheingau-Taunus-Kreis	DE71D	Internal	Bad Schwalbach
	255	Wetteraukreis	DE71E	Internal	Friedberg Hessen
	256	Giessen, Landkreis	DE721	Internal	Giessen
	257	Lahn-Dill-Kreis	DE722	Internal	Wetzlar
	258	Limburg-Weilburg	DE723	Internal	Limburg an der Lahn
	259	Marburg-Biedenkopf	DE724	Internal	Marburg
	260	Vogelsbergkreis	DE725	Internal	Lauterbach
	261	Kassel	DE731	Internal	Kassel
	262	Fulda	DE732	Internal	Fulda
	263	Hersfeld-Rotenburg	DE733	Internal	Bad Hersfeld
	264	Kassel, Landkreis	DE734	Internal	Kassel
	265	Schwalm-Eder-Kreis	DE735	Internal	Homberg
	266	Waldeck-Frankenberg	DE736	Internal	Korbach
	267	Werra-Meissner-Kreis	DE737	Internal	Eschwege
	268	Greifswald	DE801	Internal	Greifswald
	269	Neubrandenburg	DE802	Internal	Neubrandenburg
	270	Rostock	DE803	Internal	Rostock
	271	Schwerin	DE804	Internal	Schwerin
	272	Stralsund	DE805	Internal	Stralsund
	273	Wismar	DE806	Internal	Wismar
	274	Bad Doberan	DE807	Internal	Bad Doberan
	275	Demmin	DE808	Internal	Demmin
	276	Güstrow	DE809	Internal	Güstrow
	277	Ludwigslust	DE80A	Internal	Ludwigslust
	278	Mecklenburg-Strelitz	DE80B	Internal	Neustrelitz
	279	Müritz	DE80C	Internal	Waren
	280	Nordvorpommern	DE80D	Internal	Grimmen
	281	Nordwestmecklenburg	DE80E	Internal	Grevesmühlen
	282	Ostvorpommern	DE80F	Internal	Anklam
	283	Parchim	DE80G	Internal	Parchim
	284	Rügen	DE80H	Internal	Bergen
	285	Ücker-Randow	DE80I	Internal	Pasewalk
	286	Braunschweig	DE911	Internal	Braunschweig
	287	Salzgitter	DE912	Internal	Salzgitter
	288	Wolfsburg	DE913	Internal	Wolfsburg
	289	Gifhorn	DE914	Internal	Gifhorn
	290	Göttingen	DE915	Internal	Göttingen
	291	Goslar	DE916	Internal	Goslar
	292	Helmstedt	DE917	Internal	Helmstedt
	293	Northeim	DE918	Internal	Northeim
	294	Osterode am Harz	DE919	Internal	Osterode
	295	Peine	DE91A	Internal	Peine
	296	Wolfenbüttel	DE91B	Internal	Wolfenbüttel
	297	Hannover	DE921	Internal	Hannover
	298	Diepholz	DE922	Internal	Diepholz
	299	Hameln-Pyrmont	DE923	Internal	Hameln
	300	Hannover, Landkreis	DE924	Internal	Hannover
	301	Hildesheim	DE925	Internal	Hildesheim
	302	Holzminden	DE926	Internal	Holzminden
	303	Nienburg (Weser)	DE927	Internal	Nienburg
	304	Schaumburg	DE928	Internal	Stadthagen
	305	Celle	DE931	Internal	Celle
	306	Cuxhaven	DE932	Internal	Cuxhaven
	307	Harburg	DE933	Internal	Winsen
	308	Lüchow-Dannenberg	DE934	Internal	Lüchow
	309	Lüneburg, Landkreis	DE935	Internal	Lüneburg
	310	Osterholz	DE936	Internal	Osterholz-Scharmbeck
	311	Rotenburg (Wümme)	DE937	Internal	Rotenburg
	312	Soltau-Fallingbostel	DE938	Internal	Fallingbostel
	313	Stade	DE939	Internal	Stade
	314	Ülzen	DE93A	Internal	Ülzen
	315	Verden	DE93B	Internal	Verden
	316	Delmenhorst	DE941	Internal	Delmenhorst
	317	Emden	DE942	Internal	Emden
	318	Oldenburg	DE943	Internal	Oldenburg
	319	Osnabrück	DE944	Internal	Osnabrück
	320	Wilhelmshaven	DE945	Internal	Wilhelmshaven
	321	Ammerland	DE946	Internal	Westerstede

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Deutschland (cont.)	322	Aurich	DE947	Internal	Aurich
	323	Cloppenburg	DE948	Internal	Cloppenburg
	324	Emsland	DE949	Internal	Meppen
	325	Friesland	DE94A	Internal	Jever
	326	Grafschaft Bentheim	DE94B	Internal	Nordhorn
	327	Leer	DE94C	Internal	Leer
	328	Oldenburg , Landkreis	DE94D	Internal	Oldenburg
	329	Osnabrück, Landkreis	DE94E	Internal	Osnabrück
	330	Vechta	DE94F	Internal	Vechta
	331	Wesermarsch	DE94G	Internal	Brake (Unterweser)
	332	Wittmund	DE94H	Internal	Wittmund
	333	Düsseldorf	DEA11	Internal	Düsseldorf
	334	Duisburg	DEA12	Internal	Duisburg
	335	Essen	DEA13	Internal	Essen
	336	Krefeld	DEA14	Internal	Krefeld
	337	Mönchengladbach	DEA15	Internal	Mönchengladbach
	338	Mülheim a.d.Ruhr	DEA16	Internal	Mülheim
	339	Oberhausen	DEA17	Internal	Oberhausen
	340	Remscheid	DEA18	Internal	Remscheid
	341	Solingen	DEA19	Internal	Solingen
	342	Wuppertal	DEA1A	Internal	Wuppertal
	343	Kleve	DEA1B	Internal	Kleve
	344	Mettmann	DEA1C	Internal	Mettmann
	345	Neuss	DEA1D	Internal	Neuss
	346	Viersen	DEA1E	Internal	Viersen
	347	Wesel	DEA1F	Internal	Wesel
	348	Aachen	DEA21	Internal	Aachen
	349	Bonn	DEA22	Internal	Bonn
	350	Köln	DEA23	Internal	Köln
	351	Leverkusen	DEA24	Internal	Leverkusen
	352	Aachen, Landkreis	DEA25	Internal	Aachen
	353	Düren	DEA26	Internal	Dueren
	354	Erftkreis	DEA27	Internal	Bergheim
	355	Euskirchen	DEA28	Internal	Euskirchen
	356	Heinsberg	DEA29	Internal	Heinsberg
	357	Oberbergischer Kreis	DEA2A	Internal	Gummersbach
	358	Rheinisch-Bergischer-Kreis	DEA2B	Internal	Bergisch-Gladbach
	359	Rhein-Sieg-Kreis	DEA2C	Internal	Siegburg
	360	Bottrop	DEA31	Internal	Bottrop
	361	Gelsenkirchen	DEA32	Internal	Gelsenkirchen
	362	Münster	DEA33	Internal	Münster
	363	Borken	DEA34	Internal	Borken
	364	Coesfeld	DEA35	Internal	Coesfeld
	365	Recklinghausen	DEA36	Internal	Recklinghausen
	366	Steinfurt	DEA37	Internal	Steinfurt
	367	Warendorf	DEA38	Internal	Warendorf
	368	Bielefeld	DEA41	Internal	Bielefeld
	369	Gütersloh	DEA42	Internal	Gütersloh
	370	Herford	DEA43	Internal	Herford
	371	Höxter	DEA44	Internal	Höxter
	372	Lippe	DEA45	Internal	Detmold
	373	Minden-Lübbecke	DEA46	Internal	Minden
	374	Paderborn	DEA47	Internal	Paderborn
	375	Bochum	DEA51	Internal	Bochum
	376	Dortmund	DEA52	Internal	Dortmund
	377	Hagen	DEA53	Internal	Hagen
	378	Hamm	DEA54	Internal	Hamm
	379	Herne	DEA55	Internal	Herne
	380	Ennepe-Ruhr-Kreis	DEA56	Internal	Schwelm
	381	Hochsauerlandkreis	DEA57	Internal	Meschede
	382	Märkischer Kreis	DEA58	Internal	Lüdenscheid
	383	Olpe	DEA59	Internal	Olpe
	384	Siegen-Wittgenstein	DEA5A	Internal	Siegen
	385	Soest	DEA5B	Internal	Soest
	386	Unna	DEA5C	Internal	Unna
	387	Koblenz	DEB11	Internal	Koblenz
	388	Ahrweiler	DEB12	Internal	Bad Neuenahr-Ahrweiler
	389	Altenkirchen (Westerwald)	DEB13	Internal	Altenkirchen

