Protection and restoration of forest and peatland permafrost carbon pools in Komi Republic and Nenetsky Autonomous Okrug

under

UNDP/GEF project "Strengthening Protected Area System of the Komi Republic to Conserve Virgin Forest Biodiversity in the Pechora River Headwaters Region"

Description of the Project Revision

PURPOSE OF THE PROJECT REVISION: extension of the project to include new project Outcomes/Outputs/Activities addressing protection and restoration of forest and peatland permafrost carbon pools in Komi Republic and Nenetsky Autonomous Okrug.

The new outputs/outcomes framework outlined below is part of a larger Action Fiche approved by UNDP and EC in the framework of the Contribution Agreement for the multi-country Action Clima East Pilot projects on ecosystem-based approaches to climate change.

RATIONALE

The ecosystems of the Komi Republic, and Nenetsky Autonomus Okrug – NAO, belong mainly to the Barents Sea basin. These are rich forest and peat permafrost carbon pools, but are also a valuable source of global biodiversity and at the same time is an important area for industrial development. Komi shelters the only significant block of pristine forest oriented north-south; this has been included by WWF in the list of 200 global ecological regions and by UNESCO in the List of World Natural Heritage Sites ("Pristine forests of Komi"). The 29.2 million hectares of pristine boreal ecosystems in the Komi Republic represent almost 35% of the total pristine forest carbon pools remaining in the European Russia. Komi Republic shelters examples of pristine Scandinavian and Russian taiga which are now largely confined to areas of northeastern Russia, due to many centuries of clearance and logging over much of their former extent. In the north of the republic there are substantial areas with permafrost peatlands. Nenetsky Autonomus Okrug is known as a starting leg of the Euro-African and Eurasian flyways and it hosts the main portion of frozen or permafrost peatlands in Russian North-East.

Forest and soil carbon of the Komi and NAO are some of the key carbon pools of the globe. According to expert assessments of the Institute of Biology of Komi Republic, the 1.63 million[1] of the forests of the Komi Republic alone [and found just in the protected areas in the Pechora river head-waters] contain around 100 million tons of carbon. In an undisturbed state, the annual build-up of sequestration from these forests amounts to over 3 mln[2] tons of carbon. These are the highest nature value forests, mainly spruce forests, 64 % of which are mature and over-mature stands, which store maximum above-ground carbon compared to other forests of the country. At the same time these forests are highly susceptible to fires. Furthermore, under most climate change scenarios, the carbon-rich over-mature spruce stands will be receding, giving way to the proliferation of deciduous stands. Linked to this, the IPCC 4th Assessment Report further predicts that in boreal forests "the tree-line is expected to shift upward by several hundred meters"[3]. There is evidence that this process has already begun in Ural Mountains[4].

While the impact of climate on above-ground biomass has been studied to some extent, soil carbon has recently gained international attention, and specifically the permafrost melt as a climate threat is increasingly recognized by the international research community. According to the research of the European Union, "Changes in the soil carbon stock could severely affect global greenhouse gas balance and climate. It

[1] This includes 1.58 million ha of forests within two federal PAs – a reserve and a national park, plus 13 regional forest zakazniks totaling 47,475 ha. This area (1.63 million ha in total) is the ecological boundary of the project.
[2] Based on calculations prepared at the design stage of the ICI-UNDP project on protection of forest carbon pools in Komi Republic.
[3] *IPCC-4:* Badeck et al., 2001.
[4] *IPCC-4:* Shyatov et al., 2005.

remains one of the big unknowns in the global carbon cycle dynamics under a warming climate scenario."[5] The entire tundra and forest-tundra landscape in the eastern part of the Northern-European Russia is standing on two key inseparable geological layers: permafrost (beneath) and peat layer (above). Functionally, they are interconnected. On the one hand, permafrost maintains conditions for peat formation; on the other hand the peat plays a crucial role for the preservation of the permafrost. These ecosystems, therefore, are extremely vulnerable because of their connections. Changes in one of the components will inevitably impact the other, and may lead to the drastic changes in landscape structure and biogeochemistry including significant losses in carbon storage. Carbon is released as result of both melting of frozen peat[6] and more deep permafrost layers which may contain peat or more ancient organic structures. Whatever the cause of melting, numerous studies demonstrate the significant release of GHG from melting deep permafrost layers.[7]

The status of peat permafrost ecosystems should be considered through the prism of pending threats. One of the main threats comes from anthropogenic influence. The threat is high, given that NAO and Komi host some of Europe's largest on-shore oil and gas deposits. Since the 1970's, significant areas of natural ecosystems have been impacted by the extensive prospecting and exploration activities, the exploitation of oil and gas deposits in these areas started in the 1990's. These activities resulted in numerous disturbances to Arctic ecosystems and in dramatic changes in ecosystem regulation functions such as hydrology, permafrost status, carbon storage and exchange.

The human activity is enhancing and in some cases is the only cause of changes in permafrost. The 'Arctic Race' will lead to the very rapid expansion of Arctic ecosystems. Buildings, roads and pipelines, open mining constructions, unregulated movement of vehicles, surface contamination are significantly affecting these areas. This makes permafrost the most vulnerable ecosystems in the northern areas. The existing permafrost areas in northern taiga are the most vulnerable permafrost wetlands occurring in boreal zone where thawing is highly probable. The dust, sand and oil pollution lead to the degradation of the peat layer which is protecting the permafrost. Every disturbance of a surface layer in shallow peat tundra leads to the irreversible changes turning carbon accumulating ecosystems into sources of carbon emissions – both directly through GHG emissions and through hydrological flows causing further emissions. Some pictures below illustrate the impact.

