

# IMPROVEMENT OF SERVICE MAPPING METHODOLOGY BASED ON GIS

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## Abstract

*The article examines the content of service maps as one of the important areas of modern socio-economic cartography, some methodological features of their compilation and the experience gained in Uzbekistan in this area. At the same time, the role and place of modern geoinformation systems in the creation of service maps have been studied, attention is paid to scientific and practical issues of their use.*

**Key words:** *service, map, geographic information systems, social infrastructure, service, social sphere, population, socio-economic cartography, service industries.*

**I**ntroduction. Socio-economic cartography is one of the multidisciplinary and rapidly developing areas of modern cartography. In this, the design and creation of service maps has a special place. Service maps, or in other words, population service maps, are of particular importance for their educational, scientific and practical importance. In recent years, with the growing social demand for such cards, the need to print them has also increased somewhat.

First of all, it should be said that service maps are one of the cartographic sources that reflect the type, system and development dimensions of public service institutions in a specific area. Consequently, in the research of service territorial systems of the region, improvement of their territorial structure and determination of future prospects, service maps, which are the product of the cartographic research method, acquire important scientific and practical importance.

Today, with the introduction of geographic information systems into our lives, new opportunities for designing and creating service maps have appeared. These, in turn, have a positive effect on the enrichment of the content of service cards, the expansion of their imaging capabilities and scope, and speed.

Goals and tasks of work. The purpose of the work is to analyze service maps and their importance, to analyze the experience of creating service maps formed in the cartography of Uzbekistan, to clarify some methodological issues of using geographic information systems in creating service maps.

In the process of achieving this goal, the following tasks were solved:

- analysis of the meaning and interaction of "service", "service sectors", "social infrastructure" and other related terms;
- review of the general content, classification and method of creation of service maps;
- Analysis of the accumulated experience in the field of service cartography in Uzbekistan until now;
- to explain some methodological issues of using geographic information systems in drawing up service maps;
- development of proposals for further development of service cartography in our republic based on the analysis of existing experience.

Research methods. In the mapping of the territorial composition of service areas and their institutions, the methods of analyzing the experience of creating service maps, researching some methodological issues of using

GIS family software (ArcGIS, QGIS, Mapinfo programs) in creating service maps were used. In addition, in the purposeful research, analysis of the content of service cards, cartographic, aerospace, statistical, questionnaire survey, regional analysis, and geolocation methods were also used.

The main part. Before mapping the territorial composition of service industries and their institutions, it is very important to have a certain idea about their content, location and development laws.

It is known that we often come across the concept of "service" in our daily life or in existing scientific sources. In most cases, we accept this concept directly in the meaning of "service", and "service geography" in the form of "geography of service (fields)". Therefore, one of the leading scientists in this field, M.A. Abramov understands "services" and "service" as synonymous, and this certainly leaves no room for objection [1, p.14.]. This approach can be found in the works of other leading scientists of this field.

At the same time, the form of understanding of service or service areas by researchers in the form of "social infrastructure" is also often visible. In this regard, it is appropriate to highlight some peculiarities. In particular, in many cases, the authors consider the entire health or education system under the concept of "social infrastructure". However, the infrastructure, whether it is "production" or "social", is primarily a set of certain conditions, which conditionally serve to ensure the normal course of the process of production (production infrastructure) or service to the population (social infrastructure) attracts attention with At this point, in understanding the content of the social infrastructure, it is necessary to mention its two aspects (broad and narrow understanding). Therefore, if social infrastructure in a broad sense covers the conditions that serve to ensure the normal functioning of the entire social life of the population (i.e., in this sense, the entire health care, education system, etc.), in a narrower sense, or service (i.e., the direct service process) social infrastructure is characterized by the fact that it embodies a set of conditions (ie, various equipment, technical equipment, etc.) and the result of service activities that serve to ensure the normal course of the service process.

It is known that the service sector covers all strata of the population of any country and has an impact on almost all socio-economic aspects of the population's life, which in turn shows how important this sector is.

Today, the service or service industry has become a

leading facet of the world economy. Consequently, a large part of the gross domestic product of developed countries corresponds to their contribution. If, at present, economic sectors are structurally divided into three main sectors (that is, the primary sector - extractive industry and agriculture, the secondary sector - processing industry and construction), then the tertiary sector includes services that are directly related to the daily life of the population ( covers areas closely related to service). Their institutions and enterprises are functionally diverse and numerous.

As the Republic of Uzbekistan develops its national economy on the basis of market mechanisms during the period of independence, the share and importance of the service sector in its gross domestic product is increasing. If in 1995 the share of services in the republic's gross domestic product was 39.8%, in 2005 it was 41.4%, and by the beginning of 2017, this indicator was equal to 49.5% or 118811.0 billion soums [9, p.27].

