

Innovations and efficiency improvement

Innovation driven development

The Russian Railways Group's R&D activities and innovation driven development follow the priorities set forth in the Company's Long-Term Development Programme until 2025, as well as the Group's Research and Development Strategy until 2025 and further until 2030 (the "White Book"), in line with the country's strategic development goals and global R&D trends.

The Comprehensive Innovative Development Programme (CIDP) until 2025² includes 11 groups of key projects and proposals for streamlining innovation activities and establishes partnership mechanisms underpinned by open innovation principles.

In 2021, 142 innovation projects were being implemented under the CIDP, with the portfolio of innovation

projects growing by 42. In 2021, the Group invested a total of RUB 166 bn in innovation projects, including R&D, under the CIDP until 2025.

Key innovation projects in 2021

- Quantum Communications Platform for Digital Economy, hardware and software solution.
- Technological management system for suburban passenger transportation to streamline planning and organisation of current operations, facilitate transition to paperless processes and ensure effective planning of repairs.
- Automated unit for plate bearing tests to reduce the cost and duration of testing.

- Hybrid traffic management system at the pilot section of the Moscow Central Circle (Andronovka – Lefortovo – Cherkizovo) for six Lastochka ES2G electric trains (12 control cars).

In 2021, the Company signed strategic partnership agreements with Rostec and RUSNANO. The documents are aimed at joint manufacturing of high-tech import-independent products for the railway transport at Rostec facilities. The priority cooperation areas include the development of elements for microprocessor-based traffic management systems, innovative rolling stock running on alternative energy sources (hydrogen), and technology to reduce the environmental impact of railway transport.

Efficiency improvement

Improving the efficiency of infrastructure

To improve the efficiency of its infrastructure, the Company focuses on the following areas:

- repairs and upgrade of infrastructure facilities;
- streamlining the freight traffic schedule;

- improving performance at operating domains;
- streamlining the schedule for passenger trains;
- developing infrastructure to support growing transit container volumes.

¹ Approved by Russian Railways' Order No. 769/r dated 17 April 2018.

² Approved by the Company's Board of Directors (Minutes No. 13 dated 26 February 2020).

New Baikalsky Tunnel

The reporting year saw the launch of the new 6.7-kilometre-long Baikalsky Tunnel.

- Construction period 2016–2021
- Total costs RUB 35.9 bn
- Length 6.7 km (6,685.3 m)
- Depth up to 300 m

The tunnel was built as part of Baikal–Amur Mainline upgrade ordered by the Russian President Vladimir Putin to boost the carrying capacities of the railway infrastructure in the Eastern direction.

The Baikalsky Tunnel is key to expanding the throughput of the 17-kilometre-long Delbichinda–Daban section of the Baikal–Amur Mainline’s western sector. Its launch will increase the section’s throughput from 17 to 85 train pairs per day.

Once the new tunnel is in operation, it will be a 100% two-track section. Also, the section’s carrying capacity will be up 2.5 times, from 13.2 mt to 32.4 mt of freight per year, enabling the Company to accommodate additional and potential transportation volumes.

Higher traction stock efficiency

Heavy-duty traffic and higher weight standards of freight trains are key to optimising the transportation process in terms of increasing the carrying capacity, enhancing performance of locomotives and locomotive crews and reducing energy consumption for train traction.

Innovations for process improvements

- Introduction of the technology of driving freight trains without assistant. To that end, in 2021 locomotives were retrofitted with KLUB-U dedicated safety devices (414 items), telemechanic solutions for driver drowsiness detection (465 items), locomotive radio stations (759 items), and SAUT-K automatic braking control system (120 items).
- Development and introduction of virtual coupling – a wireless inter carriage link technology. In 2021, the technology was put into commercial operation in the Eastern Operating Domain. The ISAVP-RT-M auto driving system to minimise intervals was installed on 221 locomotives. The system was also integrated into 145 locomotives during construction.

- Development of a device to control the length of any breaks in communication between the shunting master and the locomotive driver. The aim is to create a device that will automatically inform the locomotive driver that a specified period of time has elapsed after the last communication with the shunting master (20 seconds).

For more details on projects to improve the efficiency of infrastructure and traction rolling stock see [Russian Railways' 2021 Annual Report](#), the Railway Transportation and Infrastructure section.