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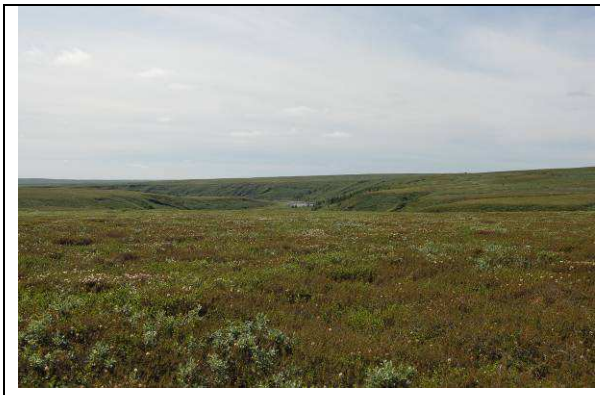
<tr><td>  </td><td>  </td></tr>
<tr><td>The natural shallow peat tundra ecosystems (Shapkina site)</td><td>Disturbances from the 70th (pictured in 2009, Shapkina site)</td></tr>
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[5] *Scanning the Horizon*, Issue 1, Nov 2011, by Joint Research Center of the European Commission.
[6] Stefan Fronzek, Margareta Johansson, Torben R. Christensen, Timothy R. Carter, Thomas Friborg and Miska Luoto (eds.) Climate change impacts on sub-arctic palsa mires and greenhouse gas feedbacks. Proceedings of the PALSALARM symposium; Abisko, Sweden 28–30 October 2008. In: Reports of Finnish Environment Institute, 3, 2009. Finnish Environment Institute Research Department. Edita Prima Ltd, Helsinki 2009. 74 pp.
[7] Mackelprang, Rachel, Waldrop, Mark P., DeAngelis, Kristen M., David, Maude M., Chavarria, Krystle L., Blazewicz, Steven J., Rubin, Edward M., . Jansson, Janet K. Metagenomic analysis of a permafrost microbial community reveals a rapid response to thaw. Nature 480, 368–371 (15 December 2011).
http://www.nature.com/nature/journal/v480/n7377/full/nature10576.html?WT.ec_id=NATURE-20111215\

	
Permanent road causes dust and sand pollution causing peat layer degradation (Shapkina site)	Temporary road – the source of CH_4 emission already for 40 years (Shapkina site)
	
The former waste reservoir from 70th still exists (Shapkina site)	New development at Shapkina site

Fig.7 Examples of ecosystem degradation at target sites.

A growing threat to permafrost ecosystems stems from climate change. Since the recess of the last glacier permafrost remained stable for millenniums, accumulating and storing in its depth climatic, geochemical and biological information. But this is changing under climate warming. In the last few decades average temperature increases in the Arctic have been near twice as high as mean global increases[8]. This trend is likely to continue and the IPCC predicts increases above global averages in arctic mean temperature and precipitation[9], both key factors regulating permafrost distribution. Abnormally high, recurrent summer precipitation increases the number of days when the organic soil is wet, thus increasing thermal conductivity and promoting permafrost thaw. For stable permafrost, the duration and thickness of winter snow cover is important, especially in discontinuous and sporadic permafrost regions[10] where a thick snow cover acts as an effective insulator and protects the ground from low air temperatures.

According to researchers, "recent years have brought reports from the far north of tundra fires, the release of ancient carbon, CH_4 bubbling out of lakes and gigantic stores of frozen soil carbon. The latest estimate is that some 18.8 million square kilometers of northern soils hold about 1,700 billion tones of organic carbon — the remains of plants and animals that have been accumulating in the soil over thousands of years. That is about four times more than all the carbon emitted by human activity in modern times and twice as much as is present in the atmosphere now. Abrupt thaw, as seen here in Alaska's Noatak National Preserve, causes the land to collapse, accelerating permafrost degradation and carbon release. We calculate that permafrost thaw will release the same order of magnitude of carbon as deforestation if current rates of deforestation continue. But because these emissions include significant quantities of methane, the overall effect on climate could be 2.5 times larger"[11]. In addition to climate effect, permafrost degradation results in radical change in

[8] *Arctic Climate Impact Assessment*, 2004
[9] Christensen et al., 2007
[10] Zhang et al., 2001
[11] Edward A.G.Schuur, Benjamin Abbott & Permafrost Carbon Network. *Climate Change: High Risk of Permafrost Thaw*. Nature Volume 480, p.32-33, published 30 Nov 2011.

hydrology, transformation of ecosystems, weakened capacity of soil to sustain infrastructure, and release of methane[12]. Thermal monitoring of Russian permafrost revealed a long-term increase of the mean annual temperature in the deep permafrost layers under peat deposits of Russian North. Degraded permafrost has extremely low regeneration capacity, since soil carbon accumulation is very slow in Arctic regions and is very limited in the sub-Arctic.

In view of the above, key ecosystem based mitigation and adaptation approaches in Russian North need to focus on:

- **Expanding and strengthening preservation of vast natural forest and permafrost pools**. It is important to change the economic paradigm in the Arctic areas so that to avoid or minimize the physical anthropogenic impact on the forest and soil cover. **According to Russian researchers those areas where a peaty permafrost has not be disrupted by human activities (e.g. through unsustainable grazing, industrial development, and transport infrastructure), the permafrost is 5 times less prone to melt.** One of the key tools to minimize and avoid destructive economic use is **establishment and maintenance of an effective, interconnected protected area system in the Russian North**. In this light, the **Komi Government committed to extend its protected areas to designate 14.6% of its territory**. Currently the Komi protected areas system includes one state nature reserve, one national park of federal jurisdiction, 165 regional nature sanctuaries and 72 regional nature monuments. A number of protected areas of regional importance are currently considered to be established by the Government. These include tundra ecosystems of the Urals, and permafrost areas near the existing Chrebtovy reserve in the Niau river canyon near Lake Bolshaka Lokhorta. The total size of protected areas in Komi is over 1.58 million hectares of unique forest and Arctic ecosystems of high biodiversity value. While several projects have recently invested in capacities of the federal-level PAs in the Russian North, capacities of the regional and local protected areas (which is the majority of all PAs) remain suboptimal. Regional-level PAs have not been equipped with infrastructure, management staff and financial resources to ensure protection of forest resources. In the most cases management plans are absent or management objectives are out of date. Existing PAs management plans focus on species conservation and do not include objectives of preserving carbon pools, emissions avoidance, maintenance of other regulating services of ecosystems. There is lack of integration of protected areas in the regional development plans and limited involvement of local communities in biodiversity conservation activities and high risk of issuing development permits without accounting for the climatic and biological functions of northern forests and permafrost areas. Climate change impacts have been detected in some of the existing protected areas, e.g. in the high altitude areas of the YUgyd Va national park. These are the loss of glaciers in the Circumpolar Urals that feed large and small rivers in the region[13] and shift of the forest boundaries.
- **Experimenting with peatland permafrost-related ecosystem restoration** at a local level is very important, as currently there is a gap in the international knowledge if and how permafrost can be preserved. One of the primary causes of the degradation of the permafrost layer are the anthropogenic loads on the upper peat soil and vegetation layer caused by industrial companies. The overlying peat soil layer plays a critical role in the mitigation of temperature variations, thus providing a special insulation layer for the permafrost. Loss of the peat layer provokes permafrost melt and can lead to catastrophic emissions of recent and relict methane, and carbon dioxide. It should be taken into account that peat formation is no longer taking place naturally in Arctic peatlands, i.e. the accumulated peat is a relict of earlier times. Thus, the Arctic peat is strictly a non-renewable resource, and the ecosystems lost their ability to restore naturally, and restoration can only be assisted by humans. Although much can be achieved towards reducing the environmental impacts of oil and gas operations when they are active, there will be some unavoidable damage to the natural structures and functions of permafrost ecosystems which cannot be repaired until the decommissioning phase. Rehabilitation is the process of actively repairing the damage. A