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Deutschland (cont.)	390	Bad Kreuznach	DEB14	Internal	Bad Kreuznach
	391	Birkenfeld	DEB15	Internal	Birkenfeld
	392	Cochem-Zell	DEB16	Internal	Cochem
	393	Mayen-Koblenz	DEB17	Internal	Koblenz
	394	Neuwied	DEB18	Internal	Neuwied
	395	Rhein-Hunsrück-Kreis	DEB19	Internal	Simmern(Hunsrück)
	396	Rhein-Lahn-Kreis	DEB1A	Internal	Bad Ems
	397	Westerwaldkreis	DEB1B	Internal	Montabaur
	398	Trier	DEB21	Internal	Trier
	399	Bernkastel-Wittlich	DEB22	Internal	Wittlich
	400	Bitburg-Prüm	DEB23	Internal	Bitburg
	401	Daun	DEB24	Internal	Daun
	402	Trier-Saarburg	DEB25	Internal	Trier
	403	Frankenthal(Pfalz)	DEB31	Internal	Frankenthal(Pfalz)
	404	Kaiserslautern	DEB32	Internal	Kaiserslautern
	405	Landau in der Pfalz	DEB33	Internal	Landau in der Pfalz
	406	Ludwigshafen am Rhein	DEB34	Internal	Ludwigshafen am Rhein
	407	Mainz	DEB35	Internal	Mainz
	408	Neustadt an der Weinstras	DEB36	Internal	Neustadt an der Wein
	409	Pirmasens	DEB37	Internal	Pirmasens
	410	Speyer	DEB38	Internal	Speyer
	411	Worms	DEB39	Internal	Worms
	412	Zweibrücken	DEB3A	Internal	Zweibrücken
	413	Alzey-Worms	DEB3B	Internal	Alzey-Worms
	414	Bad Dürkheim	DEB3C	Internal	Bad Dürkheim
	415	Donnersbergkreis	DEB3D	Internal	Kirchheim-Bolanden
	416	Germersheim	DEB3E	Internal	Germersheim
	417	Kaiserslautern, Landkreis	DEB3F	Internal	Kaiserslautern
	418	Kusel	DEB3G	Internal	Kusel
	419	Südliche Weinstrasse	DEB3H	Internal	Landau i. d. Pfalz
	420	Ludwigshafen, Landkreis	DEB3I	Internal	Ludwigshafen a. Rhein
	421	Mainz-Bingen	DEB3J	Internal	Mainz
	422	Südwestpfalz	DEB3K	Internal	Pirmasens
	423	Stadtverband Saarbrücken	DEC01	Internal	Saarbrücken
	424	Merzig-Wadern	DEC02	Internal	Merzig
	425	Neunkirchen	DEC03	Internal	Neunkirchen
	426	Saarlouis	DEC04	Internal	Saarlouis
	427	Saarpfalz-Kreis	DEC05	Internal	Homburg
	428	Sankt Wendel	DEC06	Internal	St. Wendel
	429	Chemnitz	DED11	Internal	Chemnitz
	430	Plauen	DED12	Internal	Plauen
	431	Zwickau	DED13	Internal	Zwickau
	432	Annaberg	DED14	Internal	Annaberg-Buchholz
	433	Chemnitzer Land	DED15	Internal	Glauchau
	434	Freiberg	DED16	Internal	Freiberg
	435	Vogtlandkreis	DED17	Internal	Reichenbach
	436	Mittlerer Erzgebirgkreis	DED18	Internal	Marienberg
	437	Mittweida	DED19	Internal	Mittweida
	438	Stollberg	DED1A	Internal	Stollberg (Erzgebirge)
	439	Aue-Schwarzenberg	DED1B	Internal	Aue
	440	Zwickauer Land	DED1C	Internal	Werdau
	441	Dresden	DED21	Internal	Dresden
	442	Görlitz	DED22	Internal	Görlitz
	443	Hoyerswerda	DED23	Internal	Hoyerswerda
	444	Bautzen	DED24	Internal	Bautzen
	445	Meissen	DED25	Internal	Meissen
	446	Niederschlesischer Oberla	DED26	Internal	Görlitz
	447	Riesa-Grossenhain	DED27	Internal	Grossenhain
	448	Löbau-Zittau	DED28	Internal	Zittau
	449	Sächsische Schweiz	DED29	Internal	Pirna
	450	Weisseritzkreis	DED2A	Internal	Dippoldiswalde
	451	Kamenz	DED2B	Internal	Kamenz
	452	Leipzig	DED31	Internal	Leipzig
	453	Delitzsch	DED32	Internal	Delitzsch
	454	Döbeln	DED33	Internal	Döbeln
	455	Leipziger Land	DED34	Internal	Leipzig
	456	Muldentalkreis	DED35	Internal	Grimma
	457	Torgau-Oschatz	DED36	Internal	Torgau

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Deutschland (cont.)	458	Dessau	DEE11	Internal	Dessau
	459	Anhalt-Zerbst	DEE12	Internal	Zerbst
	460	Bernburg	DEE13	Internal	Bernburg
	461	Bitterfeld	DEE14	Internal	Bitterfeld
	462	Köthen	DEE15	Internal	Köthen
	463	Wittenberg	DEE16	Internal	Wittenberg
	464	Halle/Saale Stadtkreis	DEE21	Internal	Halle
	465	Burgenlandkreis	DEE22	Internal	Naumburg
	466	Mansfelder Land	DEE23	Internal	Eisleben
	467	Merseburg-Querfurt	DEE24	Internal	Merseburg
	468	Saalkreis	DEE25	Internal	Halle
	469	Sangerhausen	DEE26	Internal	Sangerhausen
	470	Weissenfels	DEE27	Internal	Weissenfels
	471	Magdeburg	DEE31	Internal	Magdeburg
	472	Aschersleben-Stassfurt	DEE32	Internal	Aschersleben
	473	Bördekreis	DEE33	Internal	Oschersleben
	474	Halberstadt	DEE34	Internal	Halberstadt
	475	Jerichower Land	DEE35	Internal	Burg
	476	Ohrekreis	DEE36	Internal	Haldensleben
	477	Stendal	DEE37	Internal	Stendal
	478	Quedlinburg	DEE38	Internal	Quedlinburg
	479	Schönebeck	DEE39	Internal	Schönebeck
	480	Wernigerode	DEE3A	Internal	Wernigerode
	481	Altmarkkreis Salzwedel	DEE3B	Internal	Salzwedel
	482	Flensburg	DEF01	Internal	Flensburg
	483	Kiel	DEF02	Internal	Kiel
	484	Lübeck	DEF03	Internal	Lübeck
	485	Neumünster	DEF04	Internal	Neumünster
	486	Dithmarschen	DEF05	Internal	Heide
	487	Herzogtum Lauenburg	DEF06	Internal	Ratzeburg
	488	Nordfriesland	DEF07	Internal	Husum
	489	Ostholstein	DEF08	Internal	Eutin
	490	Pinneberg	DEF09	Internal	Pinneberg
	491	Plön	DEF0A	Internal	Plön
	492	Rendsburg-Eckernförde	DEF0B	Internal	Rendsburg
	493	Schleswig-Flensburg	DEF0C	Internal	Schleswig
	494	Segeberg	DEF0D	Internal	Bad Segeberg
	495	Steinburg	DEF0E	Internal	Itzehoe
	496	Stormarn	DEF0F	Internal	Bad Oldesloe
	497	Erfurt	DEG01	Internal	Saalfeld
	498	Gera	DEG02	Internal	Gera
	499	Jena	DEG03	Internal	Jena
	500	Suhl	DEG04	Internal	Suhl
	501	Weimar	DEG05	Internal	Weimar
	502	Eichsfeld	DEG06	Internal	Heiligenstadt
	503	Nordhausen	DEG07	Internal	Nordhausen
	504	Unstrut-Hainich-Kreis	DEG09	Internal	Mühlhausen/Th.
	505	Kyffhäuserkreis	DEG0A	Internal	Sondershausen
	506	Schmalkalden-Meiningen	DEG0B	Internal	Meiningen
	507	Gotha	DEG0C	Internal	Gotha
	508	Sömmerda	DEG0D	Internal	Sömmerda
	509	Hildburghausen	DEG0E	Internal	Hildburghausen
	510	Ilm-Kreis	DEG0F	Internal	Arnstadt
	511	Weimarer Land	DEG0G	Internal	Apolda
	512	Sonneberg	DEG0H	Internal	Sonneberg
	513	Saalfeld-Rudolstadt	DEG0I	Internal	Saalfeld/Saale
	514	Saale-Holzland-Kreis	DEG0J	Internal	Eisenberg
	515	Saale-Orla-Kreis	DEG0K	Internal	Schleiz
	516	Greiz	DEG0L	Internal	Greiz
	517	Altenburger Land	DEG0M	Internal	Altenburg
	518	Eisenach	DEG0N	Internal	Eisenach
	519	Wartburgkreis	DEG0P	Internal	Bad Salzungen
Danmark	520	København Og Frederiksbe	DK001	Internal	København
	521	Københavns Amt	DK002	Internal	København
	522	Frederiksborg Amt	DK003	Internal	Helsingoer
	523	Roskilde Amt	DK004	Internal	Roskilde
	524	Vestsjaellands Amt	DK005	Internal	Slagelse

