An Overview of Smart Specialization Strategy in St. Petersburg, Russia

Introduction

Today St. Petersburg is one of the largest megalopolises of Russia and Europe, it is the economic, cultural and tourist center.

Among competitive advantages of St. Petersburg are:

- Existence of one of the largest consumer markets of EAC and EU (total number of the population of the city taking into account agglomeration is over 6 million people with the high level of income);
- High extent of diversification of city economy;
- High growth rates of GRP which exceed similar indicators of other regions;
- Availability of direct access to the largest markets in Europe and Russia.

The main socio-economic indexes of St. Petersburg in 2017:

- The population is 5352.1 million people;
- The average monthly salary is 54.3 thousand rubles;
- Retail trade turnover is 1319.1 billion rubles;
- Investments into fixed capital are 658.5 billion rubles.

The internal regional product of St. Petersburg (GRP) in 2017 was 3839.4 billion rubles (717.3 thousand rubles per capita) that is 1.02% higher than a similar indicator of 2016. In value terms, the indicator for the year increased by 97.3 million rubles.

St. Petersburg takes the 3rd place in the Russian Federation on GRP volumes.

Growth of the GRP indicator since 2013 testifies to a stable economic situation in St. Petersburg.

Regarding the region of St. Petersburg strategy documents that are comparable to RIS 3 strategy are:

- Strategy of economic and social development of St. Petersburg until 2035 (afterwards in this document shortly St. Petersburg's Strategy or Strategy 2035).
- The state program "Development of industry, innovation and agriculture in St. Petersburg", approved by the Government of St. Petersburg.
- and The Smart City of St. Petersburg program.

The main goal, strategic directions and strategic goals of these documents match with the defined goals of RIS 3. All of these documents use the concept of "smart city" as the core of smart specializations.

There is currently no universally accepted definition of the term "smart city". However, the City Government believes that it embraces the idea of saving resources, creating high-quality urban environments and ensuring a high quality of life for the population through effective management of urban processes in combination with the open interaction of all stakeholders (city dwellers, business, government, etc.).

The basis for the implementation of the ideas of the "smart city" in St. Petersburg are information and communication technologies (ICT) of various directions: from local automation to artificial intelligence technologies and metacognitive technologies for managing complex socio-cyberphysical systems. At the same time, the nomenclature of ICTs of the "smart city" should be consistent with the level of development of the city itself and correspond to its real needs.

Strategy of economic and social development of St. Petersburg until 2030

St. Petersburg's Strategy is a crucial economic and political document that shapes key directions for the long-term development of the city on the basis of priorities of the Russian Federation for the period till 2035. The Strategy adopted by the Legislative Assembly of St. Petersburg, and approved in December, 2018. The first version of the document had a horizon until 2030.

The general goal of the St. Petersburg Strategy is an achievement the sustainable improvement citizens' quality of life and an increase of global competitive capacity of Saint-Petersburg based on sustainable growth due to development of innovation and knowledge-based economy. The strategic priorities contain these directions: human capital development, improvement of quality of urban and living environment, sustainable economic growth, ensuring efficiency of management and civil society.