[12] Tatiana Minayeva, Andrey Sirin 2009 *Wetlands – threatened Arctic ecosystems: vulnerability to climate change and adaptation options* // UNESCO publication "Climate change and Arctic sustainable development. Section 2 – Biodiversity and ecosystem services", pp 76-83. & Minayeva T., Sirin A. *Arctic peatlands* in: Arctic Biodiversity Trends 2010 – Selected indicators of change. CAFF International Secretariat, Akureyri, Iceland. May 2010. 71-74. & http://www.arcticbiodiversity.is/images/stories/report/pdf/Arctic_Biodiversity_Trends_Report_2010.pdf

[13] http://news.bbc.co.uk/hi/russian/sci/tech/newsid_2331000/2331243.stm

methodology for rehabilitation of ecosystems damaged by oil and gas development has been designed by Wetlands International in partnership with Shell and presented in the document "Study of Mitigation, Recovery and Restoration Options: Oil and Gas Industry Impacts on Arctic Wetlands". The methodology has not yet been tested in permafrost areas, and this project will do so.

- **Advanced research and monitoring** of forest and peatland permafrost carbon pools. To date, environmental features of permafrost peatlands in the Arctic remain poorly understood. In the European North-East of Russia the southern limit of permafrost coincides with the southern boundary of the tundra ecosystems and the northern boundary of forest tundra and taiga. Here, unlike in Eastern Siberia, the permafrost layer is discontinuous in space and time. The southern-most permafrost patches of Komi and NAO are of warmer temperatures (-0-2^{0}C) than in Siberia, and are subject to higher instability and hence higher vulnerability to degradation caused by anthropogenic activities and climate warming. This makes the permafrost areas of Komi and NAO (which are quite typical for the whole southern limit of the permafrost zone), the most interesting in terms of monitoring and research of climate change impact. Gaining knowledge of the diversity, distribution patterns, and natural functions of the permafrost, on their biodiversity and gas regulation functions makes it possible to plan restoration, conservation, traditional nature management and development projects. While Russian and international researchers have been monitoring high-depth permanent permafrost in Siberia (e.g. the Page21 project), little focus has been given so far to monitoring of the peatland permafrost ecosystems of European Russian, and especially monitoring of ecosystems under different conditions (natural, disturbed or restored).

OUTCOMES / ATLAS ACTIVITIES, INDICATORS AND RISKS

The overall objective of the project is to demonstrate effective approaches to conserving, restoring and managing carbon-rich forests and permafrost areas of the Russian North under pending climate change threats. The project will be implemented in Komi Republic and NAO building on synergies with UNDP and ICI projects, and will be highly relevant to raising the level of international knowledge on the climate-permafrost nexus. The objective will be achieved by implementing three activities as outlined below.

Activity 6: Expanding and strengthening protection of forest and permafrost ecosystem

In Komi and NAO the project will map and classify peatlands on permafrost, the existing and potential threats for ecosystems on permafrost; define the gradient of ecosystem resistance and resilience, define conservation measures and economic restrictions or alternatives that should apply for sensitive areas, and ultimately recommend an update of land use plans in Komi and NAO based on the preceding studies including conservation and wise use.

In order to increase the coverage of permafrost representativeness in the protected area system, the project will assist in creation of a new regional zakaznik (20,000 ha in the Chernorechenskaya area) in the permafrost area of the Komi Republic, and will also strengthen capacities of the largest forest-and-permafrost PA in Komi Yugyd Va National Park. The project team will assist with negotiating and obtaining necessary land use approvals, equipping protected area units with means to plan and implement conservation and patrolling activities at the PAs, including prevention of fires and illegal logging. As for the latter, close links will be established with the activities envisaged as a follow-up to the FLEG processes and in support to the Russia's national efforts for preventing illegal logging.

The project will design climate mitigation and adaptation plans for the pilot protected areas and deliver means for their implementation. Lastly it will be engaging local and indigenous communities into forest fire prevention measures, conservation and adaptation activities. Success of the implementation of climate change mitigation and adaptation activities will be measured through a monitoring system established under Activity 8 below. Further, the project will equip forest guards with means for proper surveillance and monitoring. The new regional zakaznik will become a member of the Public Private Partnership on Protected Areas which was established by UNDP with financing from GEF as a vehicle to bring additional income for protected areas from sustainable economic activities.

Activity 7: Piloting restoration of peat permafrost ecosystems

The project will support restoration measures in two pilot deposit sites in Nenetsky Autonomous Okrug – Kolva and Shapkina river – including the sites of former exploration and currently exploited areas. The sites were chosen for the presence of several factors: peatland ecosystems with high biodiversity value and sequestration potential; evidence of ecosystem degradation as a result of destructive impact on permafrost from oil and gas development activities both current and of 1970$^{th.}$; evidence of GHG emissions from melting permafrost; support of local authorities and land-users and relatively higher level of scientific data available about the sites compared to other areas.

The project will engage local and indigenous communities, regional/local government, and industrial developers in a dialogue about the restoration plan and obtain the agreements. It will further design technical plans for the restoration in line with methodologies developed by experts, costing, and stakeholder involvement plan. It will deliver the equipment, machinery and hydrotechnical facilities required for the restoration, and ultimately implement the restoration projects. The effectiveness of restoration for biodiversity and carbon mitigation will be monitored under Activity 8.

