

Review article

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The Mission of the Emperor Alexander I Petersburg State Transport University

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ABSTRACT Emperor Alexander I St. Petersburg State Transport University is the only one of the universities subordinate to the Federal Agency for Railway Transport, which in 2021, among other 106 Russian universities, was awarded the basic part of the grant of the Priority 2030 program.

The Priority 2030 Program, approved by the Government of the Russian Federation, concentrates resources to ensure the contribution of Russian universities to achieving the national development goals of the Russian Federation for the period up to 2030. The program is aimed at increasing the scientific and educational potential of universities and scientific organizations, as well as ensuring the participation of educational organizations of higher education in the socio-economic development of the subjects of the Russian Federation.

Participation in this program opens up wide opportunities for import substitution and contributes to the university's going beyond solving urgent problems limited exclusively by the activities of railway transport.

During 2021–2022, Emperor Alexander I St. Petersburg State Transport University successfully implements all the projects outlined by the program and confidently reaches the goals it has set.

The article briefly describes the key tracks of the university's development during the implementation of the development program until 2030, as well as scientific and practical achievements obtained within the framework of strategic projects as of 2023.

KEYWORDS: higher education; transport; transport universities; import substitution; academic leadership “Priority 2030”

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Обзорная статья

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АННОТАЦИЯ Петербургский государственный университет путей сообщения Императора Александра I (ПГУПС) – единственный из подведомственных Федеральному агентству железнодорожного транспорта вузов, который в 2021 г. в числе других 106 российских университетов был удостоен базовой части гранта программы “Приоритет 2030”.

Программа “Приоритет 2030”, утвержденная Правительством Российской Федерации, концентрирует ресурсы для обеспечения вклада российских университетов в достижение национальных целей развития РФ на период до 2030 г. Она направлена на повышение научно-образовательного потенциала университетов и научных организаций, обеспечение участия образовательных организаций высшего образования в социально-экономическом развитии субъектов РФ.

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Участие в программе открывает широкие возможности для импортозамещения и способствует выходу вуза за пределы решения актуальных задач, ограниченных исключительно деятельностью железнодорожного транспорта.

На протяжении 2021–2022 гг. ПГУПС успешно выполняет все намеченные программой проекты и уверенно выходит на достижение намеченных ею целей.

Представлена краткая характеристика ключевых треков развития университета при реализации программы развития до 2030 г., а также научно-практические достижения, полученные в рамках стратегических проектов по состоянию на 2023 г.

КЛЮЧЕВЫЕ СЛОВА: университеты; транспорт; транспортное образование; импортозамещение; программа стратегического академического лидерства “Приоритет 2030”

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Emperor Alexander I St. Petersburg State Transport University (PGUPS) is the only university subordinate to the Federal Railway Transport Agency (Roszheldor), which in 2021 among other 106 Russian universities was awarded the basic part of the grant of the Priority 2030 program and included by the decision of the Minister of Science and Higher Education of the Russian Federation in the state program of strategic academic leadership “Priority 2030”.

The university's participation in the Priority 2030 program is another confirmation of its high professional ambitions. The university development by 2030 is connected with the need to form an engineering vanguard to ensure Russia's intellectual sovereignty. This target image was formed and transformed taking into account the well-known events of the past years.

The strategic mission of the university to create fundamentally new engineering, technology and human capital development is relevant.

PGUPS realizes a matrix of policies, which are linked through strategic projects. Until this year, the university worked on four such projects: “Development of High-Speed Railway Service and Magnetolevitation Technologies”, “Safe Transportation Ecosystem of Mainline Infrastructure”, “Development of Transportation Infrastructure Facilities in the Arctic Zone of Russia”, and “Digital Ecosystem of Intellectual Priorities for Transportation and Logistics”.

Recognizing the changes in geopolitics and shifting agenda, PGUPS has revised the set of implemented strategic directions, clarified the vectors of development in all relevant areas. The University relies on the recommendations of experts of the operator of the largest state programs for the development of Russian universities, the Centre for Sociological Research (Sociocentre), proposed in 2022. Currently, PGUPS is implementing two strategic projects: “Safe Ecosystem of Intelligent Transport Infrastructure” and “New Technologies and Materials in Construction”.

In order to consolidate the scientific potential and resources of PGUPS following the first, most difficult

period of the Priority 2030 program implementation, PGUPS focused on two strategic areas useful for strengthening Russia's technological sovereignty in the “grocery shelf” format:

- development of digital solutions;
- creation of new materials.

A modern higher education institution is the country of tomorrow in terms of material, technical and laboratory facilities, innovative environment, support for young scientists, preservation of traditions of the best engineering education and accretion of industry values. Only the presence of all the above components will provide the university with a guaranteed qualitative evolution.

In research policy, the key result should be the increase in 2030 compared to 2020 of the volume of research and development (R&D) per one scientific and pedagogical employee by more than two times; the volume of expenditures on scientific development from own funds per one scientific and pedagogical employee by 19 times; the number of publications indexed in recognized science databases by more than two times.

The new challenges and demands of a volatile economy in an anti-globalization environment require from a modern university an appropriate response, which can and should be manifested in the unique characteristics of the main products of the university: knowledge, innovation and human capital.

In this regard, PGUPS has transformed the paradigm of further development in terms of protecting technological sovereignty, ensuring the sustainability of the university ecosystem in a volatile economy. The university relies on lean technologies that consistently realize continuous improvements relevant to the market. A lot of analytical work has been carried out, which resulted not only in reconfiguring strategic projects, but also in clarifying the functional role of partnerships on the actual ways of development of modern economy.

