



**Project “Sustainable and responsible management and re-use of degraded peatlands in Latvia”,  
LIFE REstore**

LIFE14 CCM/LV/001103

**AFTER-LIFE PLAN**

**PLANNED MEASURES AFTER THE COMPLETION OF PROJECT**



Action plan after the completion of project (AFTER-LIFE Plan) has been prepared with financial support from the European Union LIFE Programme and the Administration of Latvian Environmental Protection Fund, within a framework of project “Sustainable and responsible management and re-use of degraded peatlands in Latvia” (LIFE REstore, LIFE14 CCM/LV/001103).

The report contains only the vision of the LIFE REstore project developers. The European Commission Executive Agency for Small and Medium-sized Enterprises is not responsible for any use that may be made of the information contained therein.

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## 1 Project summary

Project “**Sustainable and responsible management and re-use of degraded peatlands in Latvia**” (LIFE REstore, LIFE14 CCM/LV/001103) is the first project of European Commission LIFE programme Climate Action sub-programme in Latvia. It was implemented from September 1 2015 to August 30 2019 by Nature Conservation Agency of Latvia, in collaboration with Latvian Peat Association, Latvian State Forest Research Institute “Silava”, and Association “Baltic Coasts”.

The project has developed national greenhouse gas emission factors for peat soils of raised bogs and transitional mires, as well as for peat soils in agricultural lands, and approved the methodology for measurements of greenhouse gas emissions. The LIFE REstore project has developed a decision-support tool for the planning of responsible use of post-harvested peatlands. In project demo sites, economic evaluation of ecosystem services was carried out. Peatlands degraded by peat extraction were inventoried, and inventory results were summarized in publicly available database [https://restore.daba.gov.lv/public/lat/datu\\_baze1/](https://restore.daba.gov.lv/public/lat/datu_baze1/). The recommendations developed by the project on the implementation of after-use scenarios will be an important component in the future National Peat Strategy.

Practical contributions by LIFE REstore project include after-use measures implemented in four demo sites peatlands degraded by peat extraction, and rewetting in one demo site:

- ✓ renaturalization by planting of *Sphagnum* mosses (Ķemeri Mire demo site);
- ✓ cultivation of highbush blueberries (Kaigu Mire);
- ✓ cultivation of large cranberries (Kaudzīšu Mire);
- ✓ afforestation (Kaigu Mire);
- ✓ construction of peat dams in Lauga Mire (necessary for the maintenance of water level in Višezers Lake – for the restoration of mire habitat of Community importance).

## 2. Activities implemented by the project

### **Development of national greenhouse gas (GHG) emission factors; approval of methodology for measuring greenhouse gas emissions**

The LIFE REstore project carried out a considerable research work on GHG emissions from managed organic soils for the purpose to replace emission factors provided by Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change (IPCC) with scientifically validated emission factors and activity data which can be used at a national level.

The approbated GHG emission accounting methodology was based on two years of GHG emission measurements in 41 locations in Latvia, in territories of various land use categories. National emission factors were developed for managed wetlands as well as for some organic soils in agricultural and forest lands. Latvia is the first of the Baltic States where the abovementioned national GHG emission factors have been developed.

### **Inventory of peatlands degraded by peat extraction**

The project identified areas degraded by peat extraction with a total area of ca. 50 thousand hectares. Out of them, ca. 15 thousand hectares (30%) are active peat extraction areas; ca. 17 thousand hectares (34%) are areas where reclamation measures have been or are currently being carried out, and ca. 18 thousand hectares (36%) can be considered as abandoned post-harvested peatlands requiring a decision on further type of use, for example, reclamation. In peatlands where the volume of peat deposit is sufficient for industrial use, peat extraction should be considered as a future use (except in protected

nature territories). Data on peatland areas show the situation on January 1, 2016. In total, 78 territories (total area ca. 10 thousand hectares) were surveyed on site. Site surveys included: determination of residual peat layer thickness, peat upper layer type; degree of decomposition; pH value. Photographs and peat samples were taken.

Vegetation was inventoried in 32 harvested peatlands; the surveyed area covered more than 32 thousand hectares. In these surveyed peatlands, peat extraction has been ceased at various periods, both 60–70 years ago and recently. Also, the thickness of the residual peat layer, water table and degree of vegetation development were different.

### **An application of publicly accessible database**

The results of peatland inventory were summarized in a publicly available geodatabase of peatlands affected by peat extraction. Database is available in a separate section of Latvian Nature Data Management System "Ozols": [https://restore.daba.gov.lv/public/lat/datu\\_baze1/](https://restore.daba.gov.lv/public/lat/datu_baze1/). For visualization of data layers and for information analysis, two applications and story map were developed. Spatial data and information that characterises the surveyed areas are available in the geodatabase.

