

# **Administrative planning of territory of the Republic of Kazakhstan by means of cartographic method and Geographic Information System**

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## **1. Introduction**

Territory economic development of a country depends on accurate and appropriate use of mapping methods. In Kazakhstan the mapping of the territory is made with methods that are not based on scientific achievements. Therefore in this research the author suggests to consider a possibility of the usage of some scientific achievements. Inasmuch the territory planning is connected with the space notion, so Geographic Information and mapping methods appear as promising technique in researching this reality. Mentioning the matter of administrative planning it is necessary to mention that the research is carried out with macro- and meso-territories of rural and urban unit level. The research results have practical value but its realizations is of low-probability because of different vector of political thought of administrative management of the country.

## **2. Economic mapping planning**

### **2.1. Kazakhstan administrative zoning**

Administrative division is an important source for geographical resource in country economic development. In Kazakhstan the administrative division was laid from XVIII century though the current zone planning scheme was created in soviet period and was edited before 40s. However administrative division of Kazakhstan in soviet period fitted administrative economic arrangement of the USSR (*Figure 1*). In the post-socialist period the development of the zoning scheme was conditioned with functioning of existed administrative centers (Baransky N.N., 1980). The reform of Kazakhstan administrative arrangement was caused by the following event: administrative unloading of Almaty city, economic-manufacturing crisis in the average cities and shift of the capital to Astana city. The reform of

administrative scheme was held apart from scientific methods of zoning theory. For this reason the process of reform was accompanied with a chaotic change in a system of administrative centers. In 90s the above mentioned administrative centers were in deep crisis and now were deprived of their status as an oblast center then gained it again. Such reforms resulted with higher economic recession in the districts. The last step in the reform was a rearrangement of some oblasts. Four oblasts of Kazakhstan were either included or divided between two or more oblasts (Figure 2).



**Figure 1.** Administrative division of Kazakhstan (Kazakh SSR, 1987)



**Figure 2.** Administrative division of Kazakhstan (90s of XX century)

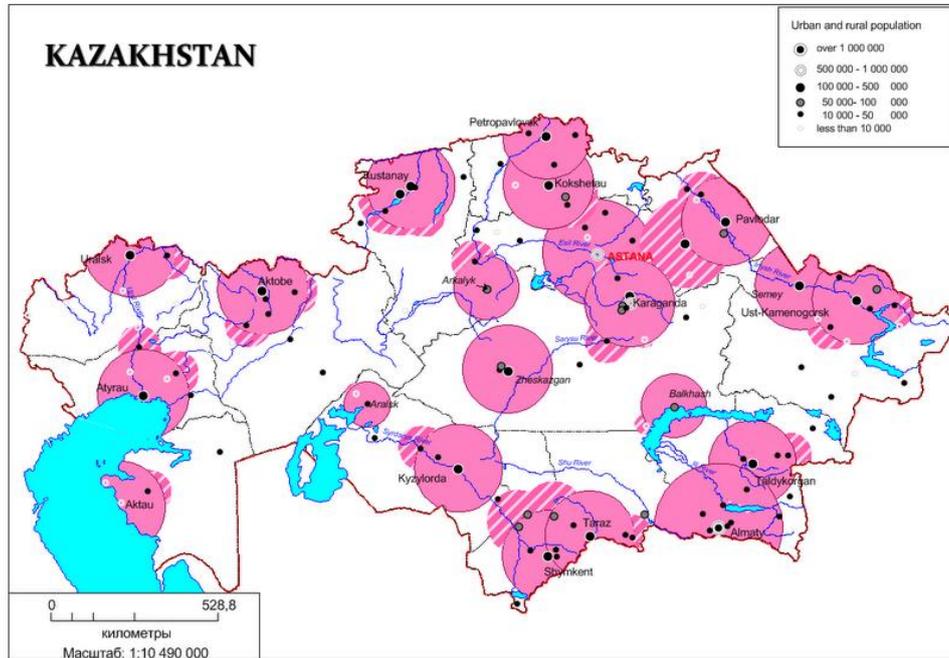
Topicality of the issue of zoning scheme development is worsened by the factor of transportation availability to an oblast center. Existing zoning created preconditions to the forming of the zones of difficult-to-achieve territories. Such districts are not safe for country population because they are not under control of a central regulatory body, the population has limited access to social objects situated in the oblast centers. The resolution of this problem is suggested through mapping research method. Means of mapping method and GIS allow to analyze zoning factors. Within administrative zoning of Kazakhstan the author of the article suggests to consider several methods: transportation access, mutual attraction, orography.

