TERMOKIR

LCA

Life Cycle Assessment

Environmental Life Cycle Assessment

TERMOKIR PL 100

Basic plaster layer

According to ISO 14040:2006 "Environmental management - Life cycle assessment - Principles and framework"

According ISO 14025:2006 "Environmental labels and declarations - Type III environmental declarations - Principles and procedures"

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Life Cycle Assessment (LCA) Summary

Life Cycle Assessment is a process to evaluate the environmental burdens associated with a product, process, or activity by identifying and quantifying energy and materials used and wastes released to the environment and assess the impact of the natural resources used and the production process releases to the environment. The assessment includes the entire life cycle of the product, process or activity and includes the extraction of raw materials; the processing, manufacturing, and fabrication of the product; the transportation or distribution of the product to the consumer; the use of the product by the consumer; and the disposal or recovery of the product after its useful life.

The purpose of the LCA method is to analyze and compare the overall environmental impacts of products and services in order to improve various processes (production, use, etc.), assist in product/service policy making, and to provide tools for decision making on reducing environmental impacts of products and service at the product development stage.

About the Company

Established in 1983, Termokir Industries Ltd. (1980) is a kibbutz-owned company based in Kibbutz Horshim providing innovative construction and building solutions for the Israeli market. Termokir supplies more than 50 different mortar products, providing high-quality technological solutions based on sustainability principles and designed for building cladding, flooring, adhesion, sealing, insulation and acoustic applications, as well as for concrete repair and grout products.

All of the company's products are manufactured on the grounds of the Kibbutz.

Company Strategy

Over the years, Termokir has become a mainstay in the Israeli construction market due to the company's clear value proposition based on three main strategic anchors: **Technology** - developing innovative and environmentally-minded products tailored to the local construction industry; **Quality** – putting our stakeholders first by developing high-quality solutions based on international standards and certification frameworks, while also providing related services, training and thorough technical guidance in implementation of the company's systems and products; and **Sustainability** – the anchor at the core of the company's value proposition, beginning with the development of its first "Thermal Plaster" product recognized for its contribution to building energy savings and efficiency in construction. The company continues to develop environmental products and to operate its factory and manufacturing processes in a sustainable way.

In addition, the company strives to achieve green office principles, by recycling, reusing and minimizing the use of paper and other materials, and by encouraging the use of digital means. Finally, Termokir engages in social impact projects with the community to implement its recycling program, for example, by working with organizations that employ individuals with disabilities.

Through the implementation of these anchors, Termokir strives to continuously challenge, improve and be innovative in the Israeli construction market.

A "Cradle to Gate " LCA study was performed to demonstrate an initial overview of the environmental impacts of TERMOKIR PL 100.

The manufacturing process of the yield (kg/m^2) needed for different layer thickness (depending on the product) to provide coverage of 1m^2 was analyzed, in regard to its impact on 6 environmental aspects (GHG emissions, Ozone depletion, Acidification, Photochemical Ozone Creation and Energy Consumption) using CML - IA baseline (version 3.06 based on CML 2 baseline 2000) and The Cumulative Energy Demand (CED) as the impact models. Like all LCA studies, the results are dependent on specific assumptions and parameters analyzed.

From an examination of the results, it can be noted that the two main environmental impact categories are Global Warming and Acidification Potential. The impact is mainly due to the embodied energy in some of the raw materials, air borne emissions from the production of these materials and the emissions resulting from maritime and land transportation.

CHAPTER A

Summary of the declaration for environmental Life Cycle Assessment (LCA)

Environment Life Cycle Assessment (LCA) operations	Sher Consulting & Training Ltd. www.2sher.co.il A company leading the Israeli industry in the fields of quality, environment, product safety and employee safety Tel: +972-9-7492232 Fax: +972-9-7492805 Mobile: +972-52-3108310 Email: pesther@2sher.co.il Sher Consulting & Training Ltd. Quality • Safety • Environment
Product producer	Termokir Industries Ltd. (1980) is a kibbutz-owned company established in 1983 in Kibbutz Horshim. It develops and manufactures high-quality construction materials using advanced technologies. It produces more than 50 different mortar products, providing high-quality technological solutions based on sustainability principles and designed for building cladding, flooring, adhesion, sealing, insulation and acoustic applications, as well as for concrete repair and grout products. https://termokir.co.il TERMOKIR
Product description	This declaration covers Termokir Termokir Termokir PL 100 - Basic plaster layer
Scope of the Life Cycle Assessment work	The Life Cycle Analysis (LCA) has been done according to the requirements / guidelines of: ISO 14040, using specialized LCA software (SimaPro 9.1) *Data was not verified with an independent third party (internal or external verification)
The tested product unit	The manufacturing and packaging process of 1 m² of PL 100 delivered in powder and having a yield of 8 kg/m² for 5 mm thickness.
Content of the environment Life Cycle Assessment (LCA)	This declaration includes: - Definition of the product and description of its properties - Raw materials and their sources - Description of manufacturing of the product at the plant - Results of Life Cycle Assessment (LCA)

Date of issue of the environmental Life Cycle Assessment declaration	August 18th, 2020
Name of declarer	Esther Peled Environmental Project Manager Environmental & Safety Division Sher Consulting & Training Ltd.

