The ecological systems of the Komi Republic and Nенетsky Autonomous Okrug (NAO) mainly belong to the Barents Sea basin. They are rich forest and peat permafrost carbon pools, and also a valuable social and global biodiversity. At the same time, the Komi Republic and NAO represent almost 35% of the total permafrost regions in the Russian part of Europe. Abnormally high, recent summer temperature increases in the Arctic have been reported more than twice the mean global increases. This trend is likely to continue and the IPCC predicts increases in the Arctic have been nearly twice the mean global increases. This trend is likely to continue and the IPCC predicts increases. The permafrost layer is a stable carbon reservoir and one of the components of the global carbon cycle dynamics under a warming climate scenario. Many tundra and forest-tundra landscapes in the eastern part of the Northern European Russia are standing on two inseparable layers: permafrost (beneath) and peat layer (above), which are functionally interconnected. Permafrost maintains the conditions for peat formation, and the peat plays a crucial role in the preservation of the permafrost layer. Changes in one of the components will inevitably impact the other, which may lead to drastic changes in landscape structure and biogeochemistry, losses in carbon storage and GHG emission.

Permafrost thaw could release comparable quantity of carbon as deforestation, and considering possible emission of methane, the effect on the climate can be even stronger. Permafrost thaw could also release the frozen soil that was sequestered over centuries and decades. The disturbed permafrost layer leads to irreversible changes turning carbon-accumulating ecosystems into sources of carbon emissions. The atmosphere and hydrological processes change, causing changes in hydrology, soil layers and landscapes. Ecosystem and species of global importance are lost, and many unique and ancient ecosystems are also at risk. In addition, the impact of permafrost thaw on agriculture and settlements is significant. The permafrost thaw could release large quantities of greenhouse gases (GHG) leading to further warming of the atmosphere.

The permafrost ecosystems are important for biodiversity and carbon storage. The permafrost ecosystems are a key component of the global carbon cycle and a significant carbon sink. The permafrost ecosystems store about 20% of the total carbon in the atmosphere. The permafrost ecosystems are also important for biodiversity, as they support a wide range of species, including many that are threatened or endangered. The permafrost ecosystems are important for agriculture, as they provide a source of water for irrigation and support the growth of crops. The permafrost ecosystems are also important for human health, as they provide a source of clean water and support the growth of crops. The permafrost ecosystems are important for tourism, as they provide a source of recreation and support the growth of crops. The permafrost ecosystems are also important for the economy, as they provide a source of income and support the growth of crops.

The permafrost ecosystems are important for economic development. The permafrost ecosystems provide a source of income for farmers and ranchers, as they provide a source of crops and livestock. The permafrost ecosystems also provide a source of income for tourism operators, as they provide a source of recreation and support the growth of crops. The permafrost ecosystems are also important for the economy, as they provide a source of income for the government, as they provide a source of income for the government.

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1. Expanding and strengthening the protection of forest and permafrost ecosystems

In Komi and NAO the project will map and classify peatlands on permafrost, the existing threats, the potential threats for ecosystems on permafrost; define ecosystem resistance to climate change and anthropogenic influence. The project intends to define the potential resilience of permafrost ecosystems, necessary conservation measures, economic conditions and restrictions that should apply to sensitive areas, and ultimately recommend an update of land use plans in Komi and NAO, including conservation and wise use.

The project will help increase the coverage of ecosystem representativeness in the protected area system, and assist in creation of a new regional zakaznik (20,000 ha in the Inta Region), and develop Komi’s largest PA — the Yugyd Va National Park with its permafrost forests. The project will assist with negotiating and obtaining necessary legislation, means to plans and implement conservation and patrolling activities in the PAs, including prevention of fires and illegal logging. The project team will assist in developing plans for adaptation to climate change and providing with indigenous communities with information and training that will be informed about natural features of ecosystems and their relation with the global climate trends, and will be involved in forest firefighting, nature protection and adaptation measures. Monitoring data (Activity 3) will be used to assess the outcomes of adaptation to climate change. Forest guards will receive tools for supervision and mechanised harvesting, in line with methodologies developed by experts based on a comprehensive ecosystem approach that supports the ability to support ecosystem functions rather than restoring individual elements like vegetation cover or soil. Provision of and benefits for ecosystem service provision. The project will assist in obtaining the necessary equipment, machinery, and implementing restoration activities. The effectiveness of restoration for biodiversity, carbon storage protection and GHG emission reduction will be monitored during the first project stages. After the measures have been implemented, the land will be handed over to the local communities as agreed with the NGO administration, companies and herder communities. The communities committed to use the rehabilitated land sustainably in line with methodologies developed by project experts to avoid degradation (depletion) of the restored ecosystems. The lands will therefore be permanently protected from any new industrial exploitation and thus conditions will be created for rehabilitation of permafrost underlining the restored soil and vegetation layers.