The objective of rehabilitation is the re-establishment of ecological processes, functions and biotic and abiotic linkages; it leads to a persistent, resilient system integrated within its landscape. The sequence and tentative menu of restoration approaches / techniques is:

(1) Hydrological restoration. A primary consideration is to reinstate hydrological conditions that are suitable for reinstallment of wetland soils and vegetation above permafrost. Restoration of hydrological regime will be achieved by maintaining drainage or adjusting spatial plans for permanent linear construction; dismantling of temporal linear constructions; adjustment of draining/flooding technologies. At some sites in order to halt further permafrost degradation/melting special cooling technologies (point soil chillers) will be used accompanied with ecosystem restoration measures. Hydrological modeling will be utilized in order to restore natural thermal and hydrological regimes favorable for peat layer maintenance.
(2) Revegetation. The next step is revegetation that involves establishing vegetation cover on bare ground or where there is inappropriate or insufficient plant cover. The vegetation that is established might not resemble the original natural plant community, so some wetland functions might not be fully recovered. At the same time, the risk of invasive species increase is low which is proven through many years of research and monitoring at the NAO field research station since 1930. There is a methodology that has been tested with field research over many years. No exotic species are being used. The species that are being used during first years of revegetation activities are regional species that have no invasion potential (e.g. *Phleum, Bromus).* No exotic species will be used. As the next stage the local indigenous species are being added (e.g. cotton-grass, *Eriophorum*) and these species have experimentally been proved to be spreading effectively on their own once the soil erosion is stopped. Previous experiments demonstrate that the mire or peatland vegetation recovers soon after restoring the grass cover, and thus should equally apply for peatland-covered permafrost ecosystems.

Detailed restoration plans and final definition of appropriate restoration techniques will be determined in the first stages of the project, as they require a lot of specialized research and planning before actual restoration can proceed. After rehabilitation the lands will be transferred for use of local deer herders. This had been discussed and agreed between the NAO administration, companies, and herder communities. The communities committed to use the rehabilitated land sustainably in line with methodologies developed by project experts to insure the non-deterioration 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 underlying the restored soil and vegetation layers.

Activity 8: Monitoring and research on climate-permafrost nexus, publicizing and replicating the experience.

Under this component, the project will facilitate establishment of a modern monitoring and research program for the permafrost areas of Russian North.

IPCC Guidelines 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Chapter Wetlands) do not include permafrost peatlands as specific land type objects. But "2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands" currently under preparation by IPCC invited

by UNFCCC SBSTA at 33rd Session (Dec2010) is focusing on emission and removals including rewetting and restoration of wetlands and aims to cover a range of wetlands types with wide geographical representation incl. those on permafrost. This will urgently require monitoring and research activities to test tiered methodological approaches, in situ evaluation of emission factors and uncertainties.

Within the activity monitoring of three peatland permafrost types will be tested: (1) natural ecosystems which will remain natural due to protection (control), (2) ecosystems which will continue to be subject to anthropogenic impacts, (3) degraded ecosystems after restoration. Monitoring of GHG emissions at each of the three subtypes will be undertaken by the project. Upon completion of the project, the monitoring activities (including carbon monitoring) will be continued by the local research institutes of the Russian Academy of Science

In view of the above, monitoring status will be located at:

- Kolva 1, Shapkino 1 – the sites at the restoration area.
- Kolva 2, Shapkino 2 – sites subject to anthropogenic impact but not restored,
- Kolva 3 – without subject to anthropogenic impact but not under protection.
- Chernorechenskaya – the site without anthropogenic impact, where taiga and tundra join on the plain area. The site will be put under strict protection category (IUCN I). Under climate change the permafrost under such peatlands is most vulnerable. This will the one of a kind monitoring.
- Yugyd Va – the site without anthropogenic impact. Will be put under protection but not strict, but which will allow limited management activities (IUCN IV). Geologically this is mountains. Again, this is one of a kind monitoring.

The system will be tested when applied to prepare the scientific background and monitor the results of the two previous activities. It will include collection of data on carbon sequestration and fluxes in permafrost ecosystems (both inside and outside protected areas), scientific basis for the development of mitigation and adaptation measures for Activities 6 and 7. Detailed studies of carbon stocks in intact in permafrost zones (including gas exchange in soils, vegetation and bedding) will be carried out. A study on replacement of spruce forest species with deciduous species in forest tundra; shifting altitude and latitude of forest boundaries will be implemented. The impact of climate change on the flora endemics will be carried out. The Activity will support investment in modern climate monitoring technologies to enable accurate measuring of GHG emissions on pilot territories involving distance monitoring methods, gasometric methods, Eddi-covariance systems. The project results will be processed into scientific and public reports and made available nationally and internationally through a serious of meetings and publications.

Table 2.Brief overview of climate benefits from site-based activities:

	Size of the site	**Brief biogeological description:**	**Access to the site and partnership with land-user (concession holder responsible for decommissioning of mining activities and restoration).**	**Estimated GHG mitigation benefit, tCO2-eq/ha from avoidance of:** **(a) Peat layer loss (total Carbon storage in 5 cm peat layer, in tCO2 eq./ha)** **(b) flooding (CH4 emissions per year in tCO2 eq./ha)*** **Not less than**
Kolva-1 site (NAO) – old exploration site which will be subject to restoration and subsequent monitoring	120 ha	Nothernhypoarctic tundra of European-West Siberian province, Kanin-Pechora subprovince	Access with assistance of the company Preliminary agreement with Pechoraneft company	(a) 100 tCO2 eq./ha (b) 10 tCO2 eq./ha/year
Kolva-2 site (NAO) – the current	80 ha	Same		(a) 100 tCO2 eq./ha

	Size of the site	**Brief biogeological description:**	**Access to the site and partnership with land-user (concession holder responsible for decommissioning of mining activities and restoration).**	**Estimated GHG mitigation benefit, tCO2-eq/ha from avoidance of: (a) Peat layer loss (total Carbon storage in 5 cm peat layer, in tCO2 eq./ha) (b) flooding (CH4 emissions per year in tCO2 eq./ha)* Not less than**
exploration site where monitoring will take place and agreements reached with companies to avoid future degradation				(b) 10 tCO2 eq./ha/year
Shapkina river – 1 site (NAO) – old exploration site which will be subject to restoration and subsequent monitoring	180 ha	Southernhypoarctic tundra of European-West Siberian province, Kanin-Pechora subprovince	Direct access by road from Naryan-Mar. Preliminary agreed with Lukoil	(a) 100 tCO2 eq./ha (b) 10 tCO2 eq./ha/year
Shapkina river -2 site (NAO) – the current exploitation site subject to monitoring and agreements with companies to avoid degradation	60 ha	Same		(a) 100 tCO2 eq./ha (b) 10 tCO2 eq./ha/year