Currently, more than 16,500 large organizations (including non-profit organizations providing market services) and more than 126,000 small business entities operate in the service sector in the republic [13].

In practice, when it comes to the content of service cards, first of all, their content is formed alternately with the content of public service sectors. For example, the health care system (health care card), the education sector (education system card) and in accordance with their internal structures (for example, provision of inpatient or outpatient medical services to the population, general secondary education, secondary special vocational education, cultural services etc.).

It is worth noting that, in essence, service cards are among the core elements of large-scale social cartography. Their main content is related to the type, size, distribution (location) of the services provided to the population. Such cards include:

a) network cards, that is, cards that reflect the static location, specialization, and size of institutions and enterprises belonging to a specific service sector;

b) includes cards related to the level of activity and development of the service sector (ie, provision of services to the population, ease of service, level, etc.).

Today, the scientific and practical importance of complex and synthetic service cards is increasing. If several types of services and their main development parameters are reflected in the complex service cards, then in the service cards with a synthetic nature, the main attention is focused on evaluating the level of development of the service sector, separating service centers, regionalizing the area by service type.

A lot of experience has been accumulated in Uzbekistan in terms of socio-geographic or service-geographic mapping. Among such cards, until now, more work has been carried out on the creation of network cards and cards reflecting the level of development of the sector and the provision of services to the population. However, cards with a synthetic nature, showing the population's needs for services and their territorial composition and level of satisfaction, are rarely implemented in practice.

In general, full-fledged complex service cards that fully reflect all regions of our country do not exist until now.

One of the first large-scale cartographic works that played an important role in the development of cartography in our country and at the same time gave a wide place to service cards is the two-volume "Atlas of

the Uzbek SSR" developed by the Department of Geography of the Academy of Sciences of Uzbekistan in the early 80s of the last century [3, p. 110-129] (Table 1).

In essence, this work is a comprehensive geographical scientific-reference atlas of Uzbekistan, in which special attention is paid to the social infrastructure related to the social life of the population. A total of 153 cards are given in this atlas. 27 of them are directly related to the social spheres (issues) related to the daily living conditions of the population, and they consist of the following three major sections:

1. Living conditions of the population.
2. Education, science, culture.
3. Physical education, sports, tourism.

Table 1.

The composition and content of the social cards given in the 2nd volume of the "Atlas of the Uzbek SSR".

Sections	Card name	Scale	The main content of the card
Living conditions of the population	Treatment and prevention facilities	1:3500000	The number of sick beds by rural districts, the number of paramedic-midwifery centers, the number of sick beds per 10,000 inhabitants
	Providing the population with medical personnel	1:3500000	The number of medical personnel - doctors, paramedics and their per 10,000 population
	Resorts, sanatoriums, vacation homes	1:3500000	The pool fund of sanatoriums, rest houses, types and specialization of sanatoriums
	Domestic service	1:7500000	The number of household service institutions, the volume of total services, the volume of services provided per capita
	Commercial service, catering	1:7500000	The number of trade and general catering establishments, retail trade turnover and general catering volume by region and their per capita
	Communal economy	1:5000000	Distribution of drinking water supply, sewerage, hotels, baths, laundries and hairdressing salons by regions and the results of their activities
Education, science, culture	Day schools	1:3500000	Number of schools, number of students, number of classes, number of students per thousand population by rural districts
	Evening (shift) general education schools	1:3500000	Number of schools and students by rural district, number of students per 1000 inhabitants
	Boarding schools	1:3500000	Number of boarding schools by rural districts, number of students, types of boarding schools
	Vocational technical schools	1:3500000	Number of educational institutions by rural districts, number of students, specialization of students by economic sectors
	Secondary special educational institutions	1:5000000	Types of secondary special educational institutions and the number of students
	Higher educational institutions	1:7500000	Types of higher education institutions, number of students, number of students per 10,000 inhabitants
	Level of education of the population	1:5000000	Population by region by level of education, number of people with secondary and higher education per 10,000 employed population
	Scientific institutions	1:7500000	The number of scientific research institutes and their distribution by fields of science, the number of scientific employees
	Museums	1:7500000	Types of museums
	Theaters, club facilities	1:7500000	Number of theaters and clubs, types, population corresponding to each institution
	Public libraries	1:5000000	Number of libraries by region, number of books and magazines, number of books and magazines per capita
	Filmification	1:3500000	Number of movie theaters, population per movie theater
	Newspaper printing	1:3500000	Types of newspapers, language of publication, number of one-time circulation, number of newspapers sold per thousand population
	Physical education, sports, tourism	Physical education and sports	1:3500000
Tourist organizations and institutions		1:5000000	Types of tourist organizations and institutions, the number of places in them
Tourist card		1:2500000	Tourist routes and their numbers, levels, tourist objects

It can be seen from the table that all the cards issued related to the service sector are mainly considered "network cards" according to their content, and their content reflects the territorial composition of social infrastructure institutions and enterprises. True, among them there are also cards for provision of a certain type of service to the population (111 p.), but the share of such cards is small.