In total, information about 237 peatlands is available, including 78 peatlands which were inventoried in geological surveys (data on 301 peat cores); 127 vegetation data forms; soil data from GHG measurement sites, and other information. Database is integrated into the Nature Data Management System "Ozols" and is accessible at: <https://ozols.gov.lv/ozols/Account/LogOn>

### **Economic evaluation of ecosystem services in project demo sites**

An economic assessment of ecosystem services was carried out for after-use scenarios implemented in project demo sites and for adjacent areas. Ecosystem services were assessed for both initial situation and for periods of five, 25 and 50 years. Economic assessment of ecosystem services was based on biophysical assessment and data on habitat types and their area.

### **A decision support tool for the sustainable use of post-harvested peatlands**

The project developed a decision support tool for planning a management and sustainable use of degraded post-harvested peatlands after peat extraction completion – a management optimization model for sustainable use of peatlands: [https://restore.daba.gov.lv/public/lat/optimizacijas\\_modelis1/](https://restore.daba.gov.lv/public/lat/optimizacijas_modelis1/).

Using this support tool, state and municipal land managers, as well as private land owners, can choose the most appropriate and cost-effective way of peatland after-use, taking into account the aspects of climate change mitigation and assessment of ecosystem services.

### **Recommendations for the implementation of after-use measures mentioned in national legislation**

The recommendations for the implementation of after-use measures which are mentioned in legislation are a valuable addition of the abovementioned optimization model. These recommendations are an important component for the future policy planning document "Guidelines for the Sustainable Use of Peat 2019–2030" (National Peat Strategy).

### **Renaturalization in Ķemeri Mire demo site**

The largest *Sphagnum* moss reintroduction experiment in Latvia has been carried out in Ķemeri Mire demo site. Here, more than 2200 kg of *Sphagnum* mosses were planted across an area of 3200 m<sup>2</sup>. Prior to planting, the site was prepared by removing the upper layer of decomposed peat. In four experimental plots, four *Sphagnum* species were planted in various combinations. Experiment included *Sphagnum*

*rubellum*, *S. fuscum*, and *S. magellanicum* which typically grow on raised bog hummocks, and *S. cuspidatum* which is a hollow species. A reference area was left near the planted area – peat fields where the upper layer of peat was not removed and *Sphagnum* was not planted, in order to monitor and compare vegetation development with and without targeted renaturalization.

#### **Cultivation of highbush blueberries in Kaigu Mire**

In Kaigu Mire demo site, highbush blueberry plantations were established in post-harvested peatland in an area of 4.2 ha, in cooperation with SIA “Arosa-R”.

#### **Cultivation of large cranberries in Kaudzišu Mire**

In Kaudzišu Mire demo site, a plantation of large cranberries was established. In cooperation with SIA “Kaudžu purvs”, 6.3 t of cranberry vines were planted in 3.4 ha of post-harvested peatland.

#### **Afforestation in Kaigu Mire**

In Kaigu Mire demo site, in cooperation with LLC “Laflora”, post-harvested peatland was after-used by afforestation. In this case, the purpose of after-use was short rotation tree plantation for the production of wood biomass and not the establishment of long-term forest. In an area of 9 ha, various tree species were planted in various combinations and using various fertiliser doses.

#### **Development of nature protection plan for Laugas purvs Nature Reserve**

For the successful restoration of optimal groundwater table in Lauga Mire, a nature protection plan was developed. It included an inventory of habitats and species, management planning as well as modeling of the impact of planned rewetting. The plan is developed for a period of 12 years (from 2017 to 2029). For the first time in Latvia, an assessment of ecosystem services has been carried out within the framework of a nature protection plan.

#### **Rewetting in Lauga Mire**

After the establishment of drainage system and initiation of peat extraction in the 1960s, the water level of Lake Višezers was lowered by 1.3 meters. The drainage adversely affected the natural development of Lake Višezers and entire Lauga Mire ecosystem. Nature protection plan includes measures for peatland rewetting and for stabilization of water level in Lake Višezers.

Following the approval of the nature protection plan, a construction design was developed in 2017 for the construction of peat dams in three sites adjacent to the Lake Višezers. Peat dams were constructed in 2018. They ensure water runoff from Lake Višezers in case if water level in the lake exceeds 58.3-58.5 meters above sea level (maximum level defined in the nature protection plan). The implementation of the above measures ensured the restoration of 309 ha of raised bog ecosystem.