The method of mutual attraction allows to answer which of the territories is the nearest to the center ignoring the transportation lines. On one hand this method is inefficient since it does not count the factor of transportation lines, on the other hand it allows to consider an administrative center as economic subject, which is the source of periphery development. In this case the role of transportation lines is insignificant because the process of economic development is an infrastructure foundation including road constructions. The author of the research took into consideration existing oblast centers, political center – Astana, economic center of Almaty and perspective average and little towns – Arkalyk, Zhezkazgan, Semey, Balkhash, Aralsk. The method of estimation of the circle radius is simple enough. It resembles the methodic of Zipf of calculation of the system of cities sequence. In the research the radius is directly proportional to the rank of the city, which depends on its population (*Table 1*).

Rank	Population (in thousands)	Rank	Population (in thousands)
1	below 10	5	500-1000
2	10-50	6	1000-5000
3	50-100	7	over 5000
4	100-500		

**Table 1.** System of ranking.

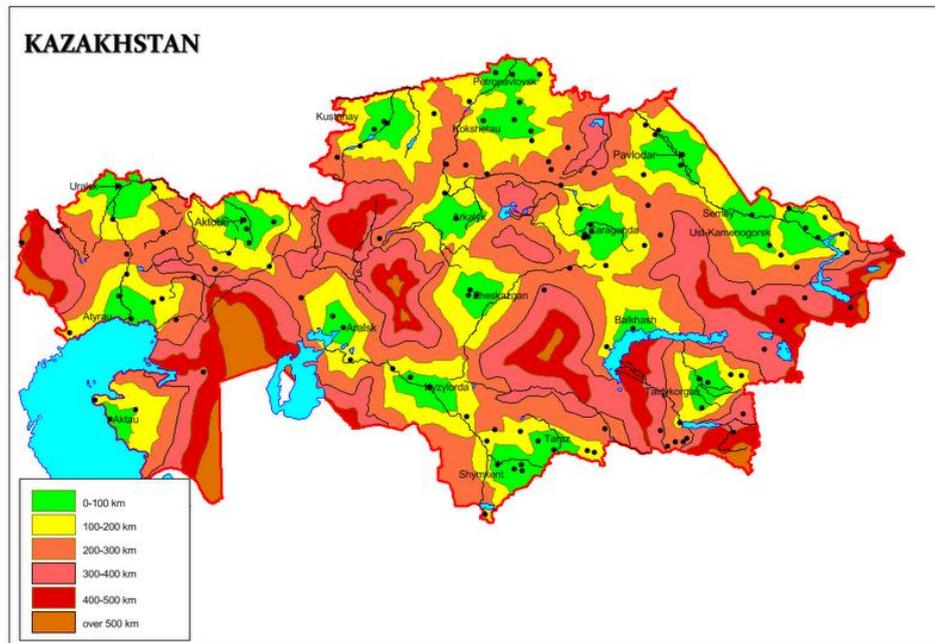
In the *Figure 3* the graphical results of the transportation attraction analysis are shown. It can be clearly seen that the territories of the radius of 100 km cover quite insignificant areas. When taking into account that each city of the second level has its own attraction which can be summarized with the attraction of the main city then the circles of oblast centers slightly changes their form.



**Figure 3.** Cut form cartographic model (method of transportation attraction)

In the *Figure 3* the intersection of several segments of transportation attraction can be seen – East Kazakhstan, North Kazakhstan and South Kazakhstan intersections. These facts have a great role in migration process, because the population in these areas does multiple shuttling movements. Another fact is observed when connecting the areas of transportation attraction at the adherent points. This points make the line of “economic excitement”. The longest “economic excitement” line in Kazakhstan goes from Petropavlovsk to Karaganda, the line of less importance - from Pavlodar to Ust-Kamenogorsk, from Taldykorgan to Almaty, from Shymkent to Taraz. The closest to each other zones of attraction are Arkalyk-Zhezkazgan-Kyzylorda.

The method of transportation access (connection) enables to estimate the real possibilities of the population and of the infrastructure unites to communicate with the oblast center. Unlike in the previous method here the main importance gets the transportation net since contemporary acting roads are a significant factor in connection between center and periphery.



**Figure 4.** Cut form cartographic model (method of transportation access)

The *Figure 4* shows that additional prospective administrative centers lessen the zones of transportation inaccessibility. Such zones (marked brown in the *Figure 4*) mainly focus near oblast boundaries. Therethrough in this case the line of “inaccessibility” falls into several separated areas. With the help of “watershed” method considering the farthest remoteness value, the dividing lines which generally have most approximate location to the existing oblast boundaries were drawn.

