

APPROACH TO THE CREATION OF GIS FOR THE GOALS OF REGIONAL
PLANNING
(the example of the East Thames Gateway, South-East London and Kent)

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1. Introduction.

The broad policy goals of the regional planning influence the organization, structure and characteristics of GIS. The development of planning strategies points to the use of particular types of hardware and software, statistical and spatial databases and forms of mathematical analysis. This paper describes an attempt to create a GIS for regional and urban planning, where the aim is to link the process of decision making in planning with the scientific analysis of information.

2. GIS for regions and cities.

GIS as a new technology can help us to solve a range of problems. From our point of view GIS for regions has to include several stages:

- selection or creation of the basic map;
- working out of the database (spatial and statistical);
- calculations (correlation, factor, cluster analysis, etc.) in order to find links between parameters and determine real groups of territorial units;
- modeling: 'vertical' models (econometrical, dynamic, etc.); 'horizontal' models (fields of potential, 2-3 dimensional dynamic PC modeling);
- mapping;
- analysis of spatial distribution of parameters.

Different research goals involve different types of databases and different sets of mathematical methods. For instance, a comparison of series of maps which were made on different themes can give us a full picture of current situation in urban sphere. There can be such blocks in the research as series of analytical maps showing the development of urban area, synthetic maps of land use, characteristics of population. Some procedures allows to display the changes in urbanized area over time.

The final goal of using GIS technology is a creation of system of **socio-economic monitoring** of urban areas permitting to watch changes of urban situation on the maps as soon as new data appear.

3. Database.

The study uses spatial information at two levels: wards and enumeration districts. The example of different scales of the spatial database is shown on Fig.1. The first level (wards for South-East London and Kent) is most suitable for meso-scale investigations such as the comparison of the East Thames Gateway area with other parts of Kent

County or with the adjacent Euroregion. The second, more detailed scale (enumeration districts for Dartfort) is useful for the delimitation of places and localities such as those in social decline or those which are prospering.

Different socio-economic statistical information sets are used. The first is of variables from the National Census of Population (1991) which is a primary source of information for socio-economic analysis. Totally database consists of approximately 200 variables.

We will describe the first set of information which concerns:

* Employment structure:

- | | |
|---------------------------------------|-------------------------------|
| 1. agriculture, forestry and fishing; | 6. construction; |
| 2. energy and water; | 7. distribution and catering; |
| 3. mining; | 8. transport; |
| 4. manufacturing metal (manuf1); | 9. banking and finance; |
| 5. other manufacturing (manuf2); | 10. services. |

for:

- a) people working **inside** the district of usual residence, %;
- b) people working **outside** of the district of usual residence, %.

* People working outside the district of usual residence, %.

These variables show "local" and "metropolitan" employment, the extent of commuting in the region influenced by the world city. That aspect is important for the description of the metropolitan area as labor force is formed here not only by balance of birth/death rates or by migration but mainly by commuting. This part of the database was considered as an example of possibilities of GIS technology in terms of supporting the planning works.

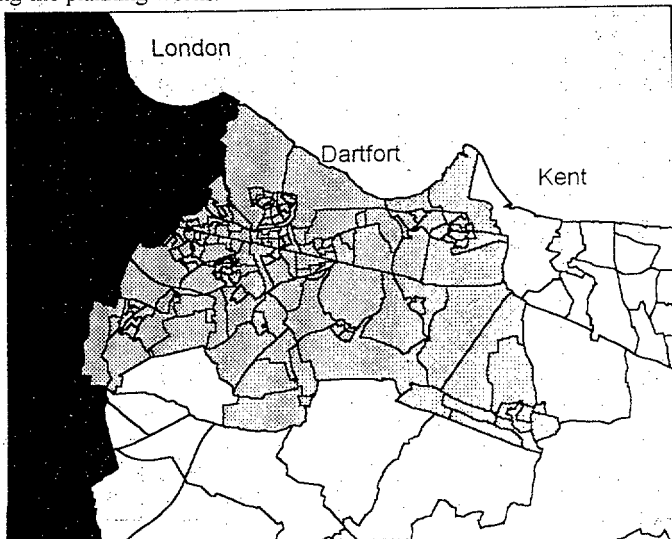


Fig. 1. Wards and enumeration districts.