2. Pilot restoration of peatland permafrost ecosystems

The project will support ecosystem restoration measures in a number of pilot sites representing oil-and-gas fields in NAO, including the sites of former exploration and currently exploited areas. The objective is to develop a technology for prevention of permafrost thawing, GHG emission reduction as a result of permafrost melting and mitigation of biodiversity decline due to ecosystem damage. Particular sites are selected, restoration plans discussed and agreements concluded as part of a dialogue with the local and indigenous communities, regional/local government and industrial developers. The project is funded in line with methodologies developed by experts based on a comprehensive ecosystem approach that supports the ability to support ecosystem functions rather than restoring individual elements like vegetation cover or soil. Provision of and benefits for ecosystem service provision. The project will assist in obtaining the necessary equipment, machinery, and implementing restoration activities. The effectiveness of restoration for biodiversity, carbon storage protection and GHG emission reduction will be monitored during the first project stages. After the measures have been implemented, the land will be handed over to the local communities as agreed with the NGOs administration, companies and herder communities. The communities committed to use the rehabilitated land sustainably in line with methodologies developed by experts to avoid degradation (depletion) of the restored ecosystems. The lands will therefore be permanently protected from any new industrial exploitation and thus conditions will be created for rehabilitation of permafrost underlining the restored soil and vegetation layers.

3. Monitoring and research on climate-permafrost nexus, publicising and replicating the experience.

The project will facilitate establishment of a modern monitoring and research programme for the peatland areas of the Russian North. The importance of these ecosystems for the protection of carbon pools, reducing its impact on climate change and humanity and as a result, the contribution that their protection, wise use and conservation can make to mitigation of climate change, meets with growing understanding on the international and national levels. This is reflected in the decisions on Climate Change of the Convention on Biological Diversity, Ramsar Convention on Wetlands and other agreements. The IPCC prepared the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. They highlight the need to collect reliable data on GHG emissions and their mitigation potential, especially in the freeze-thaw regions. There is a growing perception among experts that peatland ecosystems are crucial for reducing emissions of GHG and accommodating climate change. In Komi and NAO the project will map and classify peatlands on permafrost, the existing threats, the potential threats for ecosystems on permafrost; define ecosystem resistance to climate change and anthropogenic influence. The project intends to define the potential resilience of permafrost ecosystems, necessary conservation measures, economic conditions and restrictions that should apply to sensitive areas, and ultimately recommend an update of land use plans in Komi and NAO, including conservation and wise use.

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HOW THE PLANET LOSES ITS CARBON RESERVES

Everyone knows how carbon in the form of coal, oil and gas is lost: we burn it or process it. But sooner or later it turns into carbon dioxide and is emitted to the atmosphere. Previously, peat was widely used as a fuel, too, but nowadays significant amounts of peatland carbon are lost locally. Reasons are climate change and human activities. Draughts, winds, rain storms and other natural events that come with climate change contribute to erosion and degradation of carbon-rich soils and peat. People drain peatlands, or change their water regime because of road and pipeline construction. Vegetation and semi-natural ecosystems disappear as a result of deforestation and land transformation. Carbon stocks in peatlands are not fixed, they change and carbon losses accumulate, and therefore the greater is the plant productivity, and the more stable are the conditions for mire plants. Frozen soils and frozen peat help keep carbon even better until they start to thaw. On the other hand, peat, especially not saturated with water, prevents permafrost from thawing.

HOW CAN WE PRESERVE THE CARBON POOL

Mankind has pooled its efforts to prevent climate change, mitigate its consequences and adapt to the new conditions under the UN Framework Convention on Climate Change. The Convention recognizes the necessity to reduce GHG emission, protect carbon pools, and use material incentive methods for an improved management of natural resources without carbon losses. If we know the reason for losses of carbon from ecosystems due to human activities, then we can prevent it. This is why project analysis and use planning can help to do so, and over 150 countries agreed to apply it by signing the International Convention on Biodiversity.

By using only one resource, e.g. peat, oil or forest, changes to the entire ecosystem are caused because the ecosystem’s natural functions are not confined to one resource, they are versatile and the need for them arises constantly. An ecosystem can be viewed as a service of sources, such as carbon accumulation, water regime regulation, and supply of habitats for various animals, climate formation – in short, creation of an environment for people. By removing one of the sources, the availability of other services will be reduced. A responsible approach is to reduce or compensate such losses. The ecosystem approach implies attempts to avoid reduce or compensate such losses. People use the resources of the North ever more actively, and their activities often become the main reason for peatland and permafrost damage.