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ENVIRONMENTAL LIFE CYCLE ANALYSIS (ELCA) OF PROCLEANSORB

Peat can be used as an eco-friendly absorbent to clean up hydrocarbon spills both on land and water. By undergoing a thermal treatment, peat can be made water repellent. The procedure gives peat the ability to repel water while still absorbing hydrocarbons.

DEFINITION OF ELCA

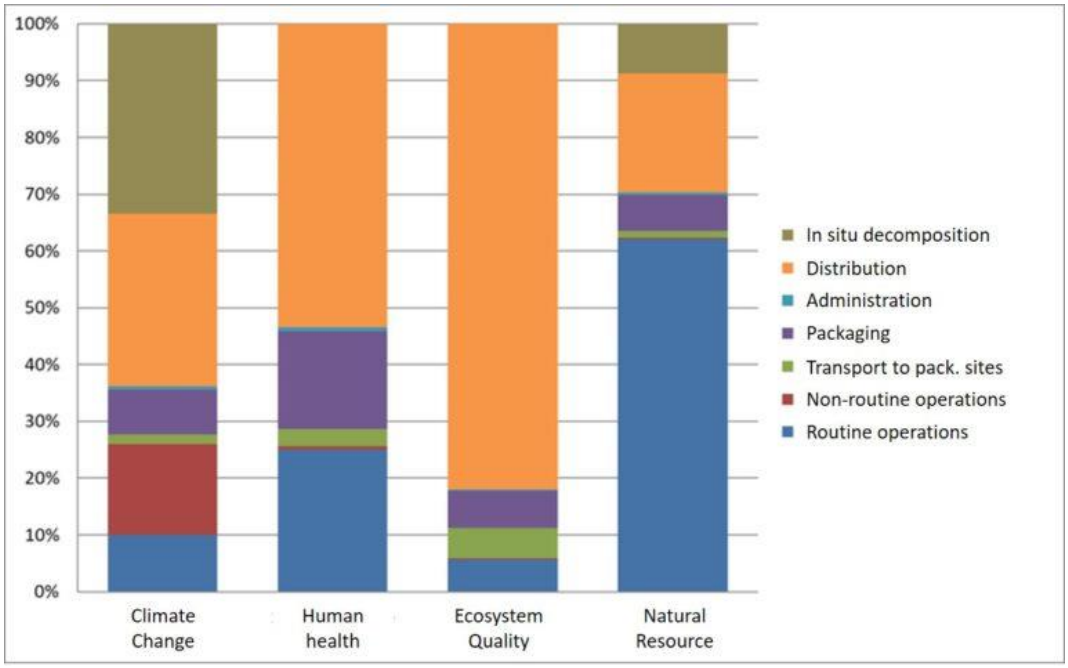
Environmental life cycle analysis is an internationally recognised approach for assessing the potential environmental and human health impacts associated with products and services throughout their life cycle, from "cradle-to-grave" by:

- compiling an inventory of relevant inputs and outputs
- evaluating the potential environmental impacts associated with those inputs and outputs
- interpreting the results of the inventory and impact phases in relation to the objectives of the study

In conjunction with the International Reference Centre for the Life Cycle of Products, Processes and Services (CIRAIG), the Canadian peat industry has conducted Environmental Life Cycle Analyses (eLCA) to evaluate the potential environmental impacts of harvesting Canadian peat. The first analysis was conducted in 2010, the latest update was in 2017.

The study used a **'cradle to point-of-sale'** type of eLCA. The general boundaries of the system include all the activities involved in the peat moss production, processing and distribution stages and exclude those related to the peat utilisation stage and end-of-life management. The analysis focused on activities and operations that took place in Canada in 2015.

RESULTS OF ELCA



Like most life cycle analyses, the results are grouped according to four "impact indicators": ***Climate Change, Human Health, Ecosystem Quality*** and ***Resources***.
Routine operations include regular operations related to peat harvesting (harrowing, vacuuming, drainage system maintenance) while non-routine operations include site opening and closing. It is therefore in the non-routine operations that the mode of site closure (restored or not) is taken into account.

The results obtained show that the peat distribution stage to buyers' markets contributes more than half of the score in the Human Health category and more than 80% of the score in the Ecosystem Quality category. In this respect, the impact reduction factors that producers can influence are related to distribution logistics.