The Strategy of the socio-economic development of St. Petersburg for 2035
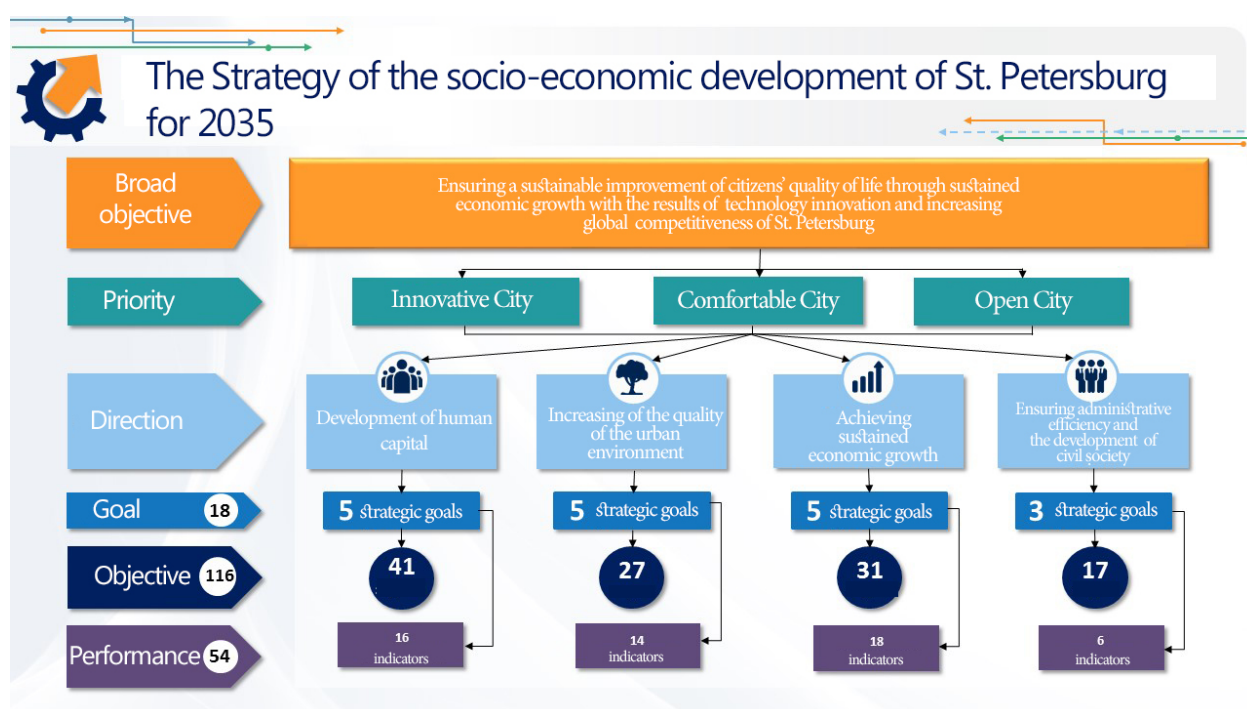
For the achieving the main goal and inside every priority there were worked out 17 programs which will be realized by the 2035 (public health and increasing the life expectancy, improvement of the education quality and access to education for everybody, healthy lifestyle and social services development, innovation and technological development of the industry, sustainable economic growth, knowledge-based economy, creating ecosystem that facilitates to develop business and markets and others).

The effectiveness of the strategy implementation is essentially provided by the following important factors:

1. Keep on moving and applying complex and systematic solutions for the achieving the main goal of the Saint-Petersburg strategy. That means the programs established in the strategy are to be realized cohesively and at optimal balance taking into account the principle of innovation development and undertaking into life.

2. Realize the growth capacity of the Saint-Petersburg city accomplishing regular evaluation of intermediate results of the strategy implementation:

- anticipate new needs of the stakeholders of strategy implementation: public and private sector, academia, applied science, industry, entrepreneurial and innovation actors, citizens.
- adjusting programs and activities of the implementation Saint Petersburg's Strategy to the new and constantly emerging challenges.
- upgrading Saint Petersburg's Strategy in accordance with economic and social changes.
- inventing and evaluating alternative ways offered for tackling with challenges and problems in economic growth critically, undertake the most appropriate ones into life.

3. Elaborating human-centric approach in course of Saint-Petersburg implementation, change outdated and inefficient mindset of underestimating the input of every citizen who wants to be the part of the achieving the Strategy's goals and programs and able to add fresh way of thinking and evaluating intermediate impact of Strategy and helps to proceed its' implementation.

4. Change mindset towards the importance of partnering decision-makers, business, innovation participants, academic sector and public actors, citizens on the way of realizing the Strategy.

5. Construct novel and ingenious mechanisms and instruments for creating favorable environment for Saint Petersburg's Strategy implementation based on an analysis of and taking in the best practices and experience regarding implementation of RIS 3 in Europe and the world.

6. Create new forms for strong and active commitment of experts from public and business sectors for regional innovation ecosystem and strategic implementation that will help to find systematic and community-based methods for solving the challenges faced in the course of achieving of the general goal of Saint-Petersburg strategy and integrate them in practice.

7. Find and bring to life the most effective forms for interfacing actors interested and involved in implementation of Saint-Petersburg strategy.