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Danmark (cont.)	525	Storstroems Amt	DK006	Internal	Naestved
	526	Bornholms Amt	DK007	Internal	Roenne
	527	Fyns Amt	DK008	Internal	Odense
	528	Soenderjyllands Amt	DK009	Internal	Aabenraa
	529	Ribe Amt	DK00A	Internal	Esbjerg
	530	Vejle Amt	DK00B	Internal	Vejle
	531	Ringkoebing Amt	DK00C	Internal	Holstebro
	532	Aarhus Amt	DK00D	Internal	Arhus
	533	Viborg Amt	DK00E	Internal	Viborg
	534	Nordjyllands Amt	DK00F	Internal	Alborg
España	535	La Coruna	ES111	Internal	Santiago De Composte
	536	Lugo	ES112	Internal	Lugo
	537	Orense	ES113	Internal	Orense
	538	Pontevedra	ES114	Internal	Vigo
	539	Principado de Asturias	ES12	Internal	Oviedo
	540	Cantabria	ES13	Internal	Santander
	541	Alava	ES211	Internal	Vitoria
	542	Guipuzcoa	ES212	Internal	Donostia-San Sebastian
	543	Vizcaya	ES213	Internal	Bilbao
	544	Comunidad Foral De Navarr	ES22	Internal	Pamplona
	545	La Riocha	ES23	Internal	Logrono
	546	Huesca	ES241	Internal	Hueska
	547	Teruel	ES242	Internal	Teruel
	548	Zaragoza	ES243	Internal	Zaragoza
	549	Comunidad de Madrid	ES3	Internal	Madrid
	550	Avila	ES411	Internal	Avila
	551	Burgos	ES412	Internal	Burgos
	552	Leon	ES413	Internal	Leon
	553	Palencia	ES414	Internal	Palencia
	554	Salamanca	ES415	Internal	Salamanca
	555	Segovia	ES416	Internal	Segovia
	556	Soria	ES417	Internal	Soria
	557	Valladolid	ES418	Internal	Valladolid
	558	Zamora	ES419	Internal	Zamora
	559	Albacete	ES421	Internal	Albacete
	560	Ciudad Real	ES422	Internal	Ciudad Real
	561	Cuenca	ES423	Internal	Cuenca
	562	Guadalajara	ES424	Internal	Guadalajara
	563	Toledo	ES425	Internal	Toledo
	564	Badajoz	ES431	Internal	Badajoz
	565	Caceres	ES432	Internal	Caceres
	566	Barcelona	ES511	Internal	Barcelona
	567	Girona	ES512	Internal	Girona
	568	Lleida	ES513	Internal	Lleida
	569	Tarragona	ES514	Internal	Tarragona
	570	Alicante	ES521	Internal	Alicante
	571	Castellon de la Plana	ES522	Internal	Castellon de la Plana
	572	Valencia	ES523	Internal	Valencia
	573	Islas Baleares	ES53	Internal	Palma
	574	Almeria	ES611	Internal	Almeria
	575	Cadiz	ES612	Internal	Cadiz
	576	Cordoba	ES613	Internal	Cordoba
	577	Granada	ES614	Internal	Granada
	578	Huelva	ES615	Internal	Huelva
	579	Jaen	ES616	Internal	Jaen
	580	Malaga	ES617	Internal	Malaga
	581	Sevilla	ES618	Internal	Sevilla
	582	Región de Murcia	ES62	Internal	Murcia
Suomi/ Finnland	583	Etelae-Savo	FI131	Internal	Mikkeli
	584	Pohjois-Savo	FI132	Internal	Joensuu
	585	Pohjois-Karjala	FI133	Internal	Joensuu
	586	Kainuu	FI134	Internal	Kajaani
	587	Keski-Suomi	FI141	Internal	Jyvaeskyla
	588	Etelä-Pohjanmaa	FI142	Internal	Kajaani
	589	Pohjanmaa	FI143	Internal	Vaasa
	590	Keski-Pohjanmaa	FI144	Internal	Kokkola

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Suomi/ Finnland (cont.)	591	Pohjois-Pohjanmaa	FI151	Internal	Oulu
	592	Lappi	FI152	Internal	Rovaniemi
	593	Uusimaa	FI161	Internal	Helsinki
	594	Itä-Uusimaa	FI162	Internal	Kotka
	595	Varsinais-Suomi	FI171	Internal	Turku Abo
	596	Satakunta	FI172	Internal	Pori
	597	Kanta-Haeme	FI173	Internal	Hämeenlinna
	598	Pirkanmaa	FI174	Internal	Tampere
	599	Päijaet-Häme	FI175	Internal	Lahti
	600	Kymenlaakso	FI176	Internal	Kouvola
	601	Etelä-Karjala	FI177	Internal	Lappeenranta
	602	Åland	FI2	Internal	Mariehamn
France	603	Paris	FR101	Internal	Paris
	604	Seine-et-Marne	FR102	Internal	Melun
	605	Yvelines	FR103	Internal	Versailles
	606	Essonne	FR104	Internal	Evry
	607	Hauts-De-Seine	FR105	Internal	Boulogne-Billancourt
	608	Seine-Saint-Denis	FR106	Internal	St. Denis
	609	Val-de-Marne	FR107	Internal	Saint-Maur
	610	Val d´Oise	FR108	Internal	Pontoise
	611	Ardennes	FR211	Internal	Charleville-Mezieres
	612	Aube	FR212	Internal	Troyes
	613	Marne	FR213	Internal	Reims
	614	Haute-Marne	FR214	Internal	Chaumont
	615	Aisne	FR221	Internal	Saint-Quentin
	616	Oise	FR222	Internal	Beauvais
	617	Somme	FR223	Internal	Amiens
	618	Eure	FR231	Internal	Evreux
	619	Seine-Maritime	FR232	Internal	Le Havre
	620	Cher	FR241	Internal	Bourges
	621	Eure-et-Loir	FR242	Internal	Chartres
	622	Indre	FR243	Internal	Chateauroux
	623	Indre-et-Loire	FR244	Internal	Tours
	624	Loir-et-Cher	FR245	Internal	Blois
	625	Loiret	FR246	Internal	Orleans
	626	Calvados	FR251	Internal	Caen
	627	Manche	FR252	Internal	Saint-Lo
	628	Orne	FR253	Internal	Alencon
	629	Cote-d´Or	FR261	Internal	Dijon
	630	Nievre	FR262	Internal	Nevers
	631	Saone-Et-Loire	FR263	Internal	Macon
	632	Yonne	FR264	Internal	Auxerre
	633	Nord	FR301	Internal	Lille
	634	Pas-de-Calais	FR302	Internal	Aras
	635	Meurthe-et-Moselle	FR411	Internal	Nancy
	636	Meuse	FR412	Internal	Verdun-sur-Meuse
	637	Moselle	FR413	Internal	Metz
	638	Vosges	FR414	Internal	Epinal
	639	Bas-Rhin	FR421	Internal	Strasbourg
	640	Haut-Rhin	FR422	Internal	Colmar
	641	Doubs	FR431	Internal	Besancon
	642	Jura	FR432	Internal	Lons-Le-Saunier
	643	Haute-Saone	FR433	Internal	Vesoul
	644	Territoire de Belfort	FR434	Internal	Belfort
	645	Loire-Atlantique	FR511	Internal	Nantes
	646	Maine-et-Loire	FR512	Internal	Angers
	647	Mayenne	FR513	Internal	Laval
	648	Sarthe	FR514	Internal	Le Mans
	649	Vendee	FR515	Internal	La Roche-sur-Yon
	650	Cotes d´Amor	FR521	Internal	Saint-Brieuc
	651	Finistere	FR522	Internal	Brest
	652	Ille-et-Vilaine	FR523	Internal	Rennes
	653	Morbihan	FR524	Internal	Lorient
	654	Charente	FR531	Internal	Angouleme
	655	Charente-Maritime	FR532	Internal	La Rochelle
	656	Deux-Sevres	FR533	Internal	Niort
	657	Vienne	FR534	Internal	Poitiers