CHAPTER B

Introduction, goals & standards

Lifecycle Boundaries	Consecutive, linked stages in a product system, process or service, from the stage of manufacturing raw materials and manufacturing products to the stage of final product – "Cradle to Gate".
The purpose of the environment Life Cycle Assessment (LCA)	The purpose of this LCA is to understand in depth the various environmental impacts of Termokir's manufacturing process. The LCA helps in comparing the various environmental effects and definition of their "extent / severity". The output of this environmental assessment helps the organization understand their products' environmental impacts and assists in developing and/or refining suitable tools for correct decision making on reducing the environmental effects of the product. In addition, intelligent use of the LCA gives the ability to compare the environmental effects of different products within the same or comparable sectors, in order to identify products that cause the least damage to the environment.
The Environmental Declaration	A statement that indicates the environmental aspects of products or a services.
The purpose of the environmental declaration	The purpose of environmental declarations is to encourage the demand and supply of products that cause the lowest environmental impacts, by giving comprehensive, exact information that is not misleading. The purposes of the environmental declaration according to ISO 14025:2006 are: • Providing LCA based information and additional information on the environmental aspects of the product • Assisting the buyer and user in making an intelligent comparison of products. The declarations themselves cannot be fully compared. • Encouraging improvement of environmental performance. • Providing information for evaluation and analysis of the environmental effects of products along their full lifecycle (LCA).

Environmental aspects that are checked during the Life Cycle Assessment	Components throughout the production of the studied product, that may interact with the environment.
Functional unit	A unit of the products that is determined by the checker as a characteristic unit for comparing competing products with each other. For example: A 1-liter plastic bottle that can be compared with an identical volume glass bottle. For this Life Cycle Assessment, the following product unit is determined by its yield: The manufacturing and packaging process of 1 m^2 of PL 100 delivered in powder and having a yield of 8 kg/m^2 for 5 mm thickness.

CHAPTER C

The environmental aspects examined in the LCA

Main LCI Method	The CML methodology, developed by the Institute of Environmental Sciences at the University of Leiden in the Netherlands, is the most widely-used and often considered the most complete methodology. It uses primarily European data to derive its impact factors. CML is an impact assessment method which restricts quantitative modeling to early stages in the cause-effect chain to limit uncertainties. Results are grouped in midpoint categories according to common mechanisms (e.g. climate change) or commonly accepted groupings (e.g. ecotoxicity). The method presents characterization factors for more than 1700 flows (2001).
Global Warming Potential (GWP)	Global Warming Potential is a relative index that evaluates the contribution of a given quantity of greenhouse gas mass to global warming. This is a relative scale that compares the greenhouse gas in question to an identical mass of carbon dioxide, so GWP is measured in equivalent units of kg of carbon dioxide CO_2. The GWP is calculated over certain periods and the value of this period must be noted when the value of the GWP is stated. In the current LCA, the GWP has been calculated using the common time constant of 100 years (GWP100). The emission factors that were used for calculating the GWP are based on the IPCC 2013 publications. Products with a lower GWP value, expressed in kg CO_2eq have an environmental advantage.
Ozone depletion potential (ODP)	Ozone Depleting is caused by the release of gaseous chemicals that react with and destroy stratospheric ozone. Although the Montreal treaty has significantly reduced the use of the most damaging substances and there is evidence that the abundance of ozone depleting gases is reducing in the atmosphere, some releases of ozone depleting chemicals still occur. Ozone Depleting Potential (ODP) is a number relating to the potential for depleting the quantity of ozone in the atmosphere following the use of a certain material. ODP is measured in units equivalent to a kg of trichlorofluoromethane - R11. Products with a lower ODP value have an environmental advantage.