8. Continue to develop and deepen interaction and collaboration of participants in the regional innovation ecosystem in terms of strategy implementation.

9. Facilitate social innovations and stimulate social renewal through collaboration and partnering of stakeholders.

Strategy 2035 is designed for 17 years (2019-2035). The implementation of Strategy 2035 is provided for in four stages:

- Stage 1 - 2019-2021;
- Stage 2 - 2022-2024;
- Stage 3 - 2025-2030;
- Stage 4 - 2031-2035.

One of the main conditions for the formation of the volume of financial resources necessary for the implementation of Strategy 2035 is the provision of sustainable economic growth in St. Petersburg, characterized by an average annual growth rate of the GRP physical volume index of 3.5-5.0% in 2019-2021 and 5.0% from 2022 to 2035.

The implementation mechanism of the Strategy involves the monitoring of its performance, which allows to control the achievement of the planned results during the social and economic development of St. Petersburg, based on a comprehensive assessment of targets and benchmarks

of the Strategy and state programs in St. Petersburg. It is assumed, that combining the efforts of government, businesses, and society will allow St. Petersburg to succeed in the implementation of the Strategy and become a fully global city with a comfortable habitat.

Table 1. Resource background of the strategy

Main indicators	2012	2016	2020	2030
	Actual data		Predicted data	
Employed in economy (thousand people)	2,530.4	2,970.5	2,966.9	3,174.2
Percent of people with higher education	44.7 %	42.3%	47.0 %	50.0 %
Workplaces with high labor productivity(thousand units)	102.7	783.1	280	400
Water use (thousand cubic meter per day)	1,625	1,416	1,500	1,500
Gross Regional Product of Saint-Petersburg (billion roubles)	2,530.4	3,742.2	5,310.5	14,000
Fixed capital investment (billion roubles)	351.9	582.3	982.7	3019
Foreign investment in economy of Saint-Petersburg (billion USD)	10.8	4.8	15.2	17
Consolidated budget revenues (billion roubles)	379.9	476.7	648.3	1401.4
Consolidated budget expenditures (billion roubles)	382.3	496.5	630.9	1401.4

According to statistics for 2016, some indicators differ significantly from the predictedfor 2020-2030. Particular attention should be paid to: employed in economy, percent of people with higher education, workplaces with high labor productivity and foreign investment in economy of St. Petersburg.

Fig. 1 clearly shows that in 2016 the number of employed in the economy exceeded the predicted data for 2020. The forecast for 2020 needs to be revised.
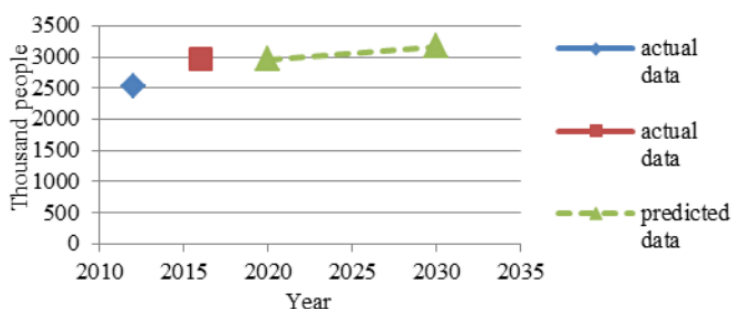

Fig. 1. Employed in economy.

The percent of people with higher education, on the contrary, in 2016 decreased compared to 2012, as can be seen in Figure 2.
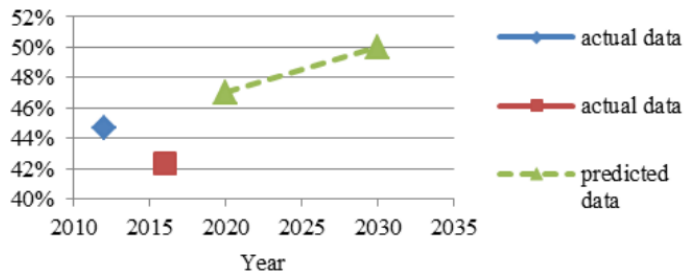
Fig. 2. Percent of people with higher education.