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
France (cont.)	658	Dordogne	FR611	Internal	Perigueux
	659	Gironde	FR612	Internal	Bordeaux
	660	Landes	FR613	Internal	Mont-De-Marsan
	661	Lot-et-Garonne	FR614	Internal	Agen
	662	Pyrenees-Atlantiques	FR615	Internal	Pau
	663	Ariege	FR621	Internal	Foix
	664	Aveyron	FR622	Internal	Rodez
	665	Haute-Garonne	FR623	Internal	Toulouse
	666	Gers	FR624	Internal	Auch
	667	Lot	FR625	Internal	Cahors
	668	Hautes-Pyrenees	FR626	Internal	Tarbes
	669	Tarn	FR627	Internal	Albi
	670	Tarn-et-Garonne	FR628	Internal	Montauban
	671	Correze	FR631	Internal	Brive-la-Gaillarde
	672	Creuse	FR632	Internal	Gueret
	673	Haute-Vienne	FR633	Internal	Limoges
	674	Ain	FR711	Internal	Bourg-En-Bresse
	675	Ardeche	FR712	Internal	Privas
	676	Drome	FR713	Internal	Valence
	677	Isere	FR714	Internal	Grenoble
	678	Loire	FR715	Internal	Saint-Etienne
	679	Rhone	FR716	Internal	Lyon
	680	Savoie	FR717	Internal	Chambery
	681	Haute-Savoie	FR718	Internal	Annecy
	682	Allier	FR721	Internal	Moulins
	683	Cantal	FR722	Internal	Aurillac
	684	Haute-Loire	FR723	Internal	Le Puy
	685	Puy-De-Dome	FR724	Internal	Clermont-Ferrant
	686	Aude	FR811	Internal	Carcassonne
	687	Gard	FR812	Internal	Nimes
	688	Herault	FR813	Internal	Montpellier
	689	Lozere	FR814	Internal	Mende
	690	Pyrenees-Orientales	FR815	Internal	Perpignan
	691	Alpes-de-Haute-Provence	FR821	Internal	Digne
	692	Hautes-Alpes	FR822	Internal	Gap
	693	Alpes-Maritimes	FR823	Internal	Nice
	694	Bouches-du-Rhone	FR824	Internal	Marseille
	695	Var	FR825	Internal	Toulon
	696	Vaucluse	FR826	Internal	Avignon
	697	Corse-du-Sud	FR831	Internal	Ajaccio
	698	Haute-Corse	FR832	Internal	Bastia
Ellada	699	Evros	GR111	Internal	Alexandroupolis
	700	Xanthi	GR112	Internal	Xanthi
	701	Rodopi	GR113	Internal	Komotini
	702	Drama	GR114	Internal	Drama
	703	Kavala	GR115	Internal	Kavalla
	704	Imathia	GR121	Internal	Veroia
	705	Thessaloniki	GR122	Internal	Thessaloniki
	706	Kilkis	GR123	Internal	Kilkis
	707	Pella	GR124	Internal	Yiannitsa
	708	Pieria	GR125	Internal	Katerini
	709	Serres	GR126	Internal	Serres
	710	Chalkidiki	GR127	Internal	Salonika
	711	Grevena	GR131	Internal	Grevena
	712	Kastoria	GR132	Internal	Kastoria
	713	Kozani	GR133	Internal	Kozani
	714	Florina	GR134	Internal	Florina
	715	Karditsa	GR141	Internal	Karditsa
	716	Larisa	GR142	Internal	Larisa
	717	Magnisia	GR143	Internal	Volos
	718	Trikala	GR144	Internal	Trikala
	719	Arta	GR211	Internal	Arta
	720	Thesprotia	GR212	Internal	Parga
	721	Ioannina	GR213	Internal	Ioannina
	722	Preveza	GR214	Internal	Preveza
	723	Zakynthos	GR221	Internal	Zakynthos
	724	Kerkyra	GR222	Internal	Liapathes

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Elladac (cont.)	725	Kefallinia	GR223	Internal	Argostolion
	726	Lefkada	GR224	Internal	Levkas
	727	Aitoloakarnania	GR231	Internal	Aitolikon
	728	Achaia	GR232	Internal	Patrai
	729	Ileia	GR233	Internal	Pirgos
	730	Voiotia	GR241	Internal	Amfiklia
	731	Evvoia	GR242	Internal	Chalkis
	732	Evrytania	GR243	Internal	Karpenision
	733	Fthoitida	GR244	Internal	Lamia
	734	Fokida	GR245	Internal	Amfissa
	735	Argolida	GR251	Internal	Navplion
	736	Arkadia	GR252	Internal	Tripolis
	737	Korinthia	GR253	Internal	Korinthos
	738	Lakonia	GR254	Internal	Sparti
	739	Messinia	GR255	Internal	Kalamai
	740	Attiki	GR3	Internal	Athinai
	741	Lesvos	GR411	Internal	Mytilini
	742	Samos	GR412	Internal	Samos
	743	Chios	GR413	Internal	Chios
	744	Dodekanisos	GR421	Internal	Rodos
	745	Kyklades	GR422	Internal	Ermupolis
	746	Irakleio	GR431	Internal	Iraklion
	747	Lasithi	GR432	Internal	Sitia
	748	Rethymni	GR433	Internal	Rethimnon
	749	Chania	GR434	Internal	Kissamos
Ireland	750	Border	IE011	Internal	Sligo
	751	Midland	IE012	Internal	Port Laoise
	752	West	IE013	Internal	Galway
	753	Dublin	IE021	Internal	Dublin
	754	Mid-East	IE022	Internal	Naas
	755	Mid-West	IE023	Internal	Limerick
	756	South-East	IE024	Internal	Waterford
	757	South-West	IE025	Internal	Cork
Italia	758	Torino	IT111	Internal	Torino
	759	Vercelli	IT112	Internal	Vercelli
	760	Biella	IT113	Internal	Biella
	761	Verbano-Cusio-Ossola	IT114	Internal	Verbania
	762	Novara	IT115	Internal	Novara
	763	Cuneo	IT116	Internal	Cuneo
	764	Asti	IT117	Internal	Asti
	765	Alessandria	IT118	Internal	Alessandria
	766	Valle d´Aosta	IT12	Internal	Aosta
	767	Imperia	IT131	Internal	San Remo
	768	Savona	IT132	Internal	Sanona
	769	Genova	IT133	Internal	Genova
	770	La Spezia	IT134	Internal	La Spezia
	771	Varese	IT201	Internal	Varese
	772	Como	IT202	Internal	Como
	773	Lecco	IT203	Internal	Lecco
	774	Sondrio	IT204	Internal	Sondrio
	775	Milano	IT205	Internal	Milano
	776	Bergamo	IT206	Internal	Bergamo
	777	Brescia	IT207	Internal	Brescia
	778	Pavia	IT208	Internal	Pavia
	779	Lodi	IT209	Internal	Lodi
	780	Cremona	IT20A	Internal	Cremona
	781	Mantova	IT20B	Internal	Mantova
	782	Bolzano-Bozen	IT311	Internal	Bozen
	783	Trento	IT312	Internal	Trento
	784	Verona	IT321	Internal	Verona
	785	Vicenza	IT322	Internal	Vicenza
	786	Belluno	IT323	Internal	Belluno
	787	Treviso	IT324	Internal	Treviso
	788	Venezia	IT325	Internal	Venezia
	789	Padova	IT326	Internal	Padua
	790	Rovigo	IT327	Internal	Rovigo