Acidification potential (AP)	The environmental impacts of acidification are one of the major contemporary environmental issues globally. When acids are emitted, the pH factor falls and acidity increases in both terrestrial and atmospheric (rainwater and fog) environments. The main sources for the emission of oxidants are agriculture and combustion of fossil fuel for generating electricity, heating and transport purposes. Acidification potential (AP) is generally a regional impact and is measured in units equivalent to a kg of sulfur dioxide- SO_2. Products with a lower AP have an environmental advantage.
Eutrophication potential (EP)	Eutrophication is the enrichment of any source (aquatic or land) with nutrients and has adverse effects on the bio-environment. The main sources of eutrophication are air pollution, effluents, waste and agricultural use of fertilizers. EP is measured in units equivalent to a kg of phosphate - PO_4. Products with a lower EP have an environmental advantage.
Photochemical ozone creation potential (POCP)	POCP – In atmospheres containing nitrogen oxides (NOx, a common pollutant) and volatile organic compounds (VOCs), ozone can be created in the presence of sunlight. Although ozone is critical in the high atmosphere to protect against ultraviolet (UV) light, low level ozone is implicated in impacts as diverse as crop damage and increased incidence of asthma and other respiratory complaints. High concentrations of ozone in the lower atmospheric layers form when the temperature is high, humidity low, the air is relatively static and when there are high concentrations of hydrocarbon air pollutants in the air, creating a smog like effect called "Summer smog". POCP is measured in units equivalent to ethylene, which forms smog. Products with a lower POCP have an environmental advantage.

Energy Consumption	The Cumulative Energy Demand (CED) LCI methodology indicates the total energy withdrawn from nature to provide a product, summing up the energy of all the resources required (extraction of raw materials, transportation and manufacturing). It measures the amount of energy required to provide a process or product. Most energy consumption today originates from exhaustible resources such as fossil fuels and using these energy sources increases the greenhouse effect due to the emission of greenhouse gases during their combustion. The energy consumption is measured in Mega Joules (MJ). Products with lower energy consumption have an environmental advantage.

CHAPTER D

Environmental Life Cycle Assessment Declaration

Test limits	A "Cradle to gate" analysis was performed. The test boundaries include: • Raw materials • Conveying the raw materials to the plant • Manufacturing of the product at the plant • Packaging of the product at the plant
Categories that have not been tested & basic assumptions	• The upstream processes include extraction and processing of raw materials, primary fuels used and transportation to the facility. • The core process includes all product manufacturing processes at the manufacturing facility itself. More than 99% of the materials have been included in the LCA. • The study applies a cut-off criterion of 1%, as some raw materials were not found in the available database. • A small amount of process waste is produced that is reprocessed as filling material. A conservative assumption has been made that all the environmental impact is allocated to the product and not the co-product (i.e. the filling material). The amount of filling materials differs between the Company's products. • Packaging waste was not included in the LCA study as it is repurposed fully (100%) to store raw materials, to produce marketing materials such as notebooks & bags, as part of our trade show and conferences booth design and more. Some of these materials are made by companies which employ people with disabilities. • The product use stage, distribution and the end of life stages were not assessed within this LCA analysis. • There may be a certain standard deviation in the environmental aspect data of the various components.

Year of manufacture of products tested	2019 manufacturing data
Source of the data received	For Termokir Products components and energy requirements • data from Termokir Ltd. Inputs used for software: • Relevant datasets for raw materials and waste handling are not available for Israel. Therefore, all input and output streams were taken from the Ecoinvent 3.6 which is relevant mostly for Europe. As Israel is following EU environmental regulation very closely, we assume the results will not differ much when local data becomes available.

Results

Impact Category per 1 m^2	Unit	Termokir PL 100
Global Warming	kg CO_2eq	1.36
Ozone Depletion	kg CFC11 eq	$1.54E^{-07}$
Acidification for soil and water	kg SO_2eq	0.007564
Eutrophication	kg PO_4eq	0.001822
Photochemical ozone creation	kg C_2H_2eq	0.000268
Energy consumption- non-renewable e fossil fuel	MJ, net calorific value	24.03

CHAPTER E

Results

PL 100

The environmental impact of Termokir's substrate layer for plaster product is mainly affected by the product's raw materials (about 80% of every impact category). This can be mainly attributed to cement (responsible for 55-74% of the impact depending on the studied impact category). Land transportation has the second highest effect on 4 out the 6 impact categories (9-18% depending on impact category, while the polymer powder additive has the second largest impact on the other two categories (energy and POCP) due to its embodied energy and emissions.

Conclusion

It can be noted that the main environmental impact categories are Global Warming and Acidification Potential. It is assumed that the impact is mainly due to the embodied energy in some of the raw materials, air borne emissions from the production of these materials and the emissions resulting from maritime and land transportation.

We found that cement scores the highest in almost all environmental impact categories. This is not surprising since it is a known fact that the cement industry is one of the main producers of carbon dioxide and other air pollutants . The presence of some substances in cement, including useful and unwanted additives such as clinker, can cause health concerns due to toxicity and require immense energy consumption. In products with higher limestone content, we can see the lower MJ values (50-70% less embodied energy than cement) versus products with higher cement content, this is also reflected in the GWP value.

One polymer powder additive in particular presented a high environmental impact. This is probably due to the fact that the conversion of the polymer emulsion to a powder like substance requires heat and energy, resulting in embodied energy and additional emissions.

