Internal Diversification – Developing a Research Method of Urban Planning

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Abstract. The paper presents a method of urban diagnosis based on internal diversification analysis. The method has been created to obtain a tool for construction of a strategy resulting in improving quality of space. It takes into account specific determinants that are associated with internal relations within urban areas. This method has been developed at the Faculty of Architecture of Poznan University of Technology and implemented in the research on the Poznan Metropolitan Area. The concept of micro-divisions and internal diversification within metropolitan areas still remains a subject of discussion among professionals, as it is treated in a number of ways. The idea that the relations between structural units in urban space are not limited to the impact they have on one another and that intensity of such interrelations varies, constituted a significant element of the previous models. In recent models, the type (quality) of interaction between the units is perceived as a substantial element. From this point of view, the impact of one unit on another can be advantageous or damaging. By labelling the negative impact with a minus, positive one with a plus, and the lack of impact with a 0, all possible types of influence can be classified in six different ways: mutual negative impact between two units (−,−), mutual positive interactions (+,+), the (+,−) relation, the (+,0) relation, the (−,0) relation, the (0,0) relation. The abovementioned types of relations became the basis for diagnosis of spatial conflicts and possibilities of sustainable development of the Poznan Metropolitan Area.

Keywords: Urban planning · Diversification · Interactions

1 The Description of the Problem

This paper is a synthesis of research on urban planning within the Poznan Metropolitan Area carried out by a team of scientists of the Faculty of Architecture, Poznan University of Technology. The spatial structure of the Poznan Metropolitan Area is currently undergoing deep structural transformations. Therefore the method implemented focuses on preventing a progressive depreciation of architectural and urban environment, on a degradation of urban landscape and social structures due to uncontrolled investment encroachment on city centres, as well as on the ineffectiveness of the existing spatial planning system. The method is based on analysis of an internal diversification of urban areas. Research related to spatial divisions and diversification of settlement network has been quite significant, especially on the national and regional level.

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The phenomenon of internal diversification is perceived and evaluated in many different ways. There are egalitarian attitudes regarding planning and local policy as a tool of eliminating differences between particular units inside the city structure. This is result of a specific vision of development related to spontaneous, bottom-up tendency to get assimilated and copy up-to-date models. The unification of urban environment is a visible effect of this phenomenon, related to contemporary global mass culture.

The other point of view refers to an internal diversification of urban areas as an important factor of development. It is believed that internal diversity is a value that gives a competitive advantage, saves expenses on overcoming existing differences and diverts them to the benefit of local communities. In this situation it is important which elements are diversified. Too large differences in income per capita among the residents are a negative phenomenon, as an economic stratification and a high level of poverty causes social pressure inside urban areas.

This problem relates specifically to the city centres and is observed in many European metropolitan areas and is also present in the Poznan Metropolitan Area [1]. This is the area that plays an important role in economic growth, employment and competitiveness. But it also faces serious problems: unbalanced urban development, areas of economic and social marginalisation, environmental degradation, insecurity and decay of social relationships. Appropriate internal relationships between urban units mean rational redevelopment of spatial, cultural and economic structures in the city. The research is not only about renewal of neglected areas, but also about finding efficient management methods. Such upgrading prevents a future stagnation, a decline in urban activity, and also an improper development of urban areas.

2 Internal Diversification of Urban Areas

The problem of internal diversification of urban areas has recently acquired significance due to growing interest on part of investors in old, neglected city centres. It has a record of unsuccessful attempts to tamper with the historic urban tissue, which is reflected in vanishing street identity, standardization of neighbourhoods and a lack of legibility of urban space. Actual planning efforts are often reduced to new investments in the existing urban structure or improving technical conditions of technical infrastructure. It is very rare that the problem is placed in the broader framework of social, cultural and

environmental categories. In this context a few positive examples of successful regeneration projects that have led to rational transformation of the urban space can be pointed out. However, in the face of today's needs of the investment market and the scale of modernization demand, these cases form only a small fragment of investment interference in the structure of degraded central areas. Most of the projects are intended to suit commercialized, short-term interests of investors. This leads to evident failures of regeneration projects and to deterioration of the urban quality in general.