### 3. SWOT analysis

#### Strengths

- National emission factors for organic soils have been developed. Methodology for measuring GHG emissions has been approved.
- Database (with application) of post-harvested peatlands has been developed.
- Decision support tool for sustainable management planning of post-harvested peatlands has been developed.
  - The recommendations for the after-use scenarios of post-harvested peatlands have been developed, and submitted to the Ministry of Environmental Protection and Regional Development, as an annex to the forthcoming Policy Planning Document "Guidelines for the Sustainable Use of Peat 2019-2030".
- After-use scenarios were introduced and practically tested in four demo sites. In one site, habitat of Community importance was restored.
- An economic assessment of ecosystem services in project demo sites and adjacent areas has been carried out.
- Book "Sustainable and Responsible Management After-Use of Peat Extraction Areas" has been published.

#### Weaknesses

- The National Peat Strategy, or "Guidelines for the Sustainable Use of Peat 2019–2030", has not been completed and approved.

#### Opportunities

- National emission factors and GHG emission measurement methodology developed by LIFE REstore project can also be used in neighbouring countries with similar climatic conditions.
- Locations of degraded peatlands in Latvia which further management territories needs to be decided were clarified. Thus, the necessary resources for the after-use of these territories can be assessed.
- New experience in the after-use of post-harvested peatlands and rewetting of protected mire habitats has been obtained, and it can be applied in other degraded areas.
- Contacts between peat management stakeholders, experts, peat industry entrepreneurs, and leading scientists were established. The importance of natural habitat

#### Threats

- Lack of public funding for after-use of post-harvested peatlands and for maintenance of State-owned territories with habitats of Community importance.

restoration and after-use of post-harvested peatlands has been discussed and widely communicated to the target audiences, so facilitating further cooperation on these significant issues.

#### **4. Objectives and methodology of AFTER LIFE project implementation plan**

The long-term use of LIFE REstore project results will be ensured by several support tools which have been developed by project activities. Such tools are: database of post-harvested peatlands; recommendations for after-use scenarios which will be annexed to future policy planning document “Guidelines for the Sustainable Use of Peat 2019–2030” of the Ministry of Environmental Protection and Regional Development; management optimization model for sustainable use of peatlands which provides recommendations of after-use scenarios which are most suitable for the territory and calculates the necessary investments for the implementation of these measures.

National GHG emission factors for organic soils in post-harvested peatlands (developed within LIFE REstore project) will allow the recalculation of national GHG emissions in the National GHG Inventory Report, and will ensure more accurate planning of national climate change mitigation policy and measures. LIFE REstore project results will also be used for the preparation of a number of other reports, such as national reports to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (produced every 4 years), biennial reports under the UNFCCC, etc.

The developed recommendations and decision support tool for planning the responsible use of post-harvested peatlands will ensure a balance between the biodiversity restoration, economic benefits and reduction of GHG emissions in Latvia in a long term.

The recommended after-use scenarios are an important part of the forthcoming MEPRD (Ministry of Environmental Protection and Regional Development) policy planning document “Guidelines for Sustainable Use of Peat 2019-2030”, and a significant support for landowners.

The publicly available database provides information on peat extraction sites in Latvia and their actual status. This information can be used for planning of management measures, consequently mitigating their impacts on climate change.

Following measures are must be implemented in order to ensure the continuation of LIFE REstore project activities and maintenance of after-used territories after the end of the project<sup>1</sup>.

##### **Maintenance and management of peat dams**

After the completion of the project, the peat dams constructed in Laugas purvs Nature Reserve must be managed in accordance with the technical recommendations. The water level of Lake Višezers must be maintained at 58.3 – 58.5 m above the sea level, as set out in nature protection plan developed for Laugas purvs Nature Reserve. Peat dams should be inspected quarterly, with in-depth inspection after spring floods (including measurements of dams and pipelines). Inspection of peat dams will be provided by Nature Conservation Agency.

##### **GHG monitoring**

Monitoring of greenhouse gases (GHG) will be continued by Latvian State Forest Research Institute “Silava”, in all the project demo sites for 20 years after the project completion. Measurements of

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<sup>1</sup> A list of all identified actions, the necessary funding and possible sources of funding are provided in Chapter 5: "Measures after the completion of LIFE project; necessary funding and its possible sources".

greenhouse gas emissions will be carried out twice a year, in August/September, when the emissions are the most representative, and groundwater table is the most stable. In each demo site, measurements of emissions are planned in five locations, similarly as during the implementation of LIFE REstore project. Greenhouse gas measurements, groundwater table will be recorded (this is particularly important in territories of berry plantations). Greenhouse gas samples will be analyzed by Latvian State Forest Research Institute “Silava” or by Latvia University of Life Sciences and Technologies. It is important to continue the monitoring of greenhouse gas emissions in order to assess the long term impact of after-use scenarios introduced in project demo sites.