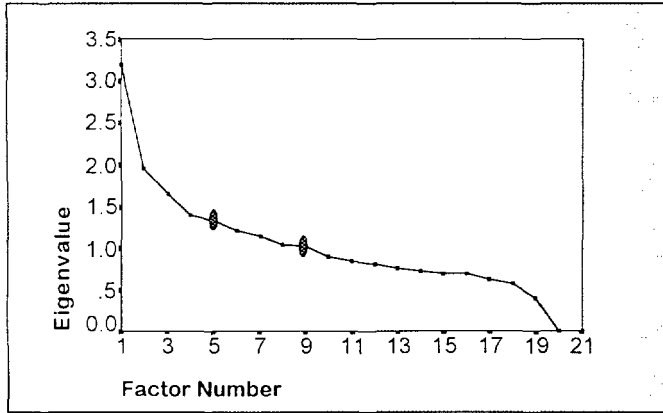


Fig. 2. Factor plot.

Factor	Pct of Var	Cum Pct
1	15.2	15.2
2	9.3	24.6
3	7.9	32.5
4	6.6	39.1
5	6.4	45.4
6	5.8	51.2
7	5.4	56.6
8	4.9	61.6
9	4.8	66.4

Table 1.

Variables	Factors								
	1	2	3	4	5	6	7	8	9
Out/district									
Agriculture	0.3	-0.2	-0.5	0.1	0.1	0.2	-0.1	-0.4	0.3
Energy	0.0	0.0	0.3	0.4	-0.2	-0.1	0.4	0.4	0.4
Mining	0.4	0.0	0.1	-0.2	-0.2	-0.5	0.1	-0.4	0.1
Manufact.1	0.4	0.4	0.1	-0.1	0.1	-0.3	0.3	0.0	0.3
Manufact.2	0.2	0.5	0.1	0.3	0.1	0.0	0.0	0.1	0.0
Construction	0.5	-0.1	0.0	-0.2	-0.1	0.4	-0.1	-0.2	0.2
Distribution	0.1	0.1	-0.5	-0.2	0.2	-0.2	-0.5	0.5	0.0
Transport	0.3	-0.5	0.3	-0.3	0.0	0.1	-0.1	0.2	-0.2
Banking	-0.6	0.4	0.1	0.1	-0.3	0.3	-0.1	-0.3	-0.1
Services	-0.6	-0.4	-0.1	0.1	0.2	0.0	0.4	0.0	-0.2
In/district									
Agriculture	0.1	0.0	-0.8	0.1	-0.1	0.0	0.3	0.0	-0.1
Energy	0.1	-0.1	0.1	-0.5	-0.3	0.3	0.3	0.2	-0.2
Mining	0.4	0.1	-0.1	0.5	0.2	0.2	0.2	0.0	-0.3
Manufact.1	0.4	0.3	0.3	0.0	0.4	0.1	0.1	-0.1	-0.2
Manufact.2	0.5	0.2	0.1	0.2	0.1	-0.1	-0.3	-0.1	-0.4
Construction	0.0	0.3	0.0	-0.4	0.4	0.3	0.2	0.1	0.4
Distribution	0.2	0.4	0.0	-0.2	-0.6	-0.2	0.0	0.1	-0.1
Transport	0.3	-0.5	0.2	0.4	-0.1	0.3	-0.3	0.1	0.2
Banking	-0.5	0.2	0.0	0.2	-0.3	0.1	-0.2	0.0	0.2
Services	-0.6	-0.4	0.3	-0.1	0.2	-0.4	0.0	-0.2	0.1
Work/out	-0.6	0.4	0.1	-0.1	0.3	0.1	-0.1	0.0	0.0

Table 2. Factor matrix.