* Rationale behind the assessment of GHG mitigation benefits: The disturbance of vegetation cover, changes in hydrological regime (both drying of peat and flooding), increase of water and wind erosion, permafrost melting and water contamination lead to different processes that end up in GHG emissions. These are:

(i) peat layer degradation and loss through direct decomposition and mineralization with further emissions of CO2;

(ii) peat erosion with later production of GHGs (CO2 under dry and CH4 under wet conditions) from removed organic material (DOC and POC);

(iii) CH4 emissions due to flooding and permafrost melting.

Estimated GHG mitigation benefits from ecosystem restoration and avoidance of negative impacts include the following:

- avoidance of Carbon release to atmosphere from peat degradation is assessed as total Carbon storage in 5 cm peat layer equated to tones CO2 equivalent/ha. Total avoided GHG efflux in project sites is estimated at 100 tCO2-eq per ha;
- avoidance of GHG (mainly CH4) release due to flooding and permafrost melting mainly because of road/pipe line damming and other influences. Annual avoided GHG efflux is estimated at 10 tCO2-eq per ha (based on non-frost period of 120 days).

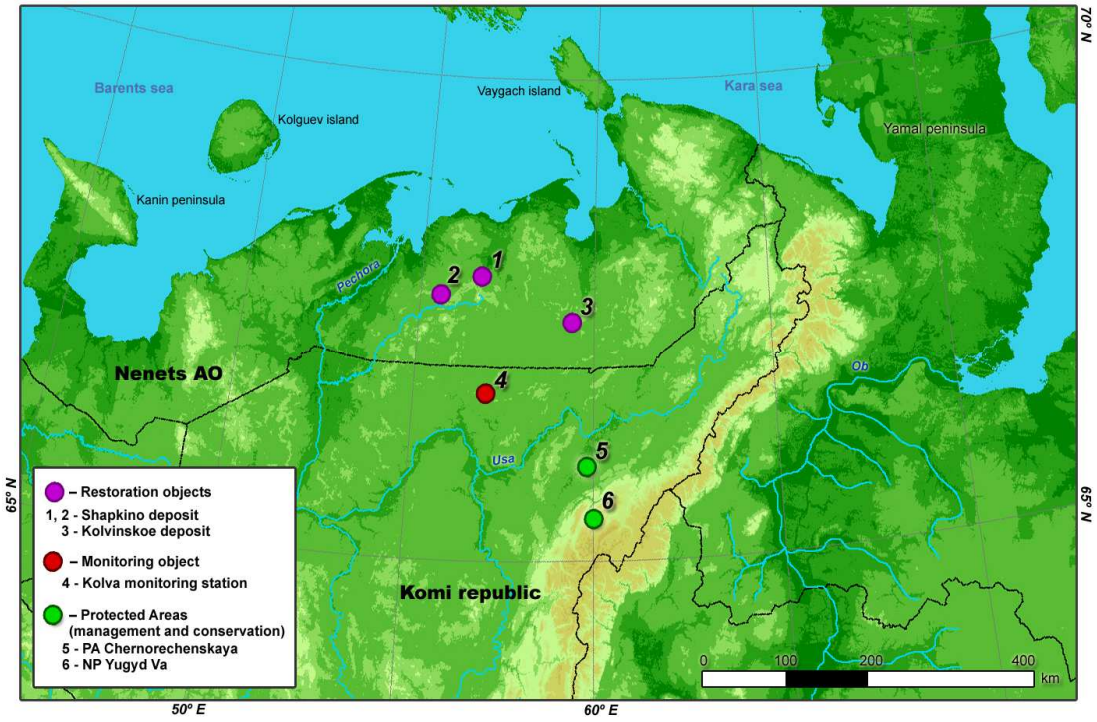

Fig.8 Map of target sites. Clarification on the correlation of points on the map with the list of sites in the table above: Point 1 on the map = Shapkina river - 1 from the table above; p.2=Shapkina river – 2; p.3 = Kolva-1 and Kolva-2 from the table above (since they are very close to each other and difficult to show on the map separately; p.4 is a separate monitoring site in Kolva district, which is not subject to any anthropogenic impact but is also not included in a protected area system. Monitoring here is important to set a reference level of what would happen to green house gas emission storage and fluxes under no anthropogenic influence (either god or bad). This is referred further in the text as Kolva-3. Points 5 and 6 correspond to protected areas Chernorechenskaya and Yugyd Va. Monitoring here is important as it indicates behavior of greenhouse gases under no negative anthropogenic impact but with addition of conservation actions (e.g. creation of protected areas).

The **indicators** to assess the project success have been established and agreed with the donor as follows:

Activity	Indicator	Other measures/effects
Strengthening protection of forests and permafrost ecosystems: strengthening of existing and creation of new PAs	20,000 ha of new regional protected area created in the Chernorechenskaya area; Strengthened protected area management capacities of the largest existing forest-and-permafrost protected area Yugyd Va National park (1.9 mln ha)	Establishment of a protected area ensures that at 20,000 ha permafrost melt is 5-times slower than it would have been without protection. The new protected area will be equipped with skilled staff, equipment and infrastructure necessary to maintain the optimal ecological regime at this area. At the existing protected area (Yugyd Va), strengthened capacities will translate into more effective prevention and control over illegal fire and logging activities, more efficient patrolling units, integration of climate aspects in management plan, community engagement in forest fire prevention, and better environmental monitoring capacities.
Piloting restoration of	180 ha of abandoned	Re-installed peatland permafrost ecosystem

peat permafrost ecosystems: hydrological restoration, assisted revegetation	permafrost peatland ecosystem restored; 60 ha of permafrost peatland under ongoing industrial exploitation – agreements reached with companies on biodiversity and climate-friendly restoration after completion of their activity, in order to avoid permafrost melt	functions (permafrost protection, waterflow and microclimate regulation) at 180 ha by restoration activities. The agreements with companies at 60 ha will help to prevent the otherwise highly probably risk of permafrost degradation and loss of its ecosystem functions, which would ultimately lead of speeding up of permafrost melt. Internationally important innovation/experimenting with permafrost ecosystem piloted resulting in advance knowledge of possibilities and technologies to slow down permafrost melt, e.g. through restoration and conservation of the upper soil and vegetation layer of permafrost peatlands. High national and international visibility.
Monitoring and research: exchanges between leading permafrost scientists, publication of results	1 method for restoring permafrost ecosystem demonstrated resulting in slowing down of permafrost thaw; 3 articles in leading international journals on the subject of permafrost ecosystems relationship with climate change	Data delivered to IPCC for incorporation into the Guidelines for National Greenhouse Gas Inventories Linkage with other leading research and applied research initiatives.

