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On the Progress of Work on the Assembly of a New Wintering Complex at Vostok Station in the 2021/2022 Season

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Background Paper submitted by the Russian Federation

Previously the Russian Federation has informed other Parties about the plans for the reconstruction of the Russian inland station Vostok and about the progress of the project (ATCM XLII IP114 *Construction of a new wintering complex at Vostok station* and ATCM XLIII BP15 *On the postponement of the first stage of work on the assembly of a new wintering building at Vostok station for the 2021/2022 season*).

Vostok station, the only operating inland Russian Antarctic station, was opened in 1957 and has been reconstructed twice (in 1974 and 1982). The first buildings have been under a thick layer of snow for a long time, the more modern ones are partially or completely immersed in the snow. Currently, the infrastructure of the station needs to be completely replaced. The reconstruction of the station includes the assembly of a new wintering complex with the subsequent cleaning of the territory from old structures, landfills and waste disposal in accordance with the requirements of the Protocol on Environmental Protection.

The project of the new wintering complex was originally developed by the Ramboll international company, and later adapted to national requirements by Russian engineering companies.

The project is based on modern architectural and construction solutions that fully take into account local environmental conditions. The project involves the use of environmentally friendly materials, renewable energy sources, vehicles and energy equipment that meet high environmental standards, while reducing their use time to increase environmental profitability. In order to save energy and minimize the impact on the environment, heat recovery during air exchange, optimal water treatment, wastewater treatment and water reuse are provided.

Container-module assembly allows you to quickly perform installation work in a short summer period. At the end of the life of the station, all structures and equipment will be dismantled and removed from the Antarctic without leaving a trace for the natural landscape.

A specific feature of the project is that the activity to create a new wintering complex at Vostok station is spaced apart in time and space, that is, it consists of separate isolated activities in various geographical and climatic zones (from coastal to high-altitude glacial) and ecological domains of Antarctica with different the degree of anthropogenic load - from irreversibly transformed areas of stations to untouched territories of inner Antarctica. Taking into account these features, the activity was divided into separate stages:

- establishment of a temporary fuel depot – a reversibly transformed area on the shores of Thala fjord, Larsemann hills;
- sea transportation of structures of the new wintering complex of Vostok station, auxiliary cargo and cargo operations in the area of Thala fjord – the sea area and the coast of Antarctica;
- intracontinental delivery of cargoes to Vostok station – glacial plateau, Central Antarctica;
- organization of a temporary camp for assembly work – an irreversibly transformed area of Vostok station;
- assembly and operation of a new wintering complex – an irreversibly transformed area of Vostok station;
- Removal of dilapidated structures – irreversibly transformed area of Vostok station.

After analyzing the scope of work in various areas of Antarctica and the calendar terms of their implementation, an environmental impact assessment (EIA) was carried out for each stage of the activity in accordance with Annex I to the Protocol on Environmental Protection to the Antarctic Treaty. The Initial Environmental Assessments (IEEs) prepared have identified each stage of activity as having no more than a minor or transitory impact.

On September 7, 2021, the container ship *Mys Dezhnev* with the modules of the new wintering complex of Vostok station on board was sent from the port of St. Petersburg to Antarctica. About 80% of the total cargo weight was loaded onto the vessel. The rest went on the *Andrey Osipov* container ship, which left St. Petersburg on September 15. The total weight of the cargo was 6.78 thousand tons. The *Yaroslav Mudryy* tanker, which delivered 6,000 tons of diesel fuel, left Nakhodka on October 4, the icebreaker *Kapitan Khlebnikov*, which escorted ships in the Antarctic, departed Vladivostok on October 6.

The crews of all ships have passed the necessary anti-epidemic measures, including quarantine.

When approaching the mainland, the ships encountered severe ice conditions. The total width of the fast ice in the unloading area reached 90 km, the height of the hummocks was 1.5–2 m. The laying of a canal in the fast ice massif and the piloting of ships to the place of unloading by the icebreaker *Kapitan Khlebnikov* took twenty-seven days. Four vessels arrived in Tala fjord near the Russian station Progress on November 25. The unloading was carried out in several stages and was completed on December 18, after which, until December 24, the icebreaker *Kapitan Khlebnikov* took the ships out of the ice massif of the Prydz bay.

Delivered general cargo, technical equipment and other cargo for the project were placed at a specially prepared storage area near Progress station, from where they will be transported to Vostok station using sledge-tractor traverses for three seasons. The distance between the coast station Progress and the continental station Vostok is 1,460 km.

In the 2021/2022 season, fourteen sledge-tractor traverses were carried out, of which nine trips along the Progress-Vostok route and five trips to fuel subbases at 550 km and 1,100 km of the route, providing refueling equipment. A seasonal transport detachment of ninety people ensured the delivery of about 1,600 tons of cargo, including 1,200 tons of materials and structures for the construction of a new wintering complex. The rest of the cargo was prepared for winter storage at a temporary storage site on the glacier.

Forty tractors *PistenBully 300 Polar*, five tractors *Caterpillar* and six all-terrain vehicles *Burlak* were used in the campaigns. For the operation, specially enlarged ski platforms were made, measuring 12.2 m long and 8.15 m wide, capable of carrying a load of over 60 tons (Figure 1).



Figure 1 – Sledge-tractor traverse

The following works were performed at Vostok station for the 2021/2022 season:

- completion of a three-year work on compaction of site 1500×450 m, intended for accommodation and storage of delivered cargo and fuel, as well as organization of personnel accommodation;
- the formation of the foundation platform intended directly for assembling the modules of the new wintering complex, site 180×60 m, 280 cm thick, was completed, the average strength of the foundation snow material exceeded the minimum allowable technical task by four times, the snow density was 610 kg/m³;
- thirty-six 3 m high ski-pillars were installed in the design state, which will allow the station to remain unloaded for many years, the metal structure of the base platform was assembled; twelve modules of the future new wintering complex were installed (Figure 2);
- an administrative building was delivered to accommodate the construction group, consisting of twenty modules; construction equipment was delivered and put into operation, including a crane with a lifting capacity of 80 tons;
- at the end of seasonal operations, measures were taken to ensure the winter storage of modules, machines and mechanisms.



Figure 2 – Installation of ski-pillars and base platform

Work on the assembly of a new wintering complex is planned to be completed within four years. The new wintering complex will provide accommodation and research activities for 15 people during wintering and 35 people during the season, will expand opportunities for international scientific cooperation, large-scale research and expeditionary work.