Research of Socio-Spatial Aspect of Economic Security of Megacities: Risk Zones and Conflict Nodes

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Abstract. The article deals with the approaches to the analysis and assessment of the global city conflicts, used in the world and Russian practice, which allow conducting comparative studies of local areas in megacities, identifying risk areas and nodes of conflict. The study of economic security of megacities logically justifies the consideration of “conflict nodes” as threats and risks of a certain type, as a result of the analysis of “risk zones” and the conditions of contradictions in megacities, it is possible to use the tools of operational and strategic development management to improve the image of the city, its competitiveness and attractiveness. The Authors propose to consider the theme of “conflictness” of urban space in the context of monitoring the safe development of megacities. Evaluation of the level of safety and conflict within the megacity is based on statistical data and indicators of public opinion about achieved level of security. The results of the study are the clustering of St. Petersburg districts by conflict indicators and risk zones, the evaluation of adequacy of objective indicators of security of residence in a particular area and subjective assessments of residents. The article presents the results of assessing the level of conflicts in St. Petersburg as a global city, a comparative analysis of the subjective and objective component of the socio-spatial aspect of economic security. On the example of St. Petersburg, the Authors compare the identified clusters by risk zones and conflict nodes and illustrate the obtained result.

1. Introduction

All stages of city development has its own peculiarities, largely due to both objective and subjective factors, including the prevailing socio-economic situation, the status of world economic relations, the public opinion about the level of quality of the urban environment acceptable for the living. Issues of economic security of megacities are one of the factors in assessing the success of the city and the level of comfort achieved at a certain stage of its development. In fact, to assess the economic security, it’s necessary to analyze the level of external and internal threats, which include the problem nodes, called by Joerg Stadelbauer “conflict nodes” [1]. In mid-XIX – early XX century there were a variety of studies of cities on the basis of cartographic materials. The work on the social mapping of urban areas by Charles Booth (1889-1903) received wide coverage that is considered, according to E. A. Volosnikova, “the forerunner of urban sociology” [2, P. 111]. The researches in the field of social mapping of Russian megacities are covered much less wide. It is worth noting numerous and various statistical studies of the territory of St. Petersburg, carried out in the middle – end of the XIX century, in the field of social differences of the population living in different districts of St. Petersburg (I.
Pushkarev, 1839) [3, P. 73-77], in the field of allocation of urban estate, social, economic, religious differences in the placement of the population of St. Petersburg by districts, building density, etc. (Research on the St. Petersburg’ topography by the Central statistical Committee of the Ministry of Internal Affairs, 1868-1870), the study of the sanitary condition of the districts of St. Petersburg by J. Gubnner, doctor of medicine, put on the map of the city districts (1877) [4, P. 89-90, 97-105]. The study of megacities, their impact on the external environment and internal space, on the formation of a variety of connections and network structures, have been the subject of close attention and study since the beginning of the XX century [5-9]. The current global trends of not only urbanization, but archiurbanization, consist in strengthening the role of megacities in the world economic relations, increasing their attractiveness for almost all groups and segments of the population, the rapid growth of their number and population. In general all of these trends contribute to the formation of new diverse forms of social organization, economic and life-supporting space, and, at the same time, the growth of conflict potential. This variety of emerging forms and connections is studied rather actively. Since the 20-30s of the XX century, there are various scientific schools and trends that research the wave processes and civilization identity of cities, the impact of the megacity environment on the development of various social groups in cities [10, 11], the emergence of risk zones with conflict locations. According to Pacione M. [12], megacities have own potential for conflict being the arena of conflict formation. J. Stadelbauer has the same ideas [1], describing the cities as a space conflict. The authors presume that the source of conflict and risk areas is formed living space, largely dependent on the location of the city and the created spatial environment. It can be argued that the theory of living space by F. Ratzel [13] reveals the problems of urban society and discusses matters of conflict in the processes of urbanization, the complex processes of internal organization of urbanization and their impact on the external environment. Symptomatically, it is the study “Big cities and spiritual life” of 1903 [14] by G. Simmel that is so relevant for the study of conflict nodes and risk zones in modern processes of agglomeration, urbanization and suburbanization. Today, the issues of assessing the level of security in each specific territory of St. Petersburg remain relevant.