For the Climate Change indicator, the importance of decomposition and distribution were noted, which contribute 33% and 30% respectively. Non-routine operations contribute 16%, which is negligible. Sensitivity analyses that explore different modes of closure demonstrate the importance of ecological restoration in reducing this impact. CO2 emissions after peat harvesting are significantly reduced if the site is quickly restored to a functional peatland ecosystem.

In the Resources category, ongoing harvesting operations make the largest contribution, at nearly 62%.

SOCIAL RESPONSIBILITY

Canada

In 2014, the Canadian Sphagnum Peat Moss Association (CSPMA) released its first Industry Social Responsibility Report (ISR). To do so, the CSPMA joined the Sustainability Assessment of Food and Agriculture Systems (SAFA) pilot project of the Food and Agriculture Organization (FAO) to ensure rigour and objectiveness of its reporting initiative. This was one of 23 pilot initiatives participating in the advancement of the SAFA Guidelines during the 2012-2013 period.

The purpose of this ISR report is to provide a benchmark for quantifying industry governance and social, environmental and economic issues. It is also intended to play a role in mobilising members towards positive change and to improve understanding and collaboration with various stakeholders. The priorities identified in this report are:

- to support research on sustainable development and responsible peatland management in regions affected by peat industry activities
- to ensure that restoration of post-harvest site is carried out by CSPMA members, in compliance with applicable regulations
- to strengthen relationships and communication with various levels of government, First Nations and Métis, and engage in constructive dialogue with NGOs and consumers

CERTIFICATION AND INDUSTRY POLICIES

Certification for Responsible Peatland Management

The Certification for Responsibly Managed Peatlands – an international first – guarantees the application of good management practices in all aspects of sustainable development.
The program is administered by an independent certification agency, the Scientific Certification Systems (SCS), which is one of the most recognized agencies in North America.
The certification program was developed in 2012 in collaboration with CSPMA and APTHQ, representatives of the U.S. and Canadian governments, academic experts and peat producers. This certification was originally an annex to the Veriflora Standard, a certification in sustainable development applied to the fields of floriculture and horticulture. Four years later, SCS launched a certification review process that made it a full-fledged standard and incorporated the latest scientific knowledge and industry's best practices.

The sector-specific goals of the Responsibly Managed Peatlands Certification program are:

- to encourage a growing segment of the peat moss production sector to implement best management practices in terms of environmental, social quality performance
- to stimulate innovation and promote continuing improvement over time

- to provide a uniform standard and assessment matrix that can be applied when evaluating the performance of a diverse array of responsible peatland management approaches
- to promote sound and responsible working conditions and ensure adequate health and safety measures for workers protect
- to encourage peat moss producers to be good neighbours in their engagement with the surrounding community
- to raise public awareness about the issues and solutions associated with peat production.
- to stimulate consumer purchases that reinforce responsible peatland management

Industry Policies

All members of the Canadian Sphagnum Peat Moss Association (CSPMA) adhere to a Preservation and Reclamation Policy that encourage harmonious cohabitation with the communities where they operate and continuous improvement of their practices.

In addition, in 2011, the Canadian association published its position on sustainability development, followed by its first social report in 2014.

In 2016, the Canadian industry introduced a national peatland restoration policy to reduce the area of sites closed to production which have not yet been restored.

ACTS AND REGULATIONS

In Canada, peatlands are partially protected by the federal government's Wetland Policy and by the Ramsar Convention, but the actual responsibility for the management of natural resources is under the authority of the provincial and territorial governments.

In all Canadian jurisdictions, peat harvesting is subject to strict regulatory frameworks. For example, in Quebec, companies wishing to open a new peatland must apply to the Ministry of Environment and Climate Change for approval and if it is public land they must comply with requirements from the Ministry of Energy and Natural Resources. Specific terms and conditions apply in all Canadian provinces.

It should also be added that some peatlands are excluded from development projects because they occur in designated natural conservation areas or because they possess special characteristics that justify their conservation as natural areas.

HARVESTING PEAT MOSS

Selecting a Peatland

The process of selecting a peatland to harvest peat moss is aided where detailed surveys of the resource exist. Factors to consider include:

- **Quality of the peat**: it must meet market standard.
- **Peat depth**: the thickness of the peat layer must be sufficient to warrant development. An average depth of 2 m is generally considered to be a minimum.
- **Surface area**: a peatland must be large enough to warrant development. An area of 50 ha is usually required, although smaller sites are occasionally developed.
- **Other factors such as**: proximity to transportation infrastructure (roads, truck access), a low density of tree cover, availability of a labour force, access to electrical power also play a decisive role in peatland selection.