### **Vegetation monitoring**

Vegetation monitoring is necessary for the assessment of progress of mire habitat restoration and management measures. In two LIFE REstore project demo sites (renaturalization in Ķemeri Mire demo site and rewetting in Lauga Mire demo site), vegetation monitoring was carried out both before and after the works. In 2017 and 2019, vegetation (projective cover of plant species) was monitored in permanent sample plots in order to assess the establishment of mire plant species at peat dams in Lauga Mire. The growth of *Sphagnum* mosses after the reintroduction in May 2018 was evaluated in Ķemeri Mire demo site.

In **Lauga Mire**, vegetation monitoring was started in 2017, by establishing ten sample plots in both the natural and degraded part of mire. In 2019, vegetation monitoring was carried out in the degraded part of Lake Višezers surroundings where peat dams were constructed in 2018. At present, the obvious impact on vegetation can not be observed since the peat dams were constructed less than one year ago. Observations will be continued for 10 years to assess the rewetting impact of on vegetation.

In **Ķemeri Mire** demo site in 2017, 13 sample plots were established in an area where topsoil removal and *Sphagnum* moss planting were not planned. In 2019, 10 sample plots were established in site where *Sphagnum* mosses and other characteristic mire species were planted on May 18, 2018. Due to favorable moisture conditions, the establishment of *Sphagnum* mosses and other mire plant species in summer 2019 was significantly better than in 2018. *Sphagnum* species (*Sphagnum fuscum*, *S. cuspidatum*, *S. rubellum*, *S. magellanicum*), as well as *Drosera rotundifolia* and *D. anglica* are recovering in entire territory of Ķemeri Mire demo site. In some parts, also *Eriophorum vaginatum*, *Rhynchospora alba*, *Andromeda polifolia*, *Oxycoccus palustris* and *Calluna vulgaris* can be found. It is planned to continue vegetation monitoring in Ķemeri Mire for 10 years after the project completion. In both sites, vegetation monitoring will be carried out by Nature Conservation Agency.

### **Hydrological monitoring**

Water table changes are a good indicator of the development of mire-characteristic conditions, so this is one of the baseline indicators of rewetting success. Six groundwater wells in Ķemeri Mire demo site and seven wells in Lauga Mire were established for water table measurements. In both demo sites, water table should be measured twice a month. After the project completion, hydrological monitoring will be carried out by the Nature Conservation Agency.

### **Public awareness raising**

In LIFE REstore project, considerable attention has been devoted to public education and information. Project communication activities focused on educating and informing the public on the importance of peatland ecosystem services, the potential of peatlands to mitigate climate change, and the scenarios of sustainable management in areas affected by peat extraction. Various informative materials were prepared within a framework of project: publications in the media, scientific publications, e-reporters on the project current events and important activities, such as peatland after-use scenarios, GHG emission measurements, development of national GHG emission factors, and peatland inventory in Latvia. Ten documentary short films on the most important project results were produced. A major part

of the communication work was educational and informative events – seminars, meetings with target groups, lectures at universities and also an international conference.

After the end of the project, stakeholders will have access to project website, which includes all LIFE REstore project results, communication materials, application of database of post-harvested peatlands, and web tool of management optimization model for degraded peatlands.

## 5. Activities after the completion of the LIFE project, necessary financing and possible sources of funding

Action	Performer	Time needed for execution	Costs	Possible source of funding	Performance indicators
<b>Web tool of management optimization model for post-harvested peatlands</b>					
<u>Action A.5</u> : Maintenance of database application in a section of Nature Data Management System Ozols.	Nature Conservation Agency	Five years after the end of the project	€ 3500/year	Nature Conservation Agency	<ul style="list-style-type: none"> <li>Maintenance of database.</li> <li>Data storage in system Data Management System Ozols.</li> <li>LIFE REstore database is integrated in Ozols: <a href="https://ozols.gov.lv/ozols/Account/LogOn">https://ozols.gov.lv/ozols/Account/LogOn</a>.</li> </ul>
<u>Action C.3</u> : Maintenance of interactive web tool of optimization model in LIFE REstore website.	Nature Conservation Agency	Five years after the end of the project	€ 600/year	Nature Conservation Agency	<ul style="list-style-type: none"> <li>Maintenance of web tool.</li> <li>Data storage on server of Ozols.</li> </ul>
<b>Inspection of project demo sites</b>					
<u>Action C.4</u> : Maintenance/management of peat dams.	Nature Conservation Agency	Ten years after the end of the project (as set in Nature protection plan)	€ 3000/year	Nature Conservation Agency, national budget	<ul style="list-style-type: none"> <li>Dams are inspected quarterly; in-depth inspection after spring floods.</li> <li>Necessary measures have been taken in accordance with the recommendations for the technical management of peat dams.</li> </ul>
<u>Action C.4</u> : Management of demo site in Ķemeri Mire (renaturalization).	Nature Conservation Agency	Annually	€ 2450/year	Nature Conservation Agency, national budget	<ul style="list-style-type: none"> <li>Demo site is inspected quarterly; particular attention in dry, hot periods in summer.</li> <li>Water supply to the planted territory, if necessary.</li> </ul>
<u>Action C.4</u> : Maintenance of afforestation in Kaigu Mire demo site.	Laflora Ltd	Annually	€ 3000/year	Laflora Ltd	<ul style="list-style-type: none"> <li>Agro-technical tending once a year.</li> <li>In 2020: fertilization for trees which were planted in unfertilised substrate (LIFE REstore experiment (€ 1000)).</li> <li>Additional fertilization for planted trees.</li> </ul>