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Italia (cont.)	791	Pordenone	IT331	Internal	Pordenone
	792	Udine	IT332	Internal	Udine
	793	Gorizia	IT333	Internal	Gorizia
	794	Trieste	IT334	Internal	Trieste
	795	Piacenza	IT401	Internal	Piacenza
	796	Parma	IT402	Internal	Parma
	797	Reggio Nell`Emilia	IT403	Internal	Reggio
	798	Modena	IT404	Internal	Modena
	799	Bologna	IT405	Internal	Bologna
	800	Ferrara	IT406	Internal	Ferrara
	801	Ravenna	IT407	Internal	Ravenna
	802	Forli-Cesena	IT408	Internal	Forli
	803	Rimini	IT409	Internal	Rimini
	804	Massa-Carrara	IT511	Internal	Massa
	805	Lucca	IT512	Internal	Lucca
	806	Pistoia	IT513	Internal	Pistoia
	807	Firenze	IT514	Internal	Florenz
	808	Prato	IT515	Internal	Prato
	809	Livorno	IT516	Internal	Livorno
	810	Pisa	IT517	Internal	Pisa
	811	Arezzo	IT518	Internal	Arezzo
	812	Siena	IT519	Internal	Siena
	813	Grosseto	IT51A	Internal	Grosseto
	814	Perugia	IT521	Internal	Perugia
	815	Terni	IT522	Internal	Terni
	816	Pesaro E Urbino	IT531	Internal	Pesaro
	817	Ancona	IT532	Internal	Ancona
	818	Macerata	IT533	Internal	Macerata
	819	Ascoli Piceno	IT534	Internal	Ascoli Piceno
	820	Viterbo	IT601	Internal	Viterbo
	821	Rieti	IT602	Internal	Rieti
	822	Rom	IT603	Internal	Rom
	823	Latina	IT604	Internal	Latina
	824	Frosinone	IT605	Internal	Frosinone
	825	L´Aquila	IT711	Internal	L´Aquila
	826	Teramo	IT712	Internal	Teramo
	827	Pescara	IT713	Internal	Pescara
	828	Chieti	IT714	Internal	Chieti
	829	Isernia	IT721	Internal	Isernia
	830	Campobasso	IT722	Internal	Campobasso
	831	Caserta	IT801	Internal	Caserta
	832	Benevento	IT802	Internal	Benevento
	833	Napoli	IT803	Internal	Napoli
	834	Avellino	IT804	Internal	Avellino
	835	Salerno	IT805	Internal	Salerno
	836	Foggia	IT911	Internal	Foggia
	837	Bari	IT912	Internal	Bari
	838	Taranto	IT913	Internal	Tarent
	839	Brindisi	IT914	Internal	Brindisi
	840	Lecce	IT915	Internal	Lecce
	841	Potenza	IT921	Internal	Potenza
	842	Matera	IT922	Internal	Matera
	843	Cosenza	IT931	Internal	Cosenza
	844	Crotone	IT932	Internal	Crotone
	845	Catanzaro	IT933	Internal	Catanzaro
	846	Vibo Valentia	IT934	Internal	Vibo Valentia
	847	Reggio di Calabria	IT935	Internal	Reggio di Calabria
	848	Trapani	ITA01	Internal	Trapani
	849	Palermo	ITA02	Internal	Palermo
	850	Messina	ITA03	Internal	Messina
	851	Agrigento	ITA04	Internal	Agrigento
	852	Caltanissetta	ITA05	Internal	Caltanissetta
	853	Enna	ITA06	Internal	Enna
	854	Catania	ITA07	Internal	Catania
	855	Ragusa	ITA08	Internal	Ragusa
	856	Siracusa	ITA09	Internal	Siracusa
	857	Sassari	ITB01	Internal	Sassari
	858	Nuoro	ITB02	Internal	Nuoro

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Italia (cont.)	859	Oristano	ITB03	Internal	Oristano
	860	Cagliari	ITB04	Internal	Cagliari
Luxembourg	861	Luxembourg	LU	Internal	Luxembourg
Nederland	862	Oost-Groningen	NL111	Internal	Winschoten
	863	Delfzijl en Omgeving	NL112	Internal	Appingedam
	864	Overig Groningen	NL113	Internal	Haren
	865	Noord-Friesland	NL121	Internal	Leeuwarden
	866	Zuidwest-Friesland	NL122	Internal	Sneek
	867	Zuidoost-Friesland	NL123	Internal	Drachten
	868	Noord-Drenthe	NL131	Internal	Assen
	869	Zuidoost-Drenthe	NL132	Internal	Emmen
	870	Zuidwest-Drenthe	NL133	Internal	Hoogeveen
	871	Noord-Overijssel	NL211	Internal	Zwolle
	872	Zuidwest-Overijssel	NL212	Internal	Deventer
	873	Twente	NL213	Internal	Enschede
	874	Veluwe	NL221	Internal	Apeldoorn
	875	Achterhoek	NL222	Internal	Doetinchen
	876	Arnhem/Nijmegen	NL223	Internal	Arnhem
	877	Zuidwest-Gelderland	NL224	Internal	Hertogenbosch
	878	Flevoland	NL23	Internal	Lelystad
	879	Utrecht	NL31	Internal	Utrecht
	880	Kop Van Noord-Holland	NL321	Internal	Hoorn
	881	Alkmaar en Omgeving	NL322	Internal	Alkmaar
	882	Ijmond	NL323	Internal	Ijmuiden
	883	Agglomeratie Haarlem	NL324	Internal	Haarlem
	884	Zaanstreek	NL325	Internal	Zaanstadt
	885	Groot-Amsterdam	NL326	Internal	Amsterdam
	886	Het Gooi en Vechtstreek	NL327	Internal	Hilversum
	887	Aggl. Leiden en Bollenstr	NL331	Internal	Leiden
	888	Agglomeratie S-Gravenhage	NL332	Internal	Den Haag
	889	Delft en Westland	NL333	Internal	Delft
	890	Oost Zuid-Holland	NL334	Internal	Gouda
	891	Groot-Rijnmond	NL335	Internal	Rotterdam
	892	Zuidoost Zuid-Holland	NL336	Internal	Dodrecht
	893	Zeeuwsch-Vlaanderen	NL341	Internal	Terneuzen
	894	Overig Zeeland	NL342	Internal	Middelburg
	895	West-Noord-Brabant	NL411	Internal	Rosendaal en Nispen
	896	Midden-Noord-Brabant	NL412	Internal	Tilburg
	897	Noordoost-Noord-Brabant	NL413	Internal	Oss
	898	Zuidoost-Noord-Brabant	NL414	Internal	Eindhoven
	899	Noord-Limburg	NL421	Internal	Venlo
	900	Midden-Limburg	NL422	Internal	Roermond
	901	Zuid-Limburg	NL423	Internal	Maastricht
Portugal	902	Minho-Lima	PT111	Internal	Viana Do Castelo
	903	Cavado	PT112	Internal	Braga
	904	Ave	PT113	Internal	Santo Tirso
	905	Grande Porto	PT114	Internal	Porto
	906	Tamega	PT115	Internal	Vila Real
	907	Entre Douro E Vouga	PT116	Internal	Sao Joao De Madeira
	908	Douro	PT117	Internal	Mirandela
	909	Alto Tras-Os-Montes	PT118	Internal	Braganca
	910	Baixo Vouga	PT121	Internal	Aveiro
	911	Baixo Mondego	PT122	Internal	Coimbra
	912	Pinhal Litoral	PT123	Internal	Pombal
	913	Pinhal Interior Norte	PT124	Internal	Penela
	914	Dao-Lafoes	PT125	Internal	Viseu
	915	Pinhal Interior Sul	PT126	Internal	Serta
	916	Serra da Estrela	PT127	Internal	Gois
	917	Beira Interior Norte	PT128	Internal	Guarda
	918	Beira Interior Sul	PT129	Internal	Castelo Branco
	919	Cova da Beira	PT12A	Internal	Covilha
	920	Oeste	PT131	Internal	Leiria
	921	Grande Lisboa	PT132	Internal	Lisboa
	922	Peninsula De Setubal	PT133	Internal	Setubal
	923	Medio Tejo	PT134	Internal	Abrantes

