

The focus of the research will be on the modifiable areal unit problem (MAUP) within which two aspects will be considered: the scale problem and the aggregation problem. The scale problem is defined as a volatility of the results of analysis under the impact of a change in the aggregation scale. In the case of aggregation, what is indicated is the volatility of the obtained research results under the impact of a change in a composition of territorial units at an accepted aggregation scale. The research question formulated in the project has the following wording: 'Assuming what aggregation scale and composition of territorial units would allow the obtainment of the correct results of spatial economic analysis carried out within the research problem posed.'

The main research objective of the project is to develop a methodological approach which allows the reduction of the impact of economies of scale and of the aggregation effect on the results of spatial analyses. The realisation of the main research objective requires identifying a number of specific objectives:

- Specific objective 1: Redefining the scale problem and the aggregation problem.
- Specific objective 2: Identifying the scale problem and the aggregation problem for spatial economic analyses.
- Specific objective 3: Formulating the conditions for a correct description of economic phenomena considered in spatial terms
- Specific objective 4: Developing a method for dealing with the scale problem or the aggregation problem
- Specific objective 5: Applying the solutions developed for selected economic issues.

Original research will be conducted within the research project with a view to systemising and completing the knowledge in the scope of the modifiable areal unit problem. The research work will be both methodological and empirical. The realisation of the major research objective will allow the formulation of a redefinition of the scale problem and the aggregation problem. That will require from researchers analysing the current research achievements in the area and, later, coining new concepts that will help define new issues. Basic conditions necessary for maintaining the correctness of analysis based on spatial data will be indicated. Also, a concept of a quasi-composition of areas will be proposed.

Theoretical considerations will be deepened by empirical research where the scale problem and the aggregation problem will be analysed comprehensively based on the example of selected economic phenomena. In the case of the scale problem, empirical research will be linked to simulation analyses. The simulation analysis will use random field methods applied for irregular areas. However, in accordance with the proposed redefinition, the aggregation problem will be analysed exclusively within deepened empirical studies conducted for selected economic phenomena.

The major advantage of the project will be a proposal of the redefinition of the scale and aggregation problems which will be linked to a quasi-composition of regions. The present work will complete the methodological and implementation gaps within the modifiable areal unit problem. Profound empirical studies of selected economic phenomena will be conducted for the two issues and they are going to contribute to the enrichment of the knowledge in a selected area of spatial econometrics. Spatial analysis of phenomena without a skilful consideration of the scale problem may lead to an erroneous interpretation of findings.

The scale problem examined within the research project is of great importance to official statistics services (GUS, Eurostat) and for maintaining the correctness of spatial empirical analyses performed. Statistical data made available within the framework of official statistics are not available for all levels of aggregation. Most statistics are made public for higher levels of aggregation than for the ones actually obtained. If, as a result of data aggregation, the measurement of phenomena properties could be changed, we should stay aware of this fact and include it in the current research. A method for determining the appropriate systems of territorial units included in the draft proposal can be the basis for delimitation issues.

The solutions developed within the project will be applied for selected economic phenomena. The following problem will be dealt with changes in selected properties of the diagnostic variables and synthetic variables resulting from changes in the level of aggregation. This issue will be considered based on the example of the determinants of socio-economic development, GDP per capita, unemployment rate, the level of wages, labour productivity, the level of investment and the value of fixed assets in enterprises per capita, the share of the working population in different sectors of the economy or the number of business entities registered in REGON per capita. All of these variables will be examined at several levels of aggregation, which will allow the assessment of the impact of the scale problem on selected properties of variables and on the results of measuring the level of socio-economic development on the basis of the synthetic variable.

The problem of the delimitation of the following issues will also be dealt with:

1. Identifying the boundaries of metropolitan areas in Poland. Determining the impact area of the core (metropolis) and the related impact of structure-function relationships in the region.
2. Studying area boundaries in terms of the tourist attractiveness.
3. In this case, the situation on the labour market will be studied. The examination of the unemployment rate, labour productivity and wages will indicate whether in a given region there is only one labour market (for instance, connected with the occurrence of a metropolis in a given area) or several regional or local markets, which operate autonomously.
4. Also, a study of the phenomenon of demographic aging of population and related demographic, social, and economic phenomena will be conducted. Analysis of demographic phenomena, in turn, will allow for the separation regions that are homogeneous in terms of the economic, cultural, social and environmental aspect, and not only for Poland, but also for a selected group of countries (representing the European Union).