The mission of the university in the conditions of import substitution, localization of production within

the country and accelerated formation of end-to-end technologies is the accumulation and implementation of new practices, breakthrough developments relevant for the development of a new technological mode. Taking into account the fact that for more than two hundred years PGUPS has been an advanced educational, research and production complex with a modern scientific and experimental base and acts as a growth point of national transportation education, science and innovation, it can be stated that the university has the necessary competencies.

Today scientists of PGUPS solve applied scientific and practical problems for the transportation industry of Saint Petersburg and the Russian Federation. The scientific infrastructure of the university is one of the largest in the country, based on the functioning of 17 leading scientific schools. The oldest of them are the schools of bridge and tunnel engineering, rolling stock, construction material science, automation and telemechanics, train traffic control, as well as railways of mainline, industrial and urban transportation.

The university has developed innovative technological solutions for the construction of fast-erecting buildings required for the sustainable development of Russian regions.

PGUPS scientists have patented a domestic environmentally friendly thermal insulation material, the use of which is oriented towards harsh climatic conditions.

In order to ensure the digital transformation of the transport industry, the university created a domestic end-to-end intellectual technology that allows organizing safe train traffic in automatic mode.

In 2022, PGUPS entered new markets that are beyond the typical markets of an industry-specific university. The range of research performed by the university has expanded: for the first time, most of the customers were not only Russian Railways, but also other representatives of real business.

The "Priority 2030" program also provides for the allocation of funds for the renovation of the laboratory research base for applied research in areas critical for the Russian Federation and relevant in the context of import substitution. The renewal process has already begun.

The university is keeping up with the times, four new laboratories have been put into operation in 2022 to perform relevant world-class research: the laboratory of digital modelling of high-speed railway construction; the training laboratory "Microprocessor and Electronic Telemechanical Devices of Railway Automation and Telemechanics"; geotechnical testing centre; and laboratory "Internet of Things". They will make it possible to develop hardware and software complexes for operational deployment from domestic components, create innovative construction materials with unique characteristics, conduct expert examinations with

the use of digital twins and tests of magnetolevitation transportation technology.

PGUPS meets the changes with fundamentally new competencies, breakthrough developments, new formats of education and academic cooperation, and innovative infrastructure.

The implementation of strategic projects, as the main drivers of the program, took place in accordance with the adopted roadmap. A distinctive feature was the integration of a number of projects within the framework of individual studies, conducted, among other things, at the new laboratory base.

The laboratory base is being actively developed, which allows the university to conduct R&D that meets the national goals of increasing railway capacity and Arctic transport development, implement new educational programs and offer products relevant to the challenges to Russia's technological sovereignty.

The PGUPS development program is based on three pillars: new formats of cooperation, new models of education and implementation of a new pool of strategic projects.

During the period of participation in the program, the university has successfully implemented a model of ecosystem management of scientific and educational space, in which the vertical management is implemented by deputy heads of scientific direction appointed from among reputable scientists. The routes of the technological direction as a whole are determined by the scientific manager from production. The management horizon – for the head of educational programs from PGUPS and for the expert – the head of production – a top manager of a high-tech company. Training is based on flexible modules with "individual constructor" competencies. It is at their intersection that growth points are created and the skills of a unique specialist capable of managing the full life cycle of projects, innovations and high-tech production useful for the import substitution economy are formed.

Examples of successful achievements are a set of microprocessor systems based on microcomputers and programmable controllers developed by PGUPS scientists. All systems are based on domestic software and hardware technical solutions and cover the whole range of needs of mainline, industrial transport and subways in control of railway automation and telemechanics devices. More than 30 patents have been obtained and dozens of license agreements have been concluded. The geography of implementation of microprocessor-based centralization systems is extensive: more than 250 stations on the railways of Russia and 23 foreign countries, subways of six cities in Russia and CIS countries.

In 2022, PGUPS expanded the range of scientific research carried out on a customer-specific and turnkey basis. The university also performs R&D for business

to meet the challenges of Industry 4.0, where priorities are set not only by customers, but also by the market.

PGUPS has long gone beyond the boundaries of an industry-specific university. A vivid example is the construction of a modern automated plant for the production of aerated concrete in Orenburg. This large-scale project was preceded by 10 years of scientific research of the university scientists on the development of structural and heat-insulating concrete. The new material is characterized by a unique combination of increased strength, operational reliability with improved heat and sound insulation properties, which has no analogues at present. The material possesses world novelty: 12 patents have been obtained on this topic and more than 70 scientific papers have been published. This complex project took into account both the customer's requirements and national priorities for localization of production within the country.

Speaking about the indicators of ongoing changes and transformation of the university within the framework of the Priority 2030 program, we can distinguish four groups of changes observed today.

1. Educational. This is the implementation of new educational programs and new competencies through the prism of project management. The indicator is the growth rate of the number of students.

2. Infrastructural. PGUPS creates its own hub of know-how from a number of new units for commercialization of scientific results. The indicator is the qualitative increase of comfortable labour and leisure spaces.

3. Research, because new topics of ambitious research meet national goals and require the development of new directions. And this is possible only in cooperation. Indicator – growth of the share of commercialization of scientific developments and the number of partners.

4. Creation of a team of young scientists to implement these changes. Today it includes 88 people, only full-time scientific and pedagogical staff. Indicator – the share of young employees aged under 39, working in the university.

The UNESCO report dated 04.03.2021 “Engineering for Sustainable Development” states that *“the training of engineers requires not only new professional qualities, including creative learning and thinking, complex problem solving, interdisciplinary and international cooperation and a code of ethics, but also requires changes in the training of the engineering profession itself”*. PGUPS is able to guarantee the knowledge-intensive development of transportation and stable supply of Industry 4.0 with human capital of a new formation.

Bionotes

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