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Portugal (cont.)	924	Leziria do Tejo	PT135	Internal	Santarem
	925	Alentejo Litoral	PT141	Internal	Sines
	926	Alto Alentejo	PT142	Internal	Portalegre
	927	Alentejo Central	PT143	Internal	Evora
	928	Baixo Alentejo	PT144	Internal	Beja
	929	Algarve	PT15	Internal	Faro
Sverige	930	Stockholms Län	SE011	Internal	Stockholm
	931	Uppsala Län	SE021	Internal	Uppsala
	932	Södermanlands Län	SE022	Internal	Nyköping
	933	Östergötlands Län	SE023	Internal	Linköping
	934	Örebro Län	SE024	Internal	Örebro
	935	Västmanlands Län	SE025	Internal	Västeras
	936	Blekinge Län	SE041	Internal	Karlskrona
	937	Skane Län	SE044	Internal	Malmö
	938	Värmlands Län	SE061	Internal	Karlstadt
	939	Dalamas Län	SE062	Internal	Falun
	940	Gävleborgs Län	SE063	Internal	Gävle
	941	Västernorrlands Län	SE071	Internal	Örnsköldsvik
	942	Jämtlands Län	SE072	Internal	Östersund
	943	Västerbottens Län	SE081	Internal	Umea
	944	Norrbottens Län	SE082	Internal	Lulea
	945	Jönköpings Län	SE091	Internal	Jönköping
	946	Kronobergs Län	SE092	Internal	Växjö
	947	Kalmar Län	SE093	Internal	Kalmar
	948	Gotlands Län	SE094	Internal	Visby
	949	Hallands Län	SE0A1	Internal	Halmstad
	950	Västra Götalands Län	SE0A2	Internal	Göteborg
United Kingdom	951	Hartlepool a. Stockton-On	UKC11	Internal	Stockton-on-Tees
	952	South Teesside	UKC12	Internal	Middlesbrough
	953	Darlington	UKC13	Internal	Darlington
	954	Durham Cc	UKC14	Internal	Durham
	955	Northumberland	UKC21	Internal	Blyth
	956	Tyneside	UKC22	Internal	Newcastle upon Tyne
	957	Sunderland	UKC23	Internal	Sunderland
	958	West Cumbria	UKD11	Internal	Workington
	959	East Cumbria	UKD12	Internal	Carlisle
	960	Halton and Warrington	UKD21	Internal	Warrington
	961	Cheshire Cc	UKD22	Internal	Chester
	962	Greater Manchester South	UKD31	Internal	Manchester
	963	Greater Manchester North	UKD32	Internal	Bolton
	964	Blackburn with Darwen	UKD41	Internal	Blackburn
	965	Blackpool	UKD42	Internal	Blackpool
	966	Lancashire Cc	UKD43	Internal	Preston
	967	East Merseyside	UKD51	Internal	Kirkby
	968	Liverpool	UKD52	Internal	Liverpool
	969	Sefton	UKD53	Internal	Southport
	970	Wirral	UKD54	Internal	Birkenhead
	971	Kingston Upon Hull	UKE11	Internal	Kingston upon Hull
	972	East Riding of Yorkshire	UKE12	Internal	Bridlington
	973	Lincolnshire	UKE13	Internal	Scunthorpe
	974	York	UKE21	Internal	York
	975	North Yorkshire	UKE22	Internal	Harrogate
	976	Barnsley, Doncaster, Roth	UKE31	Internal	Rotherham
	977	Sheffield	UKE32	Internal	Sheffield
	978	Bradford	UKE41	Internal	Bradford
	979	Leeds	UKE42	Internal	Leeds
	980	Calderdale, Kirklees, Wak	UKE43	Internal	Wakefield
	981	Derby	UKF11	Internal	Derby
	982	East Derbyshire	UKF12	Internal	Chesterfield
	983	South and West Derbyshire	UKF13	Internal	Buxton
	984	Nottingham	UKF14	Internal	Nottingham
	985	North Nottinghamshire	UKF15	Internal	Mansfield
	986	South Nottinghamshire	UKF16	Internal	Newark-on-Trent
	987	Leicester	UKF21	Internal	Leicester
	988	Leicestershire Cc, Rutlan	UKF22	Internal	Hinckley
	989	Northamptonshire	UKF23	Internal	Northampton

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
United Kingdom (cont.)	990	Lincolnshire	UKF3	Internal	Lincoln
	991	Herefordshire	UKG11	Internal	Hereford
	992	Worcestershire	UKG12	Internal	Worcester
	993	Warwickshire	UKG13	Internal	Warwick
	994	Telford and Wrekin	UKG21	Internal	Telford
	995	Shropshire Cc	UKG22	Internal	Shrewsbury
	996	Stoke-on-Trent	UKG23	Internal	Stoke-on-Trent
	997	Staffordshire Cc	UKG24	Internal	Newcastle under-Lyme
	998	Birmingham	UKG31	Internal	Birmingham
	999	Solihull	UKG32	Internal	Solihull
	1000	Coventry	UKG33	Internal	Coventry
	1001	Dudley and Sandwell	UKG34	Internal	Dudley
	1002	Walsall and Wolverhampton	UKG35	Internal	Wolverhampton
	1003	Peterborough	UKH11	Internal	Peterborough
	1004	Cambridgeshire	UKH12	Internal	Cambridge
	1005	Norfolk	UKH13	Internal	Norwich
	1006	Suffolk	UKH14	Internal	Ipswich
	1007	Luton	UKH21	Internal	Luton
	1008	Bedfordshire Cc	UKH22	Internal	Bedford
	1009	Hertfordshire	UKH23	Internal	Watford
	1010	Southend-on-Sea	UKH31	Internal	Southend-on-Sea
	1011	Thurrok	UKH32	Internal	Grays
	1012	Essex Cc	UKH33	Internal	Chelmsford
	1013	Inner London-West	UKI11	Internal	London
	1014	Inner London-East	UKI12	Internal	London
	1015	Outer London-E.A.N. East	UKI21	Internal	London
	1016	Outher London-South	UKI22	Internal	London
	1017	Outer London-W.A. North W	UKI23	Internal	London
	1018	Berkshire	UKJ11	Internal	Reading
	1019	Milton Keynes	UKJ12	Internal	Milton Keynes
	1020	Buckinghamshire Cc	UKJ13	Internal	Aylesbury
	1021	Oxfordshire	UKJ14	Internal	Oxford
	1022	Brighton and Hove	UKJ21	Internal	Brighton
	1023	East Sussex Cc	UKJ22	Internal	Hastings
	1024	Surrey	UKJ23	Internal	Guildford
	1025	West Sussex	UKJ24	Internal	Chichester
	1026	Portsmouth	UKJ31	Internal	Portsmouth
	1027	Southampton	UKJ32	Internal	Southampton
	1028	Hampshire Cc	UKJ33	Internal	Winchester
	1029	Isle of Wight	UKJ34	Internal	Newport
	1030	Medway	UKJ41	Internal	Chatham
	1031	Kent	UKJ42	Internal	Maidstone
	1032	Bristol	UKK11	Internal	Bristol
	1033	N. A. Ne. Somerset, South	UKK12	Internal	Bath
	1034	Gloucestershire	UKK13	Internal	Gloucester
	1035	Swindon	UKK14	Internal	Swindon
	1036	Wiltshire Cc	UKK15	Internal	Salisbury
	1037	Bournemouth and Poole	UKK21	Internal	Bournemouth
	1038	Dorset	UKK22	Internal	Dorchester
	1039	Somerset	UKK23	Internal	Taunton
	1040	Cornwall, Isle Of Scilly	UKK3	Internal	Truro
	1041	Plymouth	UKK41	Internal	Plymouth
	1042	Torbay	UKK42	Internal	Torquay
	1043	Devon Cc	UKK43	Internal	Exeter
	1044	Isle of Anglesey	UKL11	Internal	Holyhead
	1045	Gwynedd	UKL12	Internal	Caernarfon
	1046	Conwy and Denbighshire	UKL13	Internal	Colwyn Bay
	1047	South West Wales	UKL14	Internal	Llanelli
	1048	Central Valleys	UKL15	Internal	Rhondda
	1049	Gwent Valleys	UKL16	Internal	Abertillery
	1050	Bridgend, Neath Port Talb	UKL17	Internal	Neath
	1051	Swansea	UKL18	Internal	Swansea
	1052	Monmouthshire, Newport	UKL21	Internal	Monmouth
	1053	Cardiff, Vale of Glamorga	UKL22	Internal	Cardiff
	1054	Flintshire And Wraxham	UKL23	Internal	Wrexham
	1055	Powys	UKL24	Internal	Newtown
	1056	Aberdeenshire, North East	UKM11	Internal	Aberdeen
	1057	Angus, Dundee City	UKM21	Internal	Dundee