Peat Moss Harvesting

Ensuring proper drainage

A main drainage ditch is dug along the perimeter of the peatland to drain water. Shallow ditches are dug parallel to each other to lower the water content in the peat to about 85%. These secondary ditches drain into the main peripheral ditch.

Removing surface vegetation

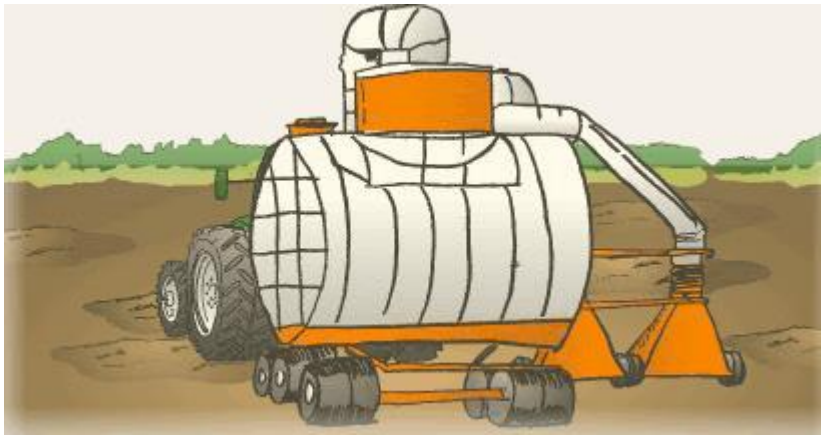
Using a rotovator, the surface vegetation is removed to expose the underlying peat. The live plan fragments can be collected and used to restore former peat harvesting fields.

Levelling and crowning the harvest fields

A screw leveller is used to even the ground surface and to profile the harvest fields in a convex fashion to improve drainage of surface runoff.

Field preparation

The surface is milled and harrowed with various pieces of equipment to loosen the peat and accelerate the drying process that depend on the sun and favourable wind conditions.



Harvesting the peat

After a few days of drying weather, the water content of the surface peat layer is reduced to about 50% and it is ready to be harvested. It is collected using large vacuum harvesters or other suitable equipment.

Processing

The peat is transported to a processing facility to be screened in various grades and packaged.

Transporting the peat

The peat is now ready for shipping and is transported in the form of compressed bales of various sizes.

RESEARCH

Research is viewed as the key to responsible peat resource management. Since 1992, the Canadian peat industry has invested significant financial and human resources in improving the knowledge about peatland and their restoration through partnerships with the scientific community.

The Peatland Ecology Research Group (PERG)

PERG is the result of a collaboration between the academic scientific community, the Canadian peat industry, and federal and provincial government agencies. The multidisciplinary scientific approach combines fundamental and applied research in peatland ecology and management.

The research program undertaken by the PERG since 1992 has been influential in making Canada a world leader in the responsible management of peat resources. The results of the research, among other things, have led to the development of techniques for the restoration of peatlands after peat harvesting.

The current research program (2018-2024) is funded by a Collaborative Research and Development (CRD) grant from the Natural Sciences and Engineering Research council of Canada. PERG investigates questions that arise directly from the industry on matters such as biodiversity, hydrology, greenhouse gases and sphagnum farming.

Key findings concerning peatland restoration

- Sphagnum moss coverage can be re-established within three to five years
- the growth rate of Sphagnum moss on the restored site is comparable to or higher than that of natural peatlands
- the ability of restored sites to capture carbon can return to levels equivalent to natural peatlands after a period of 10 to 15 years following restoration.

Sphagnum cultivation: a promising line of research

The PERG and the peat industry have been carrying out research on Sphagnum farming for many years now. It consists in the renewable production of non-decomposed Sphagnum fiber biomass on a cyclic basis. The objectives of Sphagnum moss production are multiple:

- to develop new growing substrates
- to produce floral moss
- to supply a source of Sphagnum to be used in peatland restoration

PEATLAND RESTORATION

Peatland restoration goal

The goal of restoration of peatlands after peat harvesting is to re-establish self-regulatory mechanisms that will lead back to a naturally functioning peat accumulating ecosystem, including its ability to accumulate peat.

The restoration approach for bogs, called the moss-layer transfer technique, was developed through an extensive research program. It is based on two main actions:

1. Active reintroduction of peatland plant species, along with various techniques to improve conditions for plant establishment.
2. Rewetting the peatland.