2. Problem definition
The study of the megacities as a special form of socio-spatial organization of life has scientific and practical because urbanization, as an actively developing process, involves more and more people, decreases the rural population, absorbs and destroys small towns and settlements, creates powerful points of attraction, forms new social, business and economic structures, systems of internal and external relationships. In turn, the diversity of newly created forms and relationships is accompanied by the formation of a variety of new components and elements of society and public space. This multidimensional structure forms nodes that provoke both positive and negative situations. That is why the city is “an ideal place for field research, to study the forms and processes of urban life” [15, p. 377], to identify those locations and nodes that form the conditions for the emergence of various kinds of risks and conflicts. Considering the city as a socio-spatial model, investigating behavioral preferences and consequences of various scenarios and variations of management practices, rethinking the concept of positive and negative in urban prospects, the authors consider the study of the city as a “conflict space” [1] is need, timeliness and actuality.

The study of methodological approaches and concepts of urban development management, practical activities in this field, showed importance of the study of conflict nodes as potential sources of danger. In turn, from the urbanism point of view, risk areas are the territory of the megacity or any part of it, within which it is possible to display threats of different nature due to the impact of negative factors from potential sources of danger. Identification of problem areas, conflict nodes and risk zones allows determining the location of potential sources of danger and forming an adequate policy of management to develop the city. The study of foreign and domestic practices of the most interesting management decisions in resolving conflict situations can be considered useful and interesting. Methodology of the research of conflict nodes and risk zones is also of Scientific and Practical interest. Despite the fact that using of foreign methods in Russian practice of city development
management is in some cases difficult, which is explained both by objective and subjective reasons, the analysis of research methods of problem solving, and highlighting the most complex or large-scale issues can be considered well-timed and reasonable.

The final goal of the study is analyzing “conflict nodes” as potential sources of danger, identifying risk zones and their allocation across Saint-Petersburg in order to form a “map of safe living areas” and make adjustments to the plans of socio-economic and spatial development of the megacity.

3. Data and methods
The works of Russian and foreign scientists in the field of studying the conflict potential in global cities [16, 17, 18, 19] are the basis of the research. The authors of the article have used the informational and statistical database of the MIA of Russia in Saint-Petersburg and Leningrad Region with the study of Saint-Petersburg residents opinion on police activity in 2017 [20], materials of the “Saint-Petersburg Crime Map” Internet portal [21]. Following statistical indicators of crime have been used to assess the risk zones in each specific megacity district: number of crimes committed per year, number of murders and attempted murders per year, number of thefts per year, number of injured in road traffic accidents per year. Indicators based on sociological surveys have been used to assess the conflict nodes in each specific megacity district, they are the share of residents who feel protected or rather protected from crime; the proportion of residents who feel safe or rather safe on the roads.

The risk zones and conflict nodes in Saint-Petersburg have been analyzed in the context of administrative districts of the megacity. The local security level in different areas of the megacity for groups of crime and security indicators have been analyzed on the basis of indicators normalization by converting the size scale to the dimensionless one according to the formula:

\[ X'_i = \frac{X_i - X_{\text{min}}}{X_{\text{max}} - X_{\text{min}}} \]  

(1)

Where \( X'_i \) – normalized value of input indicator;
\( X_i \) – actual value of the indicator;
\( X_{\text{min}} \) – the minimum value of the indicator in the sample;
\( X_{\text{max}} \) – maximum value of the indicator in the sample.

General scientific methods of learning, methods of logical analysis, expert review and comparative analysis methods have been used in the study.

4. Research results and discussion
Conflict is one of the main characteristics of a city according to Miller Z. L., Swyngedouw E., Hinchliffe S. and Whatmore S. [10, 11, 19], Stadelbauer J [1]. The main methodological problem of identifying conflict nodes and risk zones remains the balancing between objective and subjective components of security indicators. Using the most significant crime indicators [21] as the input indicators of the risk zones has been suggested for normalization and transformation.

- \( X_1 \) – number of crimes per year, pcs.;
- \( X_2 \) – number of murders and attempted murders per year, pcs.;
- \( X_3 \) – number of thefts per year, pcs.;
- \( X_4 \) – number of injured in road traffic accidents per year, persons.