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
United Kingdom (cont.)	1058	Clackmannanshire and Fife	UKM22	Internal	Dunfermline
	1059	East Lothian And Midlothi	UKM23	Internal	Dunbar
	1060	Scottish Borders	UKM24	Internal	Gordon
	1061	Edinburgh	UKM25	Internal	Edinburgh
	1062	Falkirk	UKM26	Internal	Falkirk
	1063	Perth, Kinross, Stirling	UKM27	Internal	Stirling
	1064	West Lothian	UKM28	Internal	Livingston
	1065	East A. West Dunbartonshi	UKM31	Internal	Dumbarton
	1066	Dumfries and Galloway	UKM32	Internal	Dumfries
	1067	E.A.N. Ayrshire, Mainland	UKM33	Internal	Kilmarnock
	1068	Glasgow City	UKM34	Internal	Glasgow
	1069	Inverclyde, East Renfrews	UKM35	Internal	Paisly
	1070	North Lanarkshire	UKM36	Internal	Coatbridge
	1071	South Ayrshire	UKM37	Internal	Ayr
	1072	South Lanarkshire	UKM38	Internal	East Kilbride
	1073	Caithness,Sutherland,Ross	UKM41	Internal	Wick
	1074	Badenoch, Strathspey, Loc	UKM42	Internal	Inverness
	1075	Lochaber,Skye,Lochalsh,Ar	UKM43	Internal	Oban
	1076	Eilean Siar (Western Isle	UKM44	Internal	Stornoway
	1077	Orkney Islands	UKM45	Internal	Kirkwall
	1078	Shetland Islands	UKM46	Internal	Lerwick
	1079	Belfast	UKN01	Internal	Belfast
	1080	Outer Belfast	UKN02	Internal	Lisburn
	1081	East of Northern Ireland	UKN03	Internal	Ballymena
	1082	North of Northern Ireland	UKN04	Internal	Londonderry
	1083	W.A.S. of Notrthern Ireand	UKN05	Internal	Omagh
Shqipëria	1084	Shqipëria	AL	External	Tiranë
Bosna i Hercego-vina	1085	Bosna i Hercegovina	BA	External	Sarajevo
Bălgarija	1086	Sofia Stolitsa	BG1	Candidate	Sofija
	1087	Varna	BG201	Candidate	Varna
	1088	Veliko Turnova	BG202	Candidate	Veliko Tarnovo
	1089	Vidin	BG203	Candidate	Vidin
	1090	Vratsa	BG204	Candidate	Bjala Slatina
	1091	Gabrovo	BG205	Candidate	Gabrovo
	1092	Dobrich	BG206	Candidate	Dobrih
	1093	Lovech	BG207	Candidate	Lovec
	1094	Montana	BG208	Candidate	Michajlovgrad
	1095	Pleven	BG209	Candidate	Pleven
	1096	Razgrad	BG20A	Candidate	Razgrad
	1097	Ruse	BG20B	Candidate	Ruse
	1098	Silistra	BG20C	Candidate	Silistra
	1099	Targovishte	BG20D	Candidate	Targoviste
	1100	Shumen	BG20E	Candidate	Sumen
	1101	Blagoevgrad	BG301	Candidate	Blagoevgrad
	1102	Burgas	BG302	Candidate	Burgas
	1103	Kurdjali	BG303	Candidate	Kardzali
	1104	Kyustendil	BG304	Candidate	Kjustendil
	1105	Pazardzhik	BG305	Candidate	Pazardzik
	1106	Pernik	BG306	Candidate	Pernik
	1107	Plovdiv	BG307	Candidate	Plovdiv
	1108	Sliven	BG308	Candidate	Sliven
	1109	Smolyan	BG309	Candidate	Smoljan
	1110	Sofia	BG30A	Candidate	Botevgrad
	1111	Stara Zagora	BG30B	Candidate	Stara Zagora
	1112	Haskovo	BG30C	Candidate	Chaskovo
	1113	Yambol	BG30D	Candidate	Jambol
Belarus	1114	Belarus	BY	External	Minsk
Schweiz	1115	Vaud	CH011	External	Lausanne
	1116	Valais	CH012	External	Sion
	1117	Geneve	CH013	External	Geneve
	1118	Bern	CH021	External	Bern

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Schweiz (cont.)	1119	Freiburg	CH022	External	Fribourg
	1120	Solothurn	CH023	External	Solothurn
	1121	Neuchatel	CH024	External	Neuchatel
	1122	Jura	CH025	External	Delemont
	1123	Basel-Stadt	CH031	External	Basel
	1124	Basel-Landschaft	CH032	External	Liestal
	1125	Aargau	CH033	External	Aarau
	1126	Zürich	CH04	External	Zürich
	1127	Glarus	CH051	External	Glarus
	1128	Schaffhausen	CH052	External	Schaffhausen
	1129	Appenzell-Ausserrhoden	CH053	External	Herisau
	1130	Appenzell-Innerrhoden	CH054	External	Appenzell
	1131	St.Gallen	CH055	External	St.Gallen
	1132	Graubünden	CH056	External	Chur
	1133	Thurgau	CH057	External	Frauenfeld
	1134	Luzern	CH061	External	Luzern
	1135	Uri	CH062	External	Altdorf
	1136	Schwyz	CH063	External	Schwyz
	1137	Obwalden	CH064	External	Sarnen
	1138	Nidwalden	CH065	External	Stans
	1139	Zug	CH066	External	Zug
	1140	Ticino	CH07	External	Bellinzona
Cyprus	1141	Cyprus	CY	Candidate	Nicosia
Česko	1142	Praha	CZ01	Candidate	Praha
	1143	Stredocesky	CZ02	Candidate	Kladno
	1144	Ceskobudejovicky	CZ031	Candidate	Ceske Budejovice
	1145	Plzensky	CZ032	Candidate	Plzen
	1146	Karlovarsky	CZ041	Candidate	Karlovy Vary
	1147	Ustecky	CZ042	Candidate	Teplice
	1148	Liberecky	CZ051	Candidate	Liberec
	1149	Kralovehradecky	CZ052	Candidate	Hradec Kralove
	1150	Pardubicky	CZ053	Candidate	Pardubice
	1151	Jihlavsky	CZ061	Candidate	Jihlava
	1152	Brnensky	CZ062	Candidate	Brno
	1153	Olomoucky	CZ071	Candidate	Olomouc
	1154	Zlinsky	CZ072	Candidate	Zlin
	1155	Ostravsky	CZ08	Candidate	Ostrava
Eesti	1156	Pohja-Eesti	EE001	Candidate	Tallin
	1157	Kesk-Eesti	EE002	Candidate	Paide
	1158	Kirde-Eesti	EE003	Candidate	Kohtla-Jaerve
	1159	Laeaene-Eesti	EE004	Candidate	Paernu
	1160	Louna-Eesti	EE005	Candidate	Tartu
Hrvatska	1161	Hrvatska	HR	External	Zagreb
Magyarország	1162	Budapest	HU011	Candidate	Budapest
	1163	Pest	HU012	Candidate	Goedoelloe
	1164	Fejer	HU021	Candidate	Szekesfehervar
	1165	Komarom-Esztergom	HU022	Candidate	Tatabanya
	1166	Veszprem	HU023	Candidate	Veszprem
	1167	Gyor-Moson-Sopron	HU031	Candidate	Gyoer
	1168	Vas	HU032	Candidate	Szombathely
	1169	Zala	HU033	Candidate	Zalaegerszeg
	1170	Baranya	HU041	Candidate	Pecs
	1171	Somogy	HU042	Candidate	Kaposvar
	1172	Tolna	HU043	Candidate	Szekszard
	1173	Borsod-Abauj-Zemplen	HU051	Candidate	Miskolc
	1174	Heves	HU052	Candidate	Eger
	1175	Nograd	HU053	Candidate	Salgotarjan
	1176	Hajdu-Bihar	HU061	Candidate	Debrecen
	1177	Jasz-Nagykun-Szolnok	HU062	Candidate	Szolnok
	1178	Szabolcs-Szatmar-Bereg	HU063	Candidate	Nyiregyhaza
	1179	Bacs-Kiskun	HU071	Candidate	Kecskemet
	1180	Bekes	HU072	Candidate	Bekescsaba