In 1980-1981, social cards were also reflected in the educational reference atlas "Atlas Uzbekskoy SSR" developed and published by the Geography Department of the Academy of Sciences of Uzbekistan in 1980-1981 [2, p.39-43]. A total of 35 cards are given in this atlas, of which 5 ("university schools", "higher and secondary special educational institutions", "public libraries", "cinema,

theaters, clubs, museums", "tourist card") are directly of a service nature. are cards that have It is worth noting that these cards are more "network cards" in essence, and the level of service is partially reflected in them.

In the years of independence, the geographical atlas of Uzbekistan [12, p.44-45, 52-53] prepared and published by the Faculty of Geography of Tashkent State University (now UzNU) has an important place in the cartography of our republic. 5 cards of a direct service nature ("Public education", "Higher, secondary special, professional educational institutions", "Health care", "Culture", "Tourist map") are reflected in it.

It should be noted that the composition and main content of these cards are consistent with the above source, and the content is limited by the number of relevant service institutions, their types, and indicators of per 1,000, 10,000, 100,000 people.

By the time of independence, the strengthening of the processes of socialization in the economic and social geography of Uzbekistan and, as a result, the increase in the number of dissertation studies of a socio-geographical nature, in turn, led to the creation of scientific development maps belonging to the socio-geographic category. Among them, it is possible to mention as an example maps such as providing medical services to the population [8], nosogeographical [5, 10], and touristic [11]. Also, in recent years, in particular, Sh.Kurbanov developed maps of some areas of the service sector (educational system) within the region [6, p.210].

When it comes to service cartography, it should be noted that Russian scientists have carried out significant research in this regard. Among them are scientists known for their scientific developments in the direct socio-economic geographical study of service provision and its mapping - A.P. Buryan, L.A. Merkusheva. Service cards related to the social infrastructure of the Ural region were developed by P. N. Chepkasov [4, p. 14, 28, 30]. The remarkable aspect of these cards is that, unlike ordinary grid cards, they show the result of a specific type of service activity ("Activity of the Ural libraries, 1978 card"), the level of provision of a specific type of service to the residents of the region ("Providing the residents of the Urals with household service enterprises, 1978 " card) and, most importantly, it is notable for being one of the first to pay attention to the comprehensive assessment of the provision of a specific type of service to the population ("Comprehensive assessment of the provision of household services to urban and rural residents of the Ural region, 1978" card).

Creating and visualizing service cards based on modern geo-information systems and technologies is not only important in creating maps that describe the demographic processes taking place in the world and in its various regions, but also studying and analyzing service processes is one of the most important issues of today's cartographic research. In this regard, special attention is paid to the actual scientific and practical issues of modern cartography, such as creating service cards, ensuring the reliability of the created cards, even in the study of demographic, social and economic problems.

The service is dedicated to carrying out targeted scientific research aimed at developing effective methods of data collection, storage, digitalization, analysis, processing, registration, evaluation and forecasting, modeling and visualization based on spatial data using modern geoinformation methods and technologies. attention is paid. One of the important tasks is the

development of modern technologies of geo-information and cartographic methods in the creation and updating of service cards. [18]

Geoinformation mapping, spatial and cartographic modeling and visualization with the help of modern cartographic methods and technologies in the preparation of service maps have a special place in the development of the social sphere. Taking into account the advantage of geoinformation systems and technologies in service area research and mapping, improvement of the mathematical and geodetic bases of these maps, taking into account innovative methods and technologies (using ArcGIS, QGIS, Mapinfo programs) has a special place.

So, if service maps are created based on GIS technologies, we can see the interdependence and integration of geoinformatics and cartography. Usually, these areas are mutually dependent. The geoinformation provision of cartography and the cartographic provision of geoinformatics show a relationship. We can see the interconnection of cartography and geoinformatics in the following steps when creating service cards [15; pp. 451-452]:

- Connecting spatial data to a single coordinate system and using a topographic map in software belonging to the family of geoinformation systems and technologies;
- Entering other information (statistical, analytical, etc.)
- Vectorization of data in the form of digital cards to form a component of databases;
- dividing the thematic content of spatial objects into layers;

When creating service cards, it is necessary to first create a database in many GIS programs that collect all statistical and other information. The application of scientific ideas based on integrated, excellence-based geoinformatics research creates opportunities for systematic learning. The electronic service includes creating cards and carrying out scientific research based on innovative approaches.