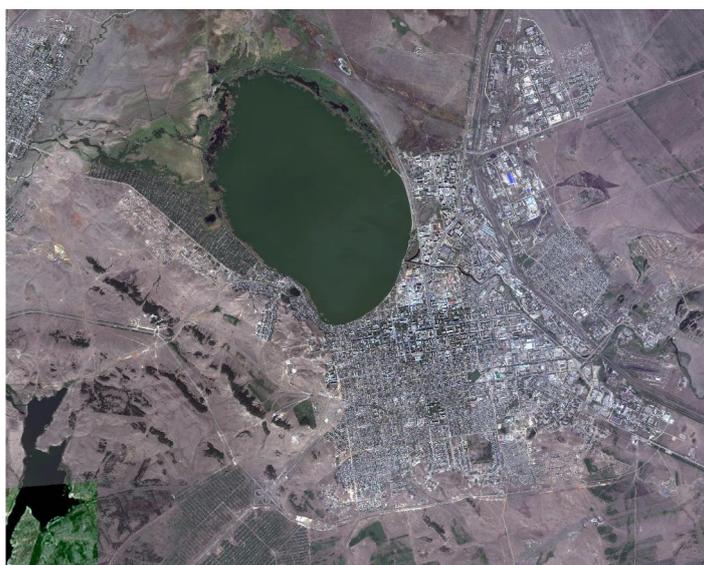
Orographic method was use as an additional technique in the zoning. Though out of wide range of physic-geographic objects only several of them can be used as a “adjuster” of oblast boundaries. In Kazakhstan to such “adjusters” the following objects can be referred - Kalba mountain range (between regions of Semey and Ust-Kamenogorsk), Mugidzhar Hills which divide east districts from Aktyube. Analysis of contemporary zoning shows that the fact of accounting the orographic boundaries presents only in one case – the boundary between South Kazakhstan abd Zhambyl oblast that goes along Karatau mountain range.

Except for given methods of analysis the secondary methods were used, for instance, method of transportation expenditures. In consequence of cartographic transformations the scheme of administrative zoning was

carried out. According to this scheme the most perspective towns in administrative reform are Zheskazgan, Arkalyk, Balkhash. The rest of the regions have some economic and infrastructure issues.

## 2.2. Geoinformation mapping of a city transport scheme.

Planning of economic and social phenomena in urban zones has a different meaning when applying to mapping products and GIS. Below there is a mapping and geoinformation analysis of Kokshetau city.



**Figure 5.** Snapshot of Kokshetau (server Digital Global)

The official information says that in the city there are around 30 transport routes, which must be sufficient for 100,000 city population. Although geographically these routes run centralized, and leave the periphery of the city uncovered with transportation net. In the research of traffic directions it was found out that most of the routes connect dormitory suburb with social objects such as market, hospitals, schools. However geographical aspect shows that private residential district is poorly covered with bus routes net. Panel districts (*Figure 5*) are situated in the north and south-east of the city, and private residential district – mainly in the south, south-west and west parts. There is a difference between geographical location of each of these city districts and private residential district. The west district, according to *Figure 5*, is located on the highway to Kostanay city which combines with the location of a large-scale social object – oblast hospital. The south-west district is covered with several routes that are attached to certain streets. Nevertheless the south district is covered only with two

routs of city transportation, one of them goes meridionally and the other runs only on the outskirts of the district.

During thematic mapping and calculation of population of the city per unit it was found out that the level of this coefficient is quite high in the panel districts. Notwithstanding the fact that the area of private residential sector exceeds panel districts several times. This leads to the problem of efficient planning of the system of city public transportation, adding the fact of territorial increase of the city, especially in the north-west and south directions. The north-west direction is agglomerative because of the fusion of the city with surrounding settlements.

The solution of this problem was stated in the thematic mapping of an index of the conditioned population density of blocks and microdistricts. With the help of mapping the city districts were divided into classes of high density, medium, low and discharged. On the basis of these classes the districts of constant high, high, medium and low charge were indicated. Predictably the major amount of the charge of the city transport relates to the north and central districts and with the highway Kokshetau-Kostanay, there runs the communication with the town-satellites. In the problem districts of residential sector the charge does not exceed the medium limit. On the ground of the data of the size of passenger loading the author of the article determined the perspective transportation routes.

### **3. Conclusion**

The conducted research has practical significance because it allows even a regular citizen to see otherwise everyday social phenomena, for instance, public transportation. It allows to analyze and see other possibilities of such phenomenon organization and functioning. The level of the phenomena is not limited – whether it is state or local level. The mapping is a socialized science and it can serve not only concrete goals of state, planning, engineering or education, but also it can serve every single person, depending on the goals s/he has. Given small research is evidence to this idea.

### **References**

Baransky N.N. (1980) Selectas. Publishing House «Mysl». Moscow