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Magyarország	1181	Csongrad	HU073	Candidate	Szeged
Island	1182	Island	IS	External	Reykjavik
Liechtenstein	1183	Liechtenstein	LI	External	Vaduz
Lietuva	1184	Alytaus (Apskritis)	LT001	Candidate	Alytus
	1185	Kauno (Apskritis)	LT002	Candidate	Kaunas
	1186	Klaipedos (Apskritis)	LT003	Candidate	Klaipeda
	1187	Marijampoles (Apskritis)	LT004	Candidate	Marijampole
	1188	Panevezio (Apskritis)	LT005	Candidate	Panevezys
	1189	Siauliu (Apskritis)	LT006	Candidate	Siauliai
	1190	Taurages (Apskritis)	LT007	Candidate	Taurage
	1191	Telsiu (Apskritis)	LT008	Candidate	Plunge
	1192	Utenos (Apskritis)	LT009	Candidate	Utena
	1193	Vilniaus (Apskritis)	LT00A	Candidate	Vilnius
Latvija	1194	Riga	LV001	Candidate	Riga
	1195	Vidzeme	LV002	Candidate	Valmiera
	1196	Kurzeme	LV003	Candidate	Liepaja
	1197	Kurzeme	LV004	Candidate	Jelgava
	1198	Latgale	LV005	Candidate	Daugavpils
Malta	1199	Malta	MA	Candidate	Valetta
Moldova	1200	Moldova	MD	External	Chisinau
Republica Makedonija	1201	Makedonija	MK	External	Skopje
Norge	1202	Oslo	NO011	External	Oslo
	1203	Akershus	NO012	External	Lillestroem
	1204	Hedmark	NO021	External	Hamar
	1205	Oppland	NO022	External	Lillehammer
	1206	Ïstfold	NO031	External	Moss
	1207	Buskerud	NO032	External	Drammen
	1208	Vestfold	NO033	External	Tonsberg
	1209	Telemark	NO034	External	Skien
	1210	Aust-Agder	NO041	External	Arendal
	1211	Vest-Agder	NO042	External	Kristiansand
	1212	Rogaland	NO043	External	Stavanger
	1213	Hordaland	NO051	External	Bergen
	1214	Sogn Og Fjordane	NO052	External	Hermansverk
	1215	Mïre Og Romsdal	NO053	External	Molde
	1216	Sïr-Trïndelag	NO061	External	Trondheim
	1217	Nord-Trïndelag	NO062	External	Steinkjer
	1218	Nordland	NO071	External	Bodo
	1219	Troms	NO072	External	Tromso
	1220	Finnmark	NO073	External	Vadso
Polska	1221	Dolnoslaskie	PL01	Candidate	Wroclaw
	1222	Kujawsko-Pomorskie	PL02	Candidate	Torun
	1223	Lubelskie	PL03	Candidate	Lublin
	1224	Lubuskie	PL04	Candidate	Zielona Gora
	1225	Lubuskie	PL05	Candidate	Lodz
	1226	Malopolskie	PL06	Candidate	Krakow
	1227	Mazowieckie	PL07	Candidate	Warszawa
	1228	Opolskie	PL08	Candidate	Opole
	1229	Podkarpackie	PL09	Candidate	Rzeszow
	1230	Podlaskie	PL0A	Candidate	Bialystok
	1231	Pomorskie	PL0B	Candidate	Gdansk
	1232	Slaskie	PL0C	Candidate	Katowice
	1233	Swietokrzyskie	PL0D	Candidate	Kielce
	1234	Warminsko-Mazurskie	PL0E	Candidate	Elblag
	1235	Wielkopolskie	PL0F	Candidate	Poznan
	1236	Zachodniopomorskie	PL0G	Candidate	Szczecin
România	1237	Bacau	RO011	Candidate	Bacau

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
România (cont.)	1238	Botosani	RO012	Candidate	Botosani
	1239	Iasi	RO013	Candidate	Iasi
	1240	Neamt	RO014	Candidate	Piatra-Neamt
	1241	Suceava	RO015	Candidate	Suceava
	1242	Vaslui	RO016	Candidate	Vaslui
	1243	Braila	RO021	Candidate	Braila
	1244	Buzau	RO022	Candidate	Buzau
	1245	Constanta	RO023	Candidate	Constanta
	1246	Galati	RO024	Candidate	Galati
	1247	Tulcea	RO025	Candidate	Tulcea
	1248	Vrancea	RO026	Candidate	Focsani
	1249	Arges	RO031	Candidate	Pitesti
	1250	Calarasi	RO032	Candidate	Calarasi
	1251	Dambovita	RO033	Candidate	Tirgoviste
	1252	Giurgiu	RO034	Candidate	Giurgiu
	1253	Ialomita	RO035	Candidate	Slobozia
	1254	Prahova	RO036	Candidate	Ploiesti
	1255	Teleorman	RO037	Candidate	Alexandria
	1256	Dolj	RO041	Candidate	Craiova
	1257	Gorj	RO042	Candidate	Tirgu Jiu
	1258	Mehedinti	RO043	Candidate	Drobeta-Turnu Severi
	1259	Olt	RO044	Candidate	Slatina
	1260	Valcea	RO045	Candidate	Rimnicu Vilcea
	1261	Arad	RO051	Candidate	Arad
	1262	Caras-Severin	RO052	Candidate	Resita
	1263	Hunedoara	RO053	Candidate	Deva
	1264	Timis	RO054	Candidate	Timisoara
	1265	Bihor	RO061	Candidate	Oradea
	1266	Bistrita-Nasaud	RO062	Candidate	Bistrita
	1267	Cluj	RO063	Candidate	Cluj-Napoca
	1268	Maramures	RO064	Candidate	Baia Mare
	1269	Satu Mare	RO065	Candidate	Satu Mare
	1270	Salaj	RO066	Candidate	Zalau
	1271	Alba	RO071	Candidate	Alba Iulia
	1272	Brasov	RO072	Candidate	Brasov
	1273	Covasna	RO073	Candidate	Sfintu Gheorghe
	1274	Harghita	RO074	Candidate	Miercurea-Ciuc
	1275	Mures	RO075	Candidate	Tirgu Mures
	1276	Sibiu	RO076	Candidate	Sibiu
	1277	Bucuresti	RO081	Candidate	Bucuresti
	1278	Ilfov	RO082	Candidate	Afumati
Rossija	1279	Rossija	RU	External	Moskva
Slovenija	1280	Pomurska	SI001	Candidate	Murska Sobota
	1281	Podravska	SI002	Candidate	Maribor
	1282	Koroska	SI003	Candidate	Ravne Na Koroskem
	1283	Savinjska	SI004	Candidate	Celje
	1284	Zasavska	SI005	Candidate	Trbovlje
	1285	Spodnjeposavska	SI006	Candidate	Brezice
	1286	Dolenjska	SI007	Candidate	Novo Mesto
	1287	Osrednjeslovenska	SI008	Candidate	Ljubljana
	1288	Gorenjska	SI009	Candidate	Kranj
	1289	Notranjsko-Kraska	SI00A	Candidate	Postojna
	1290	Goriska	SI00B	Candidate	Nova Gorica
	1291	Obalno-Kraska	SI00C	Candidate	Kozina
Slovensko	1292	Bratislavsky Kraj	SK01	Candidate	Bratislava
	1293	Tmavsky Kraj	SK021	Candidate	Trnava
	1294	Trenciansky Kraj	SK022	Candidate	Trencin
	1295	Nitriansky Kraj	SK023	Candidate	Nitra
	1296	Zilinsky Kraj	SK031	Candidate	Zilina
	1297	Banskobystricky Kraj	SK032	Candidate	Banska Bystrica
	1298	Presovsky Kraj	SK041	Candidate	Presov
	1299	Kosicky Kraj	SK042	Candidate	Kosice
Türkiye	1300	Türkiye	TR	External	Istanbul

Table A-10. Peripherality study regions (cont.).

Country	No	NUTS-3 region	NUTS-3 or equivalent code	Internal / External	Centroid
Ukraina	1301	Ukraina	UA	External	Kyiv
Jugoslavija	1302	Jugoslavija	YU	External	Beograd

Notes:

The column 'Internal/External' in the above table represents the status of the regions with respect to their relationship to the European Union. 'Internal' represent regions of member states of the European Union. 'Candidate' indicates accession countries. 'External' represents regions located in other European countries, who are neither member states of the European Union nor accession countries.

For Bulgaria, the system of region reflects the state of February, 1999; the new NUTS 2 level is still pending legislation anticipated in June/July 1999. The region system for Poland represents a temporary coding based on NUTS-2 equivalent regions, since new region codings for levels 1 and 3 are still under negotiation (Eurostat, 1999b).