One of the reasons that behind this is the lack of methodological guidance that would allow analyzing internal relations between adjacent urban units. Internal diversification analysis emphasizes the principle that a metropolitan area is not neutral in terms of economics. To put things simple, spatial diversification has been explained here as a natural result of economic inequalities. Among them, as a result of income disparities, groups with the highest income occupy the most attractive territories [2]. This is part of a general problem including the relations between spatial behaviour and economy [3]. Many models based on systemic economic approach to spatial planning emerged in the first half of the 20th c. Zofia Dembowska [4] provides a detailed description of these models. Among them the group of *gravity and potential models* is worth mentioning, which concern spatial and economic interrelations between settlement units to their economic potential and distances between them. These models are based on analogies to Newton's theory of gravity. In this approach, relations between units located in the immediate vicinity of each other are the strongest. From a classical point of view, the strength of the relation is directly proportional to these units' potential product and inversely proportional to the squared distance. The first attempts to apply the *gravity* and potential models in spatial and economic issues took place as early as in the 19th c. Johann Heinrich von Thünen in his theory of agricultural production location, published in 1826, pointed out the advantages given by the fact that production was situated in a place which had positive relations compared to other acceptable locations. These advantages depended, in his opinion, on the distance and costs involved in the transport of the produce [5]. Carey [6] noted that the bigger the population is in a given area, the larger force it has of attracting migrants. He described gravity as directly proportional to the area size and inversely proportional to the distance. Ravenstein in the study called "The Laws of Migration" [7] showed the great force of attraction related to industries located in large English and Welsh cities. In his opinion the size of workers migration depended on the distance between the place they lived in and the migration targets. In 1929, Reilly [8] applied a gravity model to study the impact of city size on retail development. He described this impact as directly proportional to the number of city residents and inversely proportional to the square root of the distance from another city.

Contemporary models, where index of the power is identical as the one used in Newton's model of gravity, i.e. <2>, are rare. This index is usually derived experimentally. The index of the power derived empirically is a result of an intuitive assumption that the resistance related to the distance depends on the type of interaction. In other words, the distance between the two units has a different impact on e.g. relations of goods exchange, number of commuting people, housing and leisure conditions etc. Lakshman and Hansen [9], in their model of potential retail market, assumed that the index of the power of distance between these zones equals 2.6 in order to determine

interactions between the two areas. O'Sullivan [10] showed that the index of the power of distance variable for British cities varies from 1.3 to 4.8 depending how intensive the urbanization of region is. An interesting attempt at a systemic approach constitutes models based on the analysis of "taken opportunities" in the behaviour of settlement inhabitants [11]. In Poland, research in this area has been carried out since the 1970s by Tadeusz Zipser. It refers to, so called, balancing movements in the development of a territory to ensure balance between travel destinations and noted acceptations [12].

3 Model of Relations Between Space Units

The idea that the relations between structural units are subject to diversified sub-relations, which vary in direction, intensiveness and quality, constitutes further development of these models. Here, the type (quality) of interaction between the units is an important element [13]. From this point of view, the impact of one unit on another can be beneficial or not. By labelling the negative impact with a "minus", positive one with a "plus", and lack of impact with a "0", all possible types of influence can be classified in six different ways.

3.1 Mutual Negative Impact

Mutual negative impact, labelled with (−,−), takes place when each of the two spatial units has a negative impact on the other. This situation is present when two units use the same insufficient element of urban infrastructure. For instance, using the same transport system by housing and manufacturing units can lead to high congestion on roads and extend the time needed to get home or to supply manufacturing materials, causing significant losses in each unit. The size of the negative impact can change, and even be completely reduced by establishing different hours in which the transport system is by the two subjects used. In many modern designs, architects and urban planners try to answer the question of the extent to which units co-existing in a given area can tolerate competitive usage of the same, limited resources of urban environment.

3.2 Mutual Positive Impact

Mutual positive interactions between two units, labelled with (+,+), take place when each unit benefits from the relation with the other. Examples of this relation include benefits related to the location of retail, cultural, and educational services near residential developments. This type of interaction is seen as one of the reasons why spatial development is concentrated in such areas, and a cause of increased prices of properties located there.

More and more frequently, the mutual benefits of the compact model of urbanization are pointed out, especially if they bring closer places of work and residence. Koppenhöfer [14] says that majority of workplaces should be located using the following rule: bring work to people, and not the other way round. The vicinity of places of work and residence reduces congestion on roads, takes pressure off the public transport,

creates social bonds, enables working women to look after their children and run their households, and makes it easier to work part-time. It is also worth mentioning that locating places of work in deteriorating, central districts is considered as a basic condition of the revitalization. Linking workplaces with residential, retail, and service developments stimulates urban and economic activity positively. This is a come-back to traditional mode of placing living spaces, workplace and shop in one building, an approach common in the past centuries. This model is popular even today in Middle and Far East cities, and has been recently applied in the revitalized urban quarters of many European cities.

3.3 "Plus-Minus" Relation

The (+,−) relation takes place when one of the unit harms the other, but draws benefits for itself. A typical example here is the inconvenience related to heavy industry being located close to residential and service territories. Disturbing elements include dust, gas, and noise emissions. At the same time, such a close location is beneficial for the manufacturing sites, giving them easy access to workforce, convenient links with research and scientific institutions as well as services. Such a conflict occurs between location and development of the Volkswagen aluminium foundry situated within the Wilda residential area in Poznan. This situation has recently been widely covered in the local press.