The **risks** which might prevent the project activities from being achieved have been assessed as follows:

Risk description	**Risk mitigation strategy**
There is no tested methodology for restoration of permafrost peatlands, and there is a gap in the domestic and international knowledge as to how permafrost can be preserved. Hence there is a risk for certain restoration techniques applied by the project to be only partially successful.	Norms, standards and safeguards for restoration must be developed very carefully and with the use of all relevant domestic and international experience. The restoration will be implemented in stages, allowing for adaptive changes in case of no success.
One of the suggested approaches for permafrost peatland restoration is through restoration of hydrological regime which involves either adjustment of spatial plans for permanent linear construction; or dismantling of temporal linear constructions; or adjustment of draining/flooding technologies. Approval process for such technological adjustments can take longer than expected by the project original timeframe.	The project will ensure early consultations with relevant authorities during the restoration projects' design stage.
Upon completion of the project, the monitoring	Upon project completion, the monitoring activities

program established for the permafrost areas should acquire a full stakeholder ownership and stable funding. Possible lack of governmental funding to ensure post-project sustainability of the monitoring program puts its post-project sustainability at risk.	(including carbon monitoring) will be continued by the local research institutes. For Komi, the RAS Institute of Biology has already confirmed their willingness to integrate permafrost monitoring programme developed by the project, into their agenda. For NAO, similar arrangements will be discussed with either the same institute, or similar research institute with relevant capacities. Official confirmations (either in form of cooperation agreement, or letter of intent) ought to be obtained by the project at the early stage of monitoring programme development.

PARTNERS

The project will be built into an existing UNDP/GEF/BMU project "Strengthening Protected Areas System of the Komi Republic". The project is executed by UNDP as a GEF agency in line with standard National Implementation Modality (NIM) mode. The Government of Russia represented Komi Rosprirodnadzor (National Implementing Partner) executes the project according to UNDP NIM modality. The UNDP Programme Support Office (and where necessary the UNDP Regional Support Center for ECIS) supports the project's implementation by maintaining the project budget and project expenditures, contracting project personnel, experts and subcontractors, carrying out procurement, and providing other assistance upon request of the National Implementing Partner. The UNDP Programme Support Office in Russia also monitors the project's implementation and achievement of the project outputs and ensure the proper use of the donor funds. To-date UNDP Russia's portfolio of GEF-financed projects is the largest in the Europe and CIS. With the co-financing from the German Government (BMU) UNDP Russia is implementing two regional initiatives addressing protection of forest and peatland carbon sinks, and one of them is fully focused on the Komi Republic. The proposed EU project will utilize existing management capacities, professional networks and implementation instruments developed for the UNDP/GEF/BMU project thus achieving considerable efficiencies and savings in management costs.

The key national partner of the project is the Ministry of Natural Resources and Environment (MNRE), which with its subordinate Federal Service to Hydrological Monitoring and Meteorology (Roshydromet) is responsible for monitoring and reporting on green house gas emission within UNFCCC including those derived from land use change. The Ministry is also responsible for protected areas policies and management of federal protected areas (including the Ugyd Va National Park). The Government of the Komi Republic is another key stakeholder of the project responsible for decision making on land use and the regional protected areas system (regional sanctuaries). Key regional partners will include the Ministry of natural resources of the Komi Republic and the Forestry Service of the Komi Republic. The Administration of the Nenetsk Autonomous Okrug (NAO) will be engages as a partner for permafrost peatlands restoration activities in the NAO pilot site.

To secure high level of professional expertise the project will cooperate with and engage as appropriate the institutes of the Russian Academy of Science (e.g. Institute of Biology of the Komi Scientific Centre, Institute of Forest Science and others) and international expertise through professional international NGOs (such as Wetlands International).

Relying on the expertise obtained within the project INTAS 08-1000028-9182 "Remote sensing methods for environmental assessment of Eurasian peatlands and associated ecosystems under climate change" (PACINE Project) implemented by the Institute of Forest Science RAS in 2007–2008 the project team will combine methods of field monitoring and remote sensing. The arctic ecosystems restoration methodologies will be applied based on the results of the project "Study of Mitigation, Recovery and Restoration Options: Oil and Gas Industry Impacts on Arctic Wetlands" carried out by Wetlands International in cooperation with Shell and aimed to develop information and guidance for decision making. The project will also use experience

and methodologies emerging from two projects funded by the German Government (ICI/BMU): "Capacity Development for a sustainable energy- and climate-policy in Eastern Europe, Russia and Central Asia - development of a Decision Support System for peatlands restoration" (2010-2011) and "Restoring Peatlands in Russia – for fire prevention and climate change mitigation".

This work will build upon the on-going ICI project financed by the German Government in the Komi Republic. The ICI project is aimed at strengthening the Komi protected areas system with the view of biodiversity conservation and enhancing carbon sinks in forest and peatland ecosystems. The ICI project is implemented in the southern and central regions of the Komi Republic without permafrost. The key focus of the project is on the fire prevention. The new ClimaEast project will build upon the on-going research and extend upon permafrost areas. It will allow assessing climate change induced warming of permafrost soils, related impacts on ecosystems and carbon pools in the Far North ecosystems (tundra and forest tundra). Based on this information it will be possible to produce practical recommendations for land users for permafrost protection in the changing climate.

