A TYPE OF PEATLAND RECULTIVATION: REFORESTING

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This type of recultivation involves the transformation and adaptation of former peat extraction sites or areas to be restored into forest lands to be used in forestry.

The aim of the further land use — forestry.

When planning to grow a forest at a peat extraction site to be recultivated, the sediment composition, including chemical and filtration properties, forming the bog depression surface should be considered. A combination of these properties influences the growth conditions of the trees, the proportion of minerals in the soil, which in turn determines the choice of tree species in the respective area.

Figure 1 **Reforesting in peatland (D.Lazdiņa)**

Table 1 **Conditions under which the recultivation scenario is possible**

The type of the top peat layer	Not a restrictive criterion
Thickness of the remaining peat layer	Not a limiting criterion
pH values of the top peat layer used	> 4 (otherwise liming must be done)
Average groundwater level	No higher than 0.35m
Number of days per year when the area is flooded	Permissible for 1-2 days per year
Degree of peat decomposition	Not a restrictive criterion
Peat deposits coverage with stumps	Not a restrictive criterion

Areas where the functionality of a good drainage system has been created, which ensures an optimal moisture regime for tree growth and the necessary nutrients available for trees, can be considered as suitable for reforesting.

The moisture regime required for growing conditions of the selected tree species can be foreseen in advance and the proportion of ditches left in operation after the end of peat extraction also can be planned. At previously used peat extraction sites, the elements of the drainage system can be renewed and reconstructed by improving the soil and normalizing the environmental reaction, which can create the growing conditions necessary for tree growth.

Soil improvement at developed peat extraction sites can be done with wood ash, mineral fertilizers or sewage sludge, as well as separately liming, if the selected fertilizer does not have soil acidity-reducing properties and/or the peat layer of the field to be restored, where the plantation is planned, has increased acidity (pH < 3.0).

Soil improvement promotes not only the growth of trees, but also weeds, so one has to consider that soon after additional plant nutrients have been introduced, an agrotechnical treatment will have to take place, cutting the grass and herbaceous plants, if they hinder the development of new trees. Agrotechnical treatment should be provided for several years in the planted areas.

The use of wood ash in the peat extraction fields developed for soil improvement can effectively improve tree growth, and the fertilizer effect can last up to 50 years (Huotari et al., 2011). It has to be taken into account that peat has a low phosphorus absorption capacity.

If the reforesting of a historically used peat extraction site is planned which has a significant thickness of the remaining peat layer (> 2 m), additional logging burdens associated with the soil's low load capacity during logging work will arise. Wood cutting in such areas should be planned during the winter period when the soil is frozen. At such sites, it is necessary to initially consider the possibility of extracting the remaining peat to an optimal thickness of the peat layer, which makes it possible to perform technical activities for mixing the peat layer with the mineral soil.

Reforesting the area of developed peat extraction sites to forest land by transforming the scenario can be done in 2 ways — forest or plantation forest. An alternative is to establish long-term tree plantations, the land is transformed into agricultural land, or its status remains unchanged. This can be applied to the purpose of planting trees, the wishes of the owner and the available financial means.

Figure 2 **Reforesting in peatland (D.Lazdiņa)**

Climate change

1. GHG emissions are reduced by reforesting the extracted peat field.
2. By reforesting the peatlands, the mineralization of the peat layer is slower than when they are used in agriculture, therefore, when assessing the climate impact of the further management of peatlands, it is preferable to use them for forestry purposes.
3. After successful reforesting, soil improvement measures (fertilization, liming, soil treatment) are repeated after several decades. This reduces soil temperature and microbial activity, thus slowing down the rate of peat mineralization and reducing CO_2 and N_2O emissions.
4. The impact on GHG emissions has been assessed for a 30-year period following the implementation of the scenario, by assuming that the scenario is introduced in an area where peat extraction has been discontinued recently and ground vegetation has not yet formed, but the topsoil is formed by fertile low or transitional bog peat. Following the introduction of the scenario, GHG emissions will be reduced by 9.7 tonnes CO_2 eq. ha^{-1} per year compared to the initial situation. Total GHG emissions in this scenario over the calculation period correspond to -3.5 tonnes CO_2 eq. ha^{-1} per year, i.e. in 30 years, a net CO_2 attraction is formed in the reforesting area. The calculation of GHG emissions includes CO_2 attraction in living and non-living biomass.

The restoration scenario is implemented if:

- The requirements and technical solutions for the restoration of the peat extraction site specified in the extraction project of mineral resources has been implemented in the territory;
- The State Forest Service, in accordance with the procedures specified in regulatory enactments, has recognized that a forest stand has been cultivated;
- The planned forest drainage system has been established and is functioning in the area to be restored;
- An act for the completed restoration work has been drawn and signed by the commission established by the local government construction board.

By fulfilling these conditions, the peat extractor has, for his part, performed the tasks foreseen in the extraction project for mineral resources: to prepare the area for restoration — the site is ready for the cultivation of a forest. Further actions must be taken by the landowner.

After a year, the number of grown trees corresponds to the planned number of trees, evenly distributed throughout the area. Trees are viable with steady growth. Species characteristic to dry peat soil or dry mineral soil forests are found in the ground vegetation. The ditch system works, and the drained, well aerated soil layer is at least 0.35 m.

Descriesptions of peatland recultivation types have been elaborated within the framework of project "Sustainable and responsible management and re-use of degraded peatlands in Latvia" (LIFE REstore, LIFE14 CCM/LV/001103).