3.4 "Plus-Zero" Relation

The (+,0) relation takes place when one of the units benefits from the other, and the latter does not incur any losses. Examples include the relations between territories designated for leisure and residence, offices and service areas – provided that leisure areas are adequate for the expected number of users. Such interaction has no negative impact on leisure areas, while supporting neighbouring areas due to their increased attractiveness enhanced by convenient access to places where people can relax and use leisure facilities.

3.5 "Zero-Minus" Relation

The (0,−) relation takes place when one of the units harms the other, and the latter draws no benefits from this relation. Examples include the post-industrial areas located in the city centre. The "unused railway tracks" area in Poznan is an unnecessary burden for PKP (Polish Railways) and produces no benefits to the company. The impact on units located in its vicinity is negative, as the potentially attractive central area remains "frozen".

3.6 "Zero-Zero" Relation

The (0,0) relations take place when two units do not influence each other. This type of interaction is likely to be very rare and it may even not exist in practice.

3.7 Model

The dependencies presented above lay at the heart of the proposed model.

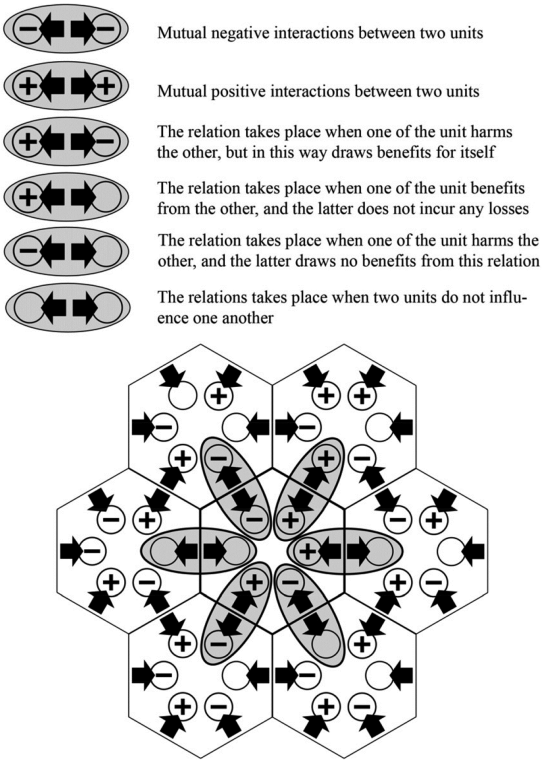

Fig. 1. Model of relations between the identified urban units

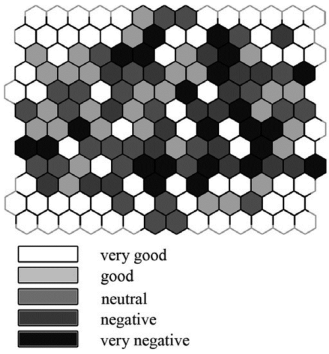

Fig. 2. Assessment of the metropolitan area space. Profit and loss balance ensuing from mutual relationships between the neighbouring spatial entities.