The following (ServiceGIS) [16] seven-step systematic structure was developed for creating electronic service cards and analyzing situations (Figure 1).

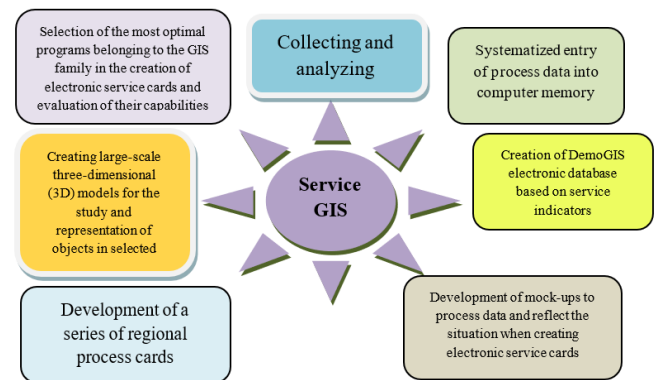


Figure 1. Structure of ServiceGIS when creating Service Cards

1. Evaluation of the capabilities of GIS and technologies in process research and the selection and capabilities of the most effective programs in the implementation of the results of these researches.

2. Collect data on the areas where service cards should be drawn up, analyze them (Fig. 2).

3. To ensure data analysis and systematic entry into computer memory.

4. Creation of the DemoGIS electronic database based on the necessary indicators for the compilation of service cards.

5. Development of data for creation of electronic service cards and creation of card layouts.
6. Development of a series of service cards.
7. Creation of large-scale three-dimensional (3D) models for the study and representation of objects in selected areas.

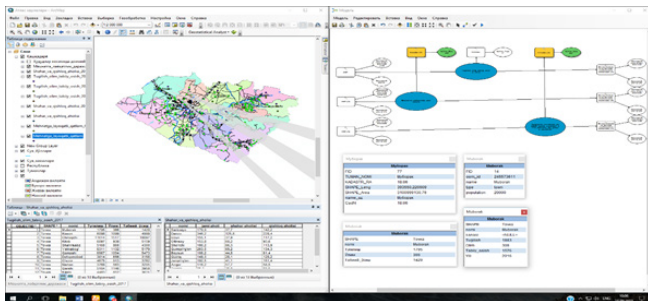


Figure 2. Database management in selected software.

This system of creating service cards speeds up the work process and, at the same time, improves the quality of the cards and the accuracy of the data (Figure 3).

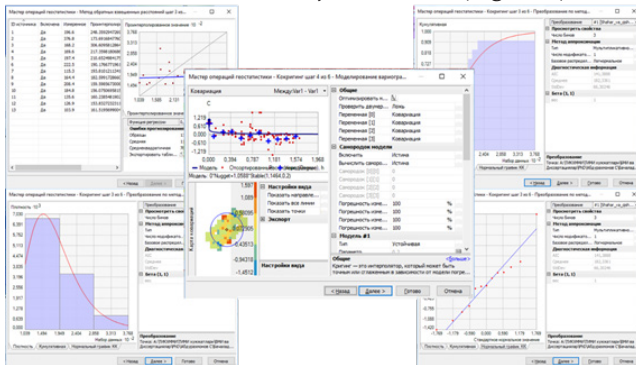


Figure 3. Examples of analysis results in software

According to cartographic criteria, thematic maps compiled on the basis of DemoGIS and geostatistical analysis methods are developed and created according to the research methodology. The results of research on the use of GIS technology are based on the fact that there are ways in which an innovative methodological approach can solve theoretical and practical problems.

Conclusion. Nowadays, the rapid progress of changes in our social life and the rapid growth of the service sector, in turn, have led to complex (complex) cards that cover different service sectors or include various indicators of the development of a specific sector, or cards that evaluate the level of development of a certain service sector. making it necessary to create. At the same time, the creation of synthetic development maps reflecting the population's needs for services and the level of their satisfaction, as well as the territorial structure, or within the framework of the tripartite "needs of the population - systems of population location - service level" is considered to be an urgent issue from a scientific and practical point of view.

Based on the above, in the future, preparation of the "Complex service atlas of Uzbekistan" covering all service areas on the scale of Uzbekistan, including: 1) type of service institutions; 2) level of service; 3) it is desirable to cover comprehensive service (or service potential) maps of regions.

In addition to the above, with the rapid introduction of new types of services into our daily life - financial, internet, mobile communication services, creating type, analytical and especially forecast cards that reflect their composition, level of development, and the situation throughout the country and in its individual regions. is one of the urgent issues of service cartography.

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