For normalization and transformation it is suggested to use the most significant social indicators of living safety in different districts of Saint-Petersburg [20] as the input indicators of the conflict nodes, based on the surveys of the residents opinion:

- \( X_5 \) – share of residents who feel protected or rather protected from crime, %,
- \( X_6 \) – share of residents, feel safe or rather safe on the roads, %.

When proceeding transformation the dimensionless value of input indicator \( X'_i \) changes from 0 (if \( X_i = X_{\text{min}} \)) to 1 (if \( X_i = X_{\text{max}} \)). The indexes for each territory have been calculated on a cumulative basis.

The risk zone index (RI) for each district of St. Petersburg has been calculated on the summation of normalized dimensionless values of the input indicator \( X'_i \) according to the formula (1) by crime indicators groups (table 1).
Table 1. Cumulative assessment of risk zones by Saint-Petersburg districts.

| District          | $X_1$ | $X_2$ | $X_3$ | $X_4$ | Risk zone index, RI |
|-------------------|-------|-------|-------|-------|---------------------|
| Kalininskiy       | 1.00  | 0.77  | 1.00  | 0.66  | 3.43                |
| Nevski             | 0.96  | 1.00  | 0.81  | 0.83  | 3.60                |
| Primorskiy        | 0.93  | 0.86  | 0.94  | 0.86  | 3.59                |
| Vyborgskiy        | 0.92  | 0.68  | 0.96  | 1.00  | 3.56                |
| Krasnosevskiy     | 0.78  | 0.59  | 0.68  | 0.50  | 2.55                |
| Moskovskiy        | 0.69  | 0.82  | 0.69  | 0.75  | 2.94                |
| Kirovskiy         | 0.69  | 0.77  | 0.57  | 0.70  | 2.73                |
| Frunzenskiy       | 0.69  | 0.64  | 0.64  | 0.56  | 2.52                |
| Krasnogvardeyskiy | 0.67  | 0.82  | 0.53  | 0.50  | 2.52                |
| Tsentral'ny       | 0.49  | 0.91  | 0.37  | 0.46  | 2.23                |
| Admiralteyskiy    | 0.48  | 0.36  | 0.38  | 0.28  | 1.51                |
| Vasilyostrovskiy  | 0.33  | 0.32  | 0.27  | 0.27  | 1.18                |
| Petrogradskiy     | 0.21  | 0.23  | 0.18  | 0.28  | 0.90                |
| Kolpinskiy        | 0.21  | 0.14  | 0.09  | 0.24  | 0.68                |
| Pushkinskiy       | 0.20  | 0.09  | 0.23  | 0.35  | 0.88                |
| Petrodvortsvoiy   | 0.13  | 0.14  | 0.16  | 0.17  | 0.60                |
| Kurortny          | 0.05  | 0.09  | 0.08  | 0.10  | 0.32                |
| Kronshtadtskiy    | 0.00  | 0.00  | 0.00  | 0.00  | 0.00                |

Compiled by [20].

The social aspect of security is studied on the basis of residents’ assessment of living safety in a particular megacity district. The conflict index (CI) is calculated for each district of St. Petersburg as sum of the normalized dimensionless values of the input indicator $X_i$; according to formula (1) by the groups of conflict nodes indicators (table 2).

Table 2. Cumulative assessment of conflict nodes by St. Petersburg districts.

| District          | $X_3$ | $X_6$ | Conflict index, CI |
|-------------------|-------|-------|--------------------|
| Kalininskiy       | 0.00  | 0.33  | 0.33               |
| Nevski             | 0.20  | 0.10  | 0.30               |
| Primorskiy        | 0.67  | 0.53  | 1.20               |
| Vyborgskiy        | 0.58  | 0.43  | 1.01               |
| Krasnosevskiy     | 0.16  | 0.26  | 0.42               |
| Moskovskiy        | 1.00  | 0.42  | 1.42               |
| Kirovskiy         | 0.03  | 0.23  | 0.26               |
| Frunzenskiy       | 0.18  | 0.46  | 0.64               |
| Krasnogvardeyskiy | 0.27  | 0.00  | 0.27               |
| Tsentral'ny       | 0.43  | 0.03  | 0.47               |
| Admiralteyskiy    | 0.82  | 0.58  | 1.40               |
| Vasilyostrovskiy  | 0.59  | 0.47  | 1.05               |
| Petrogradskiy     | 0.51  | 0.40  | 0.90               |
| Kolpinskiy        | 0.41  | 0.75  | 1.16               |
| Pushkinskiy       | 0.81  | 0.36  | 1.17               |
| Petrodvortsvoiy   | 0.33  | 0.41  | 0.74               |
| Kurortny          | 0.85  | 0.54  | 1.39               |
| Kronshtadtskiy    | 0.55  | 1.00  | 1.55               |

Compiled by [21].
The results of the conjugate analysis of the risk zones and conflict nodes by Saint-Petersburg districts are shown in table 3.