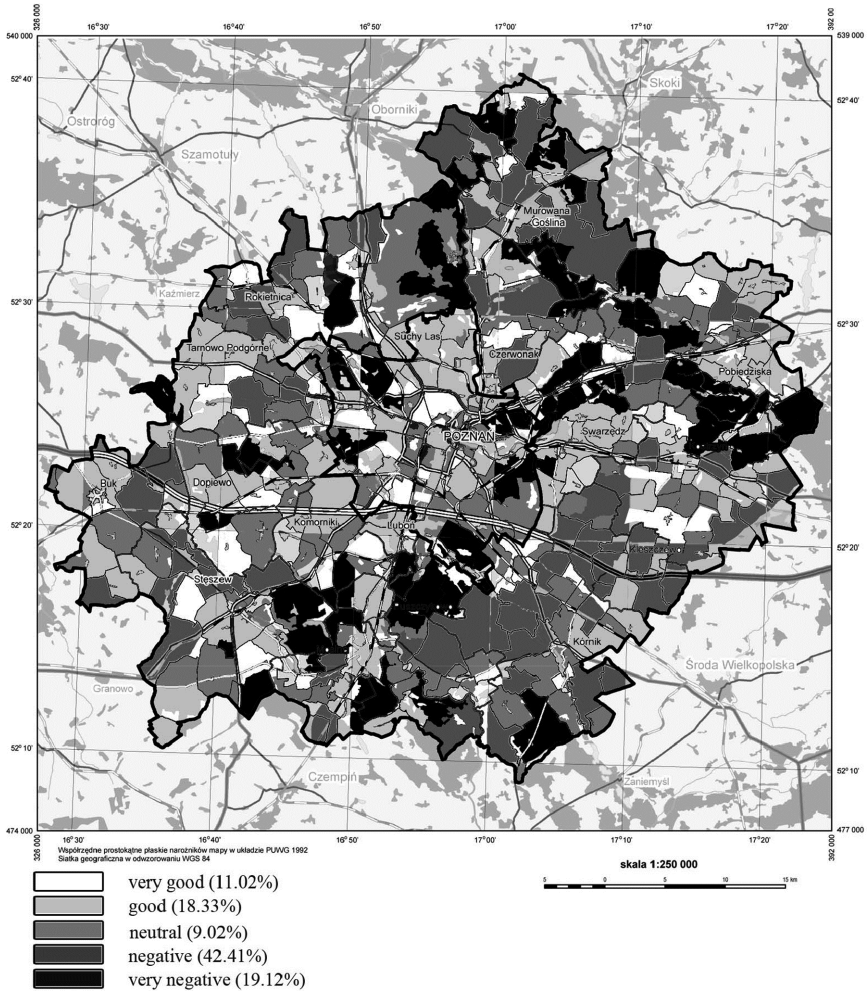

Fig. 3. Poznan Metropolitan Area, application of the theoretical model. The balance of benefits and losses resulting from the neighbourhood of urban units.

After their analysis it is possible to diagnose the settlement system in the context of:

– spatial conflicts that lower the quality of the space,
– sustainable spatial development.

It needs to be pointed out that both the criteria influence the attractiveness of the metropolitan space, property prices and strength of attracting new investors.

Figure 1 shows a theoretical approach to the presented model. Figure 2 shows a profit and loss balance ensuing from mutual relationships between the neighbouring spatial entities. Assessments are presented as a five-grade scale. The very good grade refers to entities that benefit the most from the close proximity to nearby ones. At the opposite

end of the scale there are entities evaluated as very bad, which incur the most losses from their dysfunctional neighbourhood.

Figure 3 shows the use of the model in research concerning the sustainable development of the Poznan Metropolitan Area. The studies were carried out by a group of architecture students in July 2015 as part of their summer internship. As part of the research an urban visit was carried out to an area of 2162 km^2 with 878,000 inhabitants. For partial assessment the expert Geo Urban Centric method was used that had been developed by the Institute of Architecture and Spatial Planning, Poznan University of Technology, Poland.

The research territory was divided into 311 spatial units the borders of which match the borders of urban estates and divisions, as well as natural borders determined by watercourses, streets, railway lines and other physiographic objects. The isolated spatial units match the surveying sections found in the national register of territorial division (TETRYT) maintained for the purposes of public statistics.

On the basis of detailed analysis of the internal dependencies it was found that 11.02 % of the Poznan Metropolitan Area is characterised by very good grades coming from the relationships among neighbouring spatial units. 9.02 % of the area has neutral relations, 42.41 % – bad, and 19.12 % – very bad.

4 Summary

The (+,+), (+,0), (0,0) relations between spatial units improve the stability of the entire urban system. These relations cause no losses in any of the spatial units if one of them is located close to the other unit. For instance, functional and spatial arrangements of many villages and towns near Poznan were not changed for many centuries until their stabilized relations (+,+), (+,0), (0,0), changed into (−,−), (0,−) (−,+). This process was triggered by economic and demographical changes. First of all, rapid migration of people due to a high demand for workforce in newly built factories in the 19th c. and the first half of 20th c. The (−,−), (0,−), (−,+) relations resulted in changing functional and spatial characteristics of the area urbanized in compliance with economic reasons. Further changes have occurred with development of individual car transport and unrestricted spread of even small villages at the end of the 20th c.. Entire systems have lost their stability due to rapid changes in the way land was used. The urban sprawl phenomenon has also led to the disintegration of historical settlement tissues. Throughout the Poznan Agglomeration competitive displacement of “weaker” functions (agriculture) by “stronger” functions (housing, wholesale) have distorted the area characteristics.

The changes aim at obtaining better conditions of functioning by each structural entity at the cost of the neighbouring ones. The urban layout is destabilised by conflicting interests of neighbouring land users.

From this point of view, the process of metropolitan area development can be treated as a permanent functional evolution of individual structural units related with an ongoing balancing of economic benefits. In this interpretation, the process of development dispersion can be explained by excessive economic weakness of agricultural units. The gap between prices of agricultural land and building plots, powered by underestimation

of the distances, causes people to build their houses in the suburbs and to commute to work by car.

The presented model is a simplification of complex urban processes related to competitive use of land. This allows for effective assessment of urban space quality based on analysis of internal diversification of the metropolitan area.

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