Fig. 3 reflects a significant leap in the number of workplaces with high labor productivity in 2016, which exceeds forecasts for 2020 and 2030. Accordingly, the forecast also needs to be revised.
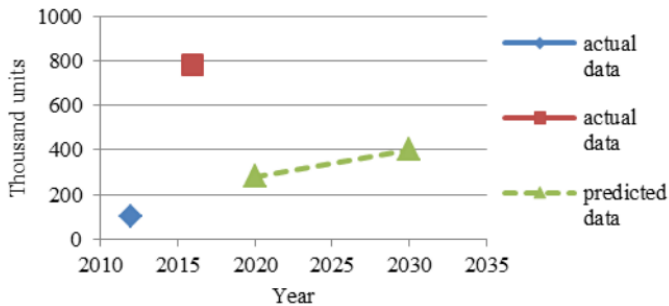

Fig. 3. Workplaces with high labor productivity.

Foreign investment in economy of St. Petersburg in 2016 significantly decreased even compared to 2012. Forecasts for 2020 and 2030 are seen as weakly achievable and need to be revised.
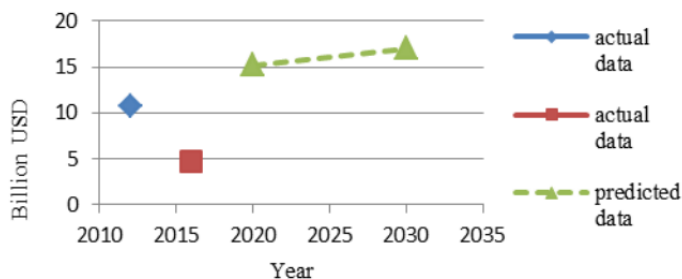

Fig. 4. Foreign investment in economy of St. Petersburg.

The Government of St. Petersburg is preparing an annual report on the implementation of the Action Plan for the implementation of the Strategy for Socio-Economic Development of St. Petersburg.

The state program "Development of industry, innovation and agriculture in St. Petersburg"

According to the program the industry of St. Petersburg is the basis of the economy of St. Petersburg, the main source of budget revenue.

Industry in St. Petersburg accounts for 20% of the gross regional product (according to 2016 data), more than 30% of the total turnover of organizations of St. Petersburg.

The contribution of industry to the formation of the budget revenues is the largest: in 2017, industrial enterprises accounted for 46.5% of tax revenues in the budget system of the Russian Federation, 19.4% of revenues in the budget of St. Petersburg (according to the KPPI based on data from the Federal Tax Service in St. Petersburg). This sector of the economy employs 17 percent of the working population.

The development of industry as a basic sector of the economy affects various aspects of the socio-economic development of the region, including: budget revenues, employment and the level of well-being of the population, the solution of social problems, and the state of the consumer market.

One of the main factors for ensuring strategic competitiveness and a necessary condition for the sustainable development of the industry of St. Petersburg is the presence of significant innovative potential in St. Petersburg.

St. Petersburg is at the forefront of innovative development and for several years has been leading in various ratings, including international ones. Since 2014, St. Petersburg has been one of the three leaders in the Rating of Innovative Regions of Russia, developed by the Association of Innovative Regions of the Russian Federation for Economic Interaction between the Subjects of the Russian Federation and the Ministry of Economic Development of the Russian Federation (hereinafter - the Rating). In 2017, St. Petersburg took first place in the Rating.

Taking into account the indicated prerequisites, goals and objectives of the socio-economic development of St. Petersburg for the long term, the innovative development of St. Petersburg is identified as one of the priority areas.

The implementation of measures provided for by the state program will contribute to the activation of the investment process, will stimulate technological re-equipment of production and innovative activity of enterprises, and will create conditions for increasing the level of labor productivity in industry and increasing the competitiveness of enterprises.

In the medium term, with the implementation of the target scenario for the development of the St. Petersburg economy, the volume of shipped products will increase by 20 times by 2023 compared to 2016 and will exceed 3.8 trillion rubles.

High-tech industries, as well as food and processing industries will have a decisive influence on the results of St. Petersburg industry.

Given the planned completion of a number of large investment projects, outstripping production growth rates (on average - 106.1% per year) can be achieved in the machine-building complex and the pharmaceutical industry.