**Table 3. Differentiation of megacity districts by risk level and potential assessment of security (on the example of Saint-Petersburg)**

| Conflict index | Risk zone index | Nearest regions |
|----------------|-----------------|-----------------|
| 0.00÷0.51      | Over 3.47       | Krasnosel'skiy, Moskovskiy, Kirovskiy, Krasnogvardeyskiy, Tsentral'nuy |
| 0.51÷0.76      | 2.78÷3.47       | Petrodvortsivy |
| 0.76÷1.01      | 2.08÷2.78       | Petrogradskiy |
| 1.01÷1.26      | 1.39÷2.08       | Vasileostrovskiy |
| 1.26÷1.51      | 0.69÷1.39       | Kolpinskiy |
| More 1.51      | 0.00÷0.69       | Primorskiy |

The study of conflict potential in global cities within a framework of socio-spatial aspect involves the study of various groups of security indexes. Residents’ vision of living safety in a specific territory comprises the social and the subjective component of conflict potential. The group of crime statistics comprises the objective component of security level and shows how much and in what directions a given territory is a risk zone. The conjugate analysis makes possible to develop an adequate model of conflict potential in a territory and partly explains why a territory is better according to the residents opinion, despite the low level of security by the statistics. In general, the results of the study represent that the security level and the public opinion are consistent, as well as the level of risk and the opportunity for the conflict potential in the megacity.

**5. Conclusions**

According to the analysis of conflict nodes by St. Petersburg districts five groups of territories have been defined: 1) the most safe district for living is Kronshtadtskiy (RI = 0); 2) very high risk zone by crime rates is in the districts: Nevskiy, Kalininskiy, Vyborgskiy and Primorskiy (RI = 3.43÷3.60); 3) high risk zone is in Krasnosel'skiy, Moskovskiy, Kirovskiy, Krasnogvardeyskiy, Tsentral'nuy, Frunzenskiy districts (RI = 2.94÷2.23); 4) moderately high level of risk zone is in Admiralteyskiy and Vasileostrovskiy districts (RI = 1.51÷1.18); 5) low level of risk zone is in Petrodvortsovy, Kolpinskiy, Kurortny, Petrogradskiy, Pushkinskiy districts (RI = 0.9÷0.32).

According to the analysis of security social component, which is reflected in the residents ratings of security, two groups of territories have been defined: 1) districts in which residents feel most protected are Vyborgskiy, Vasileostrovskiy, Kolpinskiy, Pushkinskiy, Primorskiy, Kurortny, Admiralteyskiy, Moskovskiy, Kronshtadtskiy districts (CI = 1.01÷1.55); 2) districts in which residents feel less protected are Kirovskiy, Krasnogvardeyskiy, Nevskiy, Kalininskiy, Krasnosel'skiy, Tsentral'nuy, Frunzenskiy, Petrodvortsovy (CI = 0.26÷0.90).

According to the conjugate analysis of conflict nodes and risk zones the assessments are coincided in the districts: Nevskiy, Kalininskiy, Krasnosel'skiy (a high level of conflict potential and a very high level of risk zone); Tsentral'nuy, Frunzenskiy (high level of risk zone and conflict potential);
Vasileostrovskiy (moderately high level of risk zone, but residents feel quite protected); Kurortny,
Pushkinskii (low level of risk zone, the residents feel quite protected); Kronshtadtskii (safe for living
with the absence of conflict potential).

There is a mismatch of objective and subjective ratings in Kirovskii, Krasnogvardeyskiy,
Petrodvortsovy, Petrogradskiy, Vyborgskiy, Primorskiy, Admiralteyskiy and Moskovskiy districts.
There is a contradiction in the residents opinion on the living safety and the crime stati
districts.

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