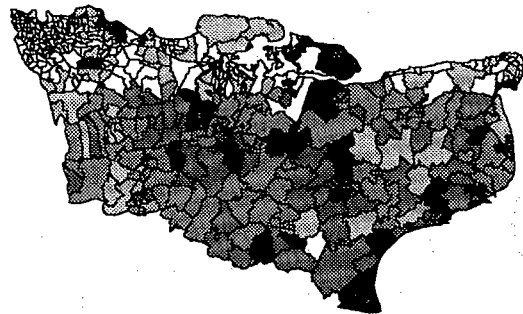
Factor 1. Polarisation of areas with manufacturing and construction (+ black) and with banking and services specialisation and high percent of people working outside the district of usual residence (- white). Factor of social polarisation (blue and white collars). Map is on Fig. 3-A.

Factor 2. Polarisation of transport and services areas (- white) and areas with 'local' distribution and people working in banking and manufacturing outside the district of usual residence (+ black). Factor of suburbanisation. Map is on Fig.3-B.

Factor 3. Localisation of agricultural areas (- white). Map is on Fig.3-C.

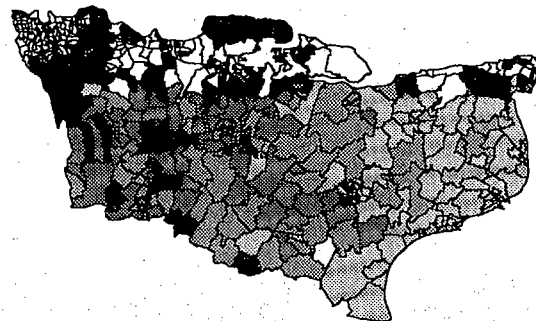
Table 3. Factors.

A: Factor 1



South-East London and Kent
Map 1. Factor analysis of employment structure.

B: Factor 2



C: Factor 3

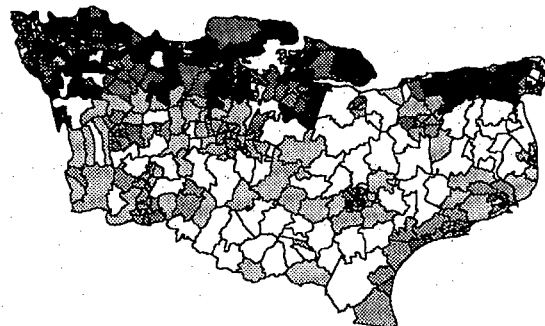


Fig. 3.

4. Hardware and software.

The PC is the normal platform for research and analysis although the added speed and power of the workstation is used for more complex calculations and larger databases. For statistical analysis SPSS software package was used, for mapping and spatial analysis ARC/INFO.

5. Statistical and spatial analysis.

With the help of standard procedures factor analysis of selected variables was carried out.

5.1. Results of factor analysis are presented below. Nine factors describe the most important links in the database (Fig. 2), they explain 45.4% of variation (Table1). Factors are defined in rotated factor matrix (Table2) three factors are described in Table 3. The first two factors have the most interesting interpretation and spatial distribution. The first one shows the social polarization (blue and white collars), the second one shows the effect of suburbanisation.

6. Mapping. Series of maps (Fig. 3) presents the results of factor analysis. It is useful for the definition of different problems with employment and commuting in different parts of metropolitan area. On the other hand this series of maps helps to realize the specific nature in employment and commuting in East Thames Gateway as an object of planning attention.

7. Results and conclusions. The work described above investigates the relationship between the identification of planning goals and the creation of a GIS. The study critically analyses various types of software and information sets for their GIS properties and interconnections. The work progresses through simple thematic maps to those which express more complex analysis using clusters and indices. These are compared with official planning statements and policy maps. This results in a more critical understanding of the relationship between the spatial expression of planning policy on the one hand and the contribution of social science analysis tools on the other.

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