The industrial production index for St. Petersburg in 2023 will be 132.1% compared to 2016, with an average annual rate of 104.1% (the target scenario for the development of the St. Petersburg economy).

The sectors producing consumer demand products, primarily food products, will develop at a steady pace (on average - 101.6% per year). The main factor in the growth of production in this industrial sector is the growth of population incomes.

To achieve this goal, the state program provides for measures aimed at solving the following problems:

- increasing the competitiveness of industry in St. Petersburg;
- development and effective use of the innovative potential of St. Petersburg;
- creation of favorable conditions for the development of the agro-industrial complex of St. Petersburg in order to provide the population of St. Petersburg with high-quality and safe food products.

Special economic zone of St. Petersburg:

Name of industrial zone	Area, ha	Specialization	Residents
Primorsky district of St. Petersburg			
Novoorlovskaya	110.41	• Information technology and telecommunications; • Pharmaceuticals and medical technology; • Energy efficiency; • Accurate instrumentation.	• "ORION MEDIC" CJSC; • "Vertex" CJSC; • "Novartis Neva" LLC; • "RCI Sintez" CJSC; • "Crystal SET" LLC; • "Quadro Electric Technology" LLC
Petrodvoretsovy district of St. Petersburg			
Neudorf	18.99	• Information technology and telecommunications; • Pharmaceuticals and medical technologies; • Energy efficiency; • Precise instrument making.	• "RAKURS-Engineering" LLC; • "Pharm-holding" CJSC; • "BIOCAD" CJSC; • "Vertex" JSC; • "Novartis Neva" LLC; • "Inmed" LLC

Industrial and industrial parks of St. Petersburg:

Name of industrial zone	Area, ha	Specialization	Residents
Petrodvoretsovy district of St. Petersburg			
Mariyno	130	Industrial and warehouse facilities of II and III hazard classes	· LLC "Teknos"; · Logistic group "Admiral-Terminal SV"; · JSC "PO "Diesel-Energo"; · "DSK Plastic Omnium Inergy"
Pushkin district of St. Petersburg			
A Plus Park St. Petersburg — 3	8.3	Production Facilities	· GC "Darnitsa"
A Plus Park St. Petersburg — 1	72	Objects of industrial and warehouse purposes	· Auchan distribution center; · Decathlon distribution center; · Scania production and warehouse complex; · ETM production and warehouse complex; · Perekrestok distribution center
Kolpinsky district of St. Petersburg			
A Plus Park St. Petersburg — 2	13	Objects of industrial and warehouse purposes	· AGC Production complex
Nevsky district of St. Petersburg			
Zvezda	22	Objects of industrial and warehouse purposes	· FORMAN Products; · Pro-bite (professional chemistry); · Treves — "Ergon"; · Severny-Technopark; · Skaala
Resort area of St. Petersburg			
Voskov Technopark	4	Objects of industrial and warehouse purposes	More than 50 residents
Kirovsky district of St. Petersburg			
Narvsky	2.4	Objects of industrial and warehouse purposes	10 residents

The Smart City of St. Petersburg program

The main goal of the Smart City of St. Petersburg program is to ensure the high quality of life perceived by the population. The assessment of its reachability is based on six basic principles:

- The principle of creating a comfortable urban environment for everyone. It suggests that the urban environment is provided with the needs and expectations of all population groups. We have objective and subjective expectations of a city dweller.
- The principle of coordination and interaction of all participants in the development of the city. It is assumed that all categories of stakeholders should be involved in the process of creating and using a "smart city".
- The principle of the additional purpose of urban infrastructure. It is assumed that priority is given to infrastructure elements.
- Principles of development based on monitoring, analysis and forecasting. It is assumed that a comprehensive digital description of the city as an integrated system and monitoring of its condition for solving the problems of assessing, analyzing and predicting the development of the city.
- The principle of creating a digital environment for self-organization of residents and businesses. It is supposed to create a single information space.

- The principle "Smart City is a city where happy people live". Estimated priority orientation on creating positive motivation of residents from interacting with the urban environment.

In accordance with the above principles, there are three main enlarged areas of ICT application in the "smart city".

