Popular science summary

Transport infrastructure connects people and increases market accessibility. But does it always simultaneously reduce disparities in accessibility, lead to territorial cohesion, and so-called accessibility convergence? What are the relationships between accessibility convergence and income convergence at the national level, and what are they at the regional level? The potential accessibility model, using differences in travel length (according to the so-called half-life), as well as the Potential Accessibility Dispersion (PAD) index, allows for a multi-criteria view of the long-term effects of transport infrastructure development at any spatial scale (e.g., regional, national, or European). However, the relationships between accessibility convergence and income convergence are very complex, depending on a range of factors distributed over the long term across several interlinked phases of country and regional development in the context of developing infrastructure, the spatial configuration of the economic and population potential quotient, and the conditions of the decomposition of accessibility changes over individual decades of investment processes. The main goal of the project '**POTOMACC. POpulation, access TO Market and potential Accessibility in the context of regional Convergence and territorial Cohesion**' is a multi-criteria analysis of the relationships between economic and territorial cohesion processes, as well as the mutual relationships in the core-periphery system between the triad of aggregates, i.e., 1) population, 2) GDP (market), and 3) the development of transport infrastructure (understood as changes in accessibility) over a long period of time at various spatial scales (Europe and Poland) using the potential model, for different travel lengths (half-lives), employing methods such as: potential quotient, potential accessibility decomposition, beta and sigma accessibility convergence; the Potential Accessibility Dispersion index, and econometric modeling (income convergence vs accessibility convergence).

In recent decades in Europe, there has been a strong polarization of population growth between the so-called European core and periphery, as well as between growth poles and peripheries within individual European countries, while the dynamics of GDP per capita are much more varied, both at the national level (strong differentiation into three speeds in groups of countries in Europe) and at the regional level. In Poland, in recent decades, the processes of suburbanization and population growth in agglomerations, depopulation of former industrial areas (Upper Silesia, Łódź, etc.), and areas of the former Congress Kingdom have been accompanied by a relatively uniform, in terms of cardinal directions, although at the same time highly polycentric and divergent, growth in regional GDP *per capita*. Thus, in Poland, the changes in population and economic potential (global GDP) were spatially similar, resulting in minor spatial changes in the potential quotient, especially for long travel lengths.

Changing conditions in the spatial distribution of the potential quotient of economic and population potentials, including new convergence clubs in Europe (three-speed Europe) and the dynamic development of transport infrastructure in countries that joined the EU after 2004, provide new foundations for estimating the mutual relationships between economic convergence, territorial cohesion, and accessibility convergence. In Poland, there has not yet been an empirical analysis of the relationships between changes in population (land-use component) and the increase in accessibility driven by transport infrastructure development (transport component). The project POTOMACC aims to fill this gap in empirical research, both at the continental level and in Poland. The innovative nature of the research will concern, among others, considering different phases/trajectories of the relationships between economic cohesion and territorial cohesion over the long term at various spatial levels using many alternative research methods.