The project experience in carbon monitoring and permafrost restoration will be further replicated through the Russian and international scientific networks and conferences. In doing so the project will rely on the partnerships with the Russian Academy of Science and IPCC expert networks. The work will contribute to the design of LULUCF programming in other regions and countries in the Northern hemisphere. The project work in the protected areas (restoration, monitoring, improved adaptation capacities) will be replicated and up-scaled through the Ministry of natural resources and environment of Russia. The project demonstrations on permafrost restoration has a potential for replication throughout Russia's Arctic regions and Siberia where there is an evidence of permafrost degradation due to industrial development and climate change.

The project also takes into account the ongoing research under the Page21 program. That program focuses on permafrost monitoring at high depth in non-peat permanent permafrost in Siberia, and hence addresses different types of ecosystems and different objectives (there is practical conservation or restoration work). Yet, there has been communication established between the specialists teams, and information exchange between them will continue throughout project implementation.

REPORTING

Additional reporting requirements for the new EC-funded project components are as follows.

Annual thematic reporting

For activities funded by EC, in line with EC requirements, the narrative report, in the format which will be provided by UNDP Regional Support Center in Bratislava, will be prepared by the country office in collaboration and with assistance from the UNDP BRC every 12 months (covering calendar year). The report will be sent to UNDP Regional Centre in Bratislava (not EC) not later than 2 months after the end of previous calendar year, as BRC is tasked with quality checking and compiling all country reports under the Clima East package and submitting them to EC centrally. The report of the country office will include at least the following information:

i. Brief summary and context of the EC project in the country;
ii. Activities carried out during the reporting period;
iii. Difficulties encountered and measures taken to overcome problems;
iv. AWP and other expenditure reports (financial reporting will be submitted in US dollars)
v. Risk and adaptive management
vi. Atlas QPR
vii. Lessons learned/good practice
viii. Changes introduced in implementation;
ix. Achievements/results by reporting against the indicators listed in the Results and Resource Framework in Annex II
x. Work plan and the budget for the following 12 months period, including forecasted progress in the achievement of the project objective(s) and indicators.

To cover direct costs for the project staff who, while working for this project at the same time are working for other project(s) managed by the CO, only a part of their time devoted to this project will be reclaimed. This will be confirmed by timesheets for use of EC in case of verification

Final thematic report

For activities funded by EC, the final report will contain the same information as listed in the annual thematic reporting above (excluding the last indent) covering the whole Implementation Period of the country action, and information on the measures taken to make the European Union visible as the source of financing, as well as details on the transfers of assets and full summary of the project's income and expenditure and payments received. Final report will be submitted no later than 3months after closure of the project.

Financial reporting

Project implementation and reporting should comply with the terms and conditions of the European Union Contribution Agreement with UNDP # ENPI/2012/303-093 dated 4 December 2012.

VISIBILITY, TRANSPARENCY AND COMMUNICATIONS

For activities funded by EC, UNDP will take all appropriate measures to publicise the fact that the activities have been receiving funding from the European Union. Information given to the press, the beneficiaries of the project, all related publicity material, official notices, reports and publications, will acknowledge that the project was carried out "with funding by the European Union" and will display in an appropriate way the European logo (twelve yellow stars on a blue background). In cases where equipment or vehicles and major supplies have been purchased using funds provided by the European Union, UNDP will include appropriate acknowledgement on such vehicles, equipment and major supplies (including display of the European logo (twelve yellow stars on a blue background) provided that such actions do not jeopardize UNDP privileges and immunities and the safety and security of the UNDP staff. The size and prominence of the acknowledgement and European Union logo will be clearly visible in a manner that will not create any confusion regarding the identification of the project as an activity of UNDP, the ownership of the equipment and supplies by UNDP, and the application to the project of UNDP privileges and immunities.

All publications of UNDP pertaining to the EC-funded project Action, in whatever form and whatever medium, including the internet, shall carry the following or a similar disclaimer: "This document has been produced with the financial assistance of the European Union. The views expressed herein can in no way be taken to reflect the official opinion of the European Union." Publicity pertaining to European Union contributions may quote these contributions in Euro (€ or EUR), in parenthesis if necessary.

With the aim to ensure coherence and coordination between related projects and activities under UNDP-EC Agreement – Clima East part II, the project will keep informed stakeholders on relevant to the Agreement developments and progress, inform about upcoming relevant meetings and exchange related documents, press releases, publications when these are issued, provide meeting and mission reports and share necessary links to project websites. Information will be channeled through UNDP Regional Centre to European Commission. EC will provide to UNDP information on EU policy developments, partnerships and cooperation agreements in such a way that the project outcomes are policy relevant and able to contribute to these demands

Results and Resources Framework

Intended Outcome as stated in the Country Programme Results and Resource Framework: Improved environmental sustainability of development processes and increased energy efficiency
Outcome indicators as stated in the Country Programme Results and Resources Framework, including baseline and targets: Outcome **Indicator**: Environment indicators included into development policies at the sub-national and regional levels; **Baseline**: Environmental impact is not a priority for development planning, energy efficiency is not considered as mandatory condition for effective development at local level; **Target**: Environmental impact is considered as a threat to sustainable development in at least 3 Russian regions; energy efficiency/energy saving strategies are developed and introduced in a number of Russian regions
Applicable Key Result Area: Environment and Sustainable Development
Partnership Strategy: The key national partner of the project is the Ministry of Natural Resources and Environment (MNRE), which with its subordinate Federal Service to Hydrological Monitoring and Meteorology (Roshydromet) is responsible for monitoring and reporting on green house gas emission within UNFCCC including those derived from land use change. The federal MNRE Ministry is also responsible for protected areas policies and management of federal protected areas (including the Ugyd Va National Park). The Government of the Komi Republic and the Komi Rosprirodnadzor are the key regional stakeholders of the project responsible for decision making on land use and the regional protected areas system (regional sanctuaries). Key regional partners will include the Ministry of natural resources of the Komi Republic and the Forestry Service of the Komi Republic. The Administration of the Nenetsk Autonomous Okrug (NAO) will be engaged as a partner for permafrost peatlands restoration activities in the NAO pilot site. To secure high level of professional expertise the project will cooperate with and engage as appropriate the institutes of the Russian Academy of Science (e.g. Institute of Biology of the Komi Scientific Centre, Institute of Forest Science and others) and international expertise through professional international NGOs (such as Wetlands International).
Project title and ID (ATLAS Award ID): Protection and restoration of forest and peatland permafrost carbon pools in Komi Republic and Nenetsky Autonomous Okrug under UNDP/GEF project "Strengthening Protected Area System of the Komi Republic to Conserve Virgin Forest Biodiversity in the Pechora River Headwaters Region" Project ID – 00059042, Atlas Award ID – 00048772