1. The first and most traditional area includes solutions for monitoring the life processes of the city, for this purpose primary data collection devices (sensors, cameras, etc.) are intensively introduced in modern cities, including the lower level of the Internet of Things (IoT) mechanisms. In general, this approach is called the "sensitive city". The need to process a large amount of information necessitates the use of technological solutions for the collection, processing and analysis of big data. The specifics of the implementation of ICT solutions for this significantly depends on the subject area (including the incoming data volumes, requirements for reactivity and performance, as well as the representativeness of the placement of primary devices).

2. The second enlarged area includes solutions for managing the development of the city. Their peculiarity consists in the need for a quantitative presentation of the integrated development goals of the city and an assessment of the effectiveness of their achievement. The solution to such problems is complicated by the fact that the city is a complex socio-technical system, which makes it impossible to reduce the task of achieving the integrated development goal of the city to achieving private development goals in certain areas. For this reason, modern approaches to goal-setting in urban development involve the formation of an integrated target image of the city in a digital environment, built taking into account the structure of urban entities and the features of their interaction between themselves and with the population. A feature of ICT solutions of the "smart city" in this area is the implementation of multi-criteria optimization mechanisms in the face of uncertainty based on quantitative indices of quality of life in various fields (physiological, socio-economic, psychological). The indices themselves are constructed on the basis of retrospective and relevant city data from various sources (including both direct measurements and the results of predictive modeling).

3. The third enlarged region provides solutions for the provision of people living in the city with new services aimed at simplifying the interaction of consumers with the urban environment. A feature of these decisions is the diversity and inconstancy of the real processes of interaction between people and the city. For this reason, it is supposed to provide the consumer with information, data and knowledge generated on the basis of available information, in all possible diversity, using multimodal interfaces of human-computer interaction. At the same time, the pro-activeness of the socio-technical services of the "smart city" is important, expressed in their adaptation to changing urban conditions and monitoring the current state and needs of the main stakeholders (in the simplest case, by geolocation).

The implementation of the digital image of St. Petersburg was used to automate the aggregation, processing and verification of data on urban areas. This allowed us to combine in a single logic such heterogeneous data as departmental statistics, results of field observations, environmental studies, opinion polls and data from online sources, including social networks.

This is necessary for the subsequent implementation of hybrid predictive models of the dynamics of the urban environment, urban mobility and the evolution of the social structure of the urban population. At the same time, predictive models can be used to analyze and forecast urban processes at various spatio-temporal scales (from planning walking routes of tourist groups to

assessing the effectiveness of long-term urban development programs). In addition, with the help of a digital image, the tasks of planning the placement of objects of social and commercial infrastructure are solved. For this, data from various sources is compared and the most reliable parameters are automatically determined, popularity / attendance modeling of various points of attraction is modeled, and the actual provision of the population with social infrastructure is calculated.

In general, the digital image provides a combination of data, models and aggregated knowledge in order to create decision support tools for managing urban processes.

Conclusion

In order for the economic development of St. Petersburg to proceed at an accelerated pace, it is necessary to solve a number of problems that are characteristic of all cities of Russia.

First of all, this concerns the lack of labor resources. This problem is connected both with the gradual aging of the able-bodied population due to the low birth rate in the early 1990s, and with the mismatch between supply and demand for labor. Most of the graduates of recent years are humanities, and the competition, and accordingly, the graduation rate for workers in specialties is declining. This gap is also affected by the weakening of ties between educational institutions and enterprises of the city. Another problem that needs to be solved is the predominance of enterprises of the old formation in the Petersburg economy that do not use new working methods. One more problem is the decrease in investment flow.

Joint work to eliminate all these problems will allow St. Petersburg to achieve all the economic growth indicators laid down in Strategy 2035.

All current documents are fully consistent with the UN sustainable development goals and one of its scenarios has prospects for implementation. A number of pilot innovative projects in St. Petersburg are aimed at sustainable urban development. Major research universities take part in the implementation of most of those projects; some of them are supported by instruments of cooperation across borders through project funding. Cooperation, exchange of experience, joint financing make it possible to achieve sustainable development goals and indicators of economic and social development of such a large European city as St. Petersburg.

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