Machines widely used for agriculture or peat extraction purposes can be used to collect and spread plants and mulches, allowing the restoration technique to be applied on large peat surfaces.

Peatland restoration is a multi-year process. Its success is gauged by studying the growth of vegetation communities and other factors that affect the ecosystem, such as hydrology and carbon cycling.

Peatland Restoration Guide

A first restoration guide was published in 1997 by the PERG.
A second, much larger edition was published in 2003. This second edition remains an indispensable resource to this day.

Steps leading to peatland restoration

Collecting plant fragments from a donor site
Surface vegetation on a donor site is chipped by a rotovator to a maximum depth of 10cm. Plant fragments are then collected and transported to the restoration site. The vegetation of donor sites quickly regenerates because the lower parts of plants and fragments remain in the ground. Donor sites can be used more than once on a sustainable basis.

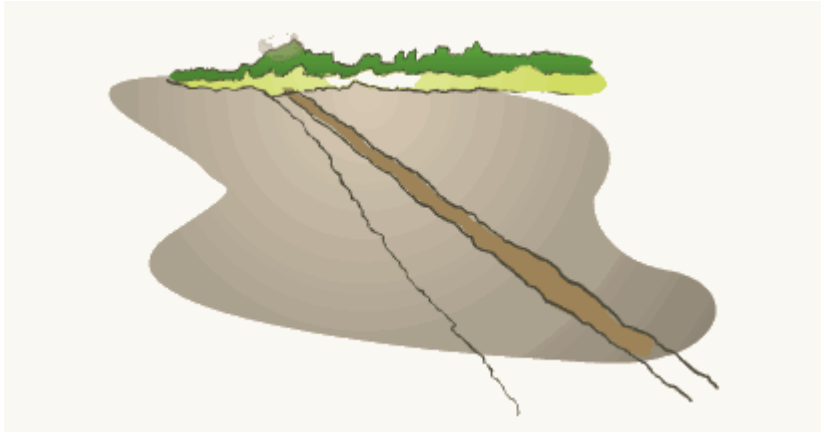
Preparing the site to be restored
A screw leveller is used to evenly flatten the peat fields, to scrape the peat surface and to build berms to ensure a good distribution of water.

Spreading plants
A manure spreader is used to spread Sphagnum moss and other plant fragments on the restoration site. A ratio of introduction of 1 to 10 is used, which means that 1m2 of plant material coming from

the donor site is spread over 10m2 of surface to restore. Sphagnum is the key species involved in bog restoration. It allows the re-establishment of a moss carpet that is able to initiate self-regulatory mechanisms and eventually restore the peat accumulation function.

Adding a straw mulch
A straw mulch is used to cover and protect the fragile plant fragments. It improves the micro-climate conditions on the ground and prevents drying of the plant material.

Fertilising
A very light addition of phosphorous may be added to favour colonisation of plants that nurse Sphagnum mosses.



Blocking drainage ditches
Blocking drainage ditches allows the peatland to fully rewet. This encourages the grown of Sphagnum mosses and other peatland plants.

Fen restoration

The guides presented above describe the Moss Layer Transfer Technique (MLTT) for the restoration of Sphagnum-dominated peatlands. The PERG is also working to develop other techniques better suited to the restoration of peatlands with residual peat corresponding more to that of a fens than a bog. The main goal is to raise the water table and reintroduce plant species typical of more minerotrophic environments.

Other reclamation options

Depending on the specific context (environmental, social, economic) and regulations, other reclamation options can be implemented, such as tree plantation, berry cultivation and marsh or pools creation.

SOCIAL LIFE CYCLE ANALYSIS

Social Life Cycle Assessment (sLCA) is a tool that provides a socio-economic assessment of organizations involved in the life cycle of a product. It focuses on businesses' behaviour and on the relationships, they have with their stakeholders, for example their workers and the local community. The focus ranges from social issues of concern, working conditions and local engagement, to procurement policy and environmental practices.

Since 2010, peat producers have focused on the socio-economic aspects of the industry to continue their efforts towards true sustainable development. Thus, in 2012, the industry conducted a first sLCA to assess the social performance of peat production companies.

In 2015, the initiative was updated with an even more comprehensive assessment covering social and environmental aspects. The results are presented using 71 sustainable development indicators, classified according to the following eight dimensions:

– Governance
– Consumers
– Economic Performance
– Local Community
– Responsible peatland management
– Workers
– Suppliers
– Environmental Integrity

Canadian Sphagnum Peat Moss Association

(CSPMA)