					<ul style="list-style-type: none"> <li>• After five years – evaluation and decision on necessary additional fertilization.</li> <li>• Research will be continued in framework of project Marginal Lands for Growing Industrial Crops (MAGIC).</li> </ul>
<u>Action C.4</u> : Replacement of information boards; installation of overhead roofs; replacement of protected nature territory information signs (“oak leaves”) on necessity.	Nature Conservation Agency	On necessity	€ 2500	Nature Conservation Agency	<ul style="list-style-type: none"> <li>• Information on project and its implemented after-use scenarios in demo sites is passed to general audience through information boards.</li> </ul>
<b>GHG monitoring in project demo sites</b>					
<u>Action D.1</u> : GHG measurements in project demo sites.	LSRI Silava	20 years after the end of the project	€ 2500/year	LSRI Silava	<ul style="list-style-type: none"> <li>• Measurements of GHG emissions in demo sites twice a year (August/September, when the emissions are the most representative, and groundwater table is the most stable); 5 sampling localities in each site.</li> <li>• Measurements of water table (particularly important in berry plantations); installation of groundwater monitoring wells.</li> <li>• Analyses of GHG samples – LSRI Silava and Latvia University of Life Sciences and Technologies (40 samples).</li> </ul>
<b>Hydrological monitoring in demo sites in Ķemeri Mire and Lauga Mire</b>					
<u>Action D.1</u> : Hydrological monitoring in two demo sites.	Nature Conservation Agency	10 years after the end of the project	€ 3000/year, or 2000 if automatic loggers are purchased	Nature Conservation Agency	<ul style="list-style-type: none"> <li>• Data on regular water table measurements in demo sites are obtained.</li> <li>• Water table measurements: in 6 wells twice a month in Ķemeri demo site; 7 wells twice a month in Lauga demo site.</li> </ul>

					<ul style="list-style-type: none"> <li>Annual data analysis.</li> </ul>
<b>Vegetation monitoring in demo sites in Ķemeri Mire and Lauga Mire</b>					
<u>Action D.1:</u> Vegetation monitoring.	Nature Conservation Agency	10 years after the end of the project (preferably – for a longer period of time)	€ 600/year	Nature Conservation Agency	<ul style="list-style-type: none"> <li>Vegetation is monitored and analysed once a year (20 permanent vegetation sample plots in Lauga Mire, 13 sample plots in Ķemeri Mire).</li> <li>Vegetation monitoring should be continued after the end of the project as rewetting influence on vegetation often can not be observed in the first or second year.</li> </ul>
<b>Maintenance of LIFE REstore website</b>					
<u>Action E.1:</u> Maintenance of project website.	Nature Conservation Agency	Five years after the end of project.	€ 700/year	Nature Conservation Agency, national budget	<ul style="list-style-type: none"> <li>Project website is accessible five years after the project end.</li> <li>Website contains all information on project, deliverables, communication materials, project short-films, access to web tool and database.</li> <li>After the project completion, project details will be distributed via website of Nature Conservation Agency; up-to-date information via Unit of Nature Education and Communication.</li> </ul>
<b>Free of charge use of State-owned land parcel</b>					
Real Estate Tax.	Nature Conservation Agency	Annually	~ € 50/year	Nature Conservation Agency	<ul style="list-style-type: none"> <li>According to the cooperation agreement signed between the Nature Conservation Agency and the Joint-Stock Company “Latvijas valsts meži”, under which the land parcel is transferred to the Nature Protection Board for free of charge use for the purpose of implementation of project activities:</li> </ul>