INTENDED OUTPUTS	OUTPUT TARGETS FOR (YEARS)	INDICATIVE ACTIVITIES	RESPONSIBLE PARTIES	INPUTS
Output 1: Expanding and strengthening protection of forest and permafrost ecosystem **Baseline:** Permafrost carbon pools underrepresented in the regional PA system, management capacities of existing PAs to conserve high-value natural forests and fragile permafrost ecosystems are	Year 2013 Methodology for classification and mapping of peatlands on permafrost developed (quarter 1 through 3) and appraised (quarter 4). Feasibility assessment for creation of a new regional zakaznik in the permafrost area performed (quarter 2-3). Capacity assessment of the strengthen capacities of the Yugyd Va National	1.1. Development of a comprehensive methodology for classification, inventory and mapping of permafrost peatlands; 1.2. Establishment of a new regional protected area covering vulnerable permafrost peatland ecosystems; 1.3. Strengthening capacities of the existing PA to conserve high-value forests and permafrost pools;	Ministry of Natural Resources and Environment Komi Rosprirodnadzor	National expertise, technical assistance EUR 800,000

limited **Indicators:** - 20,000 ha of new regional protected area created in the Chernorechenskaya area of the Komi Republic - Strengthened protected area management capacities of the largest existing forest-and-permafrost protected area Yugyd Va National park (1.9 mln ha).	Park performed, capacity gaps and needs identified (quarter 2-3). Climate mitigation and adaptation plans developed for the target protected areas (quarter 3-4). Year 2014 Analysis of existing and potential threats for permafrost ecosystems performed (quarter 1 through 4). Technical&staff capacities of the Yugyd Va National Park strengthened (quarter 2-3). Means provided for implementation of PA climate mitigation and adaptation plans, including fire surveillance and prevention equipment (quarter 2-3). Year 2015 Programmes developed to engage local and indigenous communities into forest fire prevention measures, conservation and adaptation activities (quarter 1 through 4). Year 2016 Creation of a new regional zakaznik in the permafrost area of the Komi Republic finalized (quarter 1-4).	1.3. Community engagement into forest fire prevention and control, conservation and adaptation activities		
Output 2: Piloting restoration of peat permafrost ecosystems: hydrological restoration, assisted revegetation **Baseline**: abandoned permafrost ecosystems at various stages of degradation **Indicators**: - 180 ha of abandoned	Year 2013 Restoration methodologies developed by experts (quarter 1-3). Selection of restoration sites re-confirmed (quarter 3). Feasibility study (incl.fieldworks) for each of the pilot sites performed (quarter 3). Regulatory gap analysis for restoration performed (quarter 2-3). Community outreach ensured (quarter 2-4).	2.1. Development of methodologies for piloting restoration of permafrost peatlands, technical design of restoration projects, relevant cost-benefit assessment; 2.2. Implementation of pilot restoration projects, stakeholder outreach, community engagement; 2.3. Restoration project monitoring,	Komi Rosprirodnadzor	National expertise, technical assistance, EUR 1,000,000

permafrost peatland ecosystem restored - 60 ha of permafrost peatland under ongoing industrial exploitation – agreements reached with companies on biodiversity and climate-friendly restoration after completion of their activity, in order to avoid permafrost melt.	Necessary land use permissions obtained (quarter 4). Year 2014 Technical plans for restoration designed (quarter 1-2). Equipment & machinery required for restoration procured (quarter 2-3). Restoration works initiated (quarter 3). Year 2015 Monitoring of restoration activities ensured (quarter 2-4). Year 2016 Restoration completed (quarter 2-3). Eeffectiveness of restoration for biodiversity and carbon mitigation assessed and monitored (quarter 2-4). Lessons learned collected, result dissemination activities performed (quarter 3-4). Rehabilitated lands transferred for use of local deer herders (quarter 4)	assessment of restoration effectiveness for biodiversity and carbon mitigation, collection of lessons learned and dissemination of pilot testing results		
Output 3: Monitoring and research: exchanges between leading permafrost scientists, publication of results **Baseline**: environmental features of permafrost peatlands in the Arctic are poorly understood. Lack of knowledge of the diversity, distribution patterns, and natural functions of the permafrost, on their biodiversity and gas regulation functions makes it difficult to plan restoration, conservation, and ecosystem management	Year 2013 Integrated peatland monitoring programme developed (quarter 1-4). Detailed fieldwork plan developed (quarter 2). Field monitoring equipment procured, monitoring sites duly equipped (quarter 3-4). Year 2014 Monitoring of GHG emissions for three peatland permafrost types (including those under restoration) initiated (quarter 2). Baseline carbon storage&emission data collected at the selected monitoring sites (quarter 2). Study on replacement of spruce forest	3.1. Development of an integrated peatland monitoring programme; 3.2. Implementation of monitoring programme and analysis of GHG storage and emissions data for three peatland permafrost types; 3.3. Outreach to international scientific community and sharing of obtained knowledge and data on permafrost ecosystems relationship with climate change	Ministry of Natural Resources and Environment Komi Rosprirodnadzor	National and international expertise, technical assistance EUR 700,000

Indicators: - 1 method for restoring permafrost ecosystem demonstrated resulting in slowing down of permafrost thaw - 3 articles in leading international journals on the subject of permafrost ecosystems relationship with climate change.	species with deciduous species in forest tundra; shifting altitude and latitude of forest boundaries implemented (quarter 2-4). Year 2015 Monitoring of GHG emissions for three peatland permafrost types (including those under restoration) continued (quarter 1-4). Detailed studies of carbon stocks in intact in permafrost zones (including gas exchange in soils, vegetation and bedding) continued (quarter 1-4). Year 2016 Monitoring of GHG emissions at three peatland permafrost types (including those under restoration) continued (quarter 1-4). Impact assessment of climate change on the flora endemics finalized (quarter 3). Results of study on replacement of spruce forest species with deciduous species in forest tundra; shifting altitude and latitude of forest boundaries obtained (quarter 3). Lessons learned collected, result dissemination activities performed (quarter 4).			