It is apparent that there are two main factors affecting the environmental footprint:

- The amount of product (powder form) needed for 1 m^2 (as a derivative of layer thickness).
- The proportion of cement in the product formula.

CHAPTER F

References

SimaPro 9.1

LCA and Carbon Footprint software that is capable of using a number of different data analysis methodologies, by the Dutch firm Pre-Consultants.

ISO 14040

This standard describes the principles and framework for Life Cycle Assessment (LCA).

ISO 14025

This standard establishes principles and details processes for the development of type III environmental declarations. Type III environmental declarations as described in this chapter are intended first and foremost for use in communication between manufacturers but may also be used in communication between a manufacturer and consumers under certain conditions.

"CML-IA baseline (version 3.06 based on CML 2 baseline 2000)"

The LCA methodology that was used for examining the effect of the environmental aspects of the LCI (Life Cycle Inventory) results.

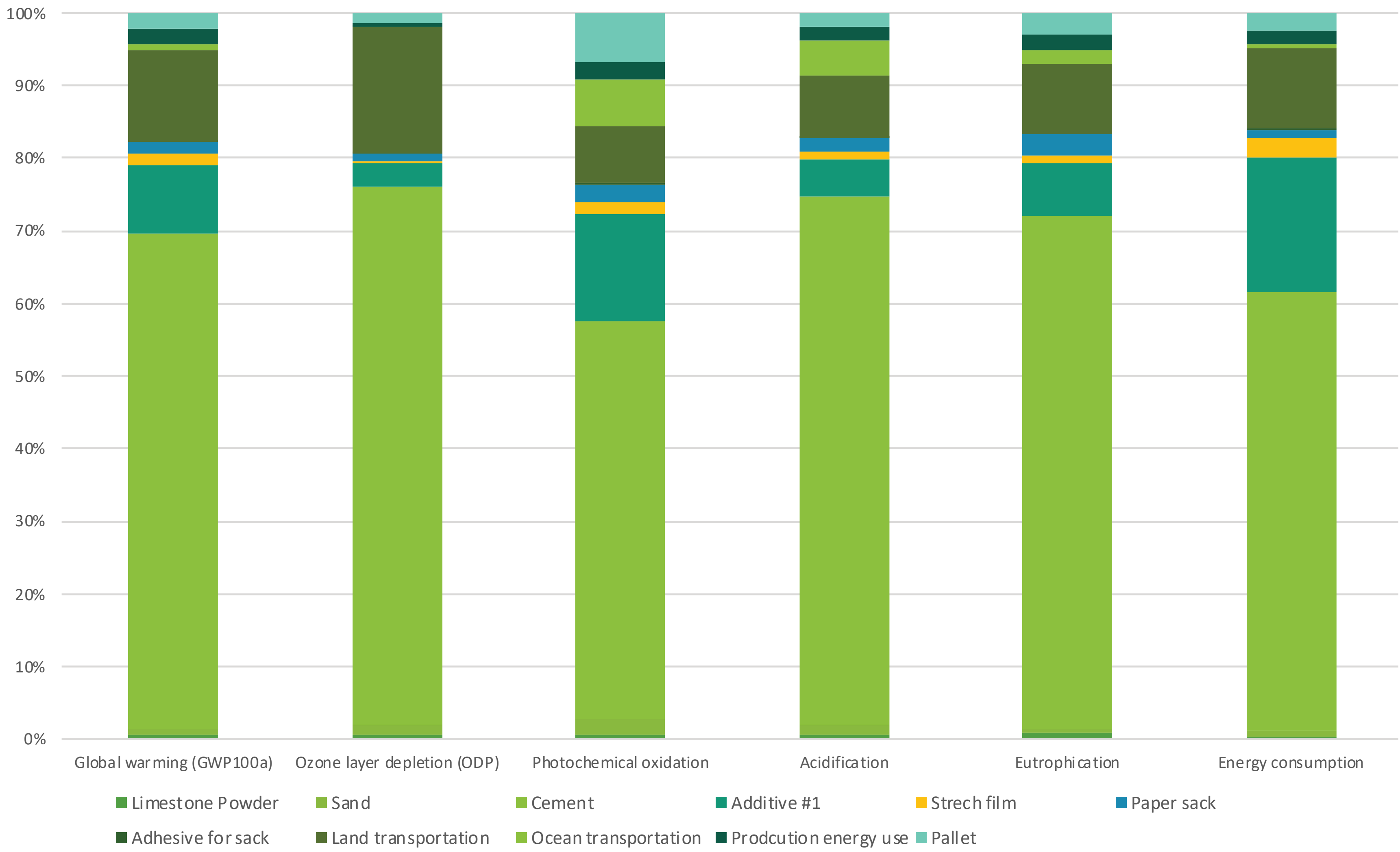
"Cumulative Energy Demand V1.11"

The LCA methodology that was used for examining the effect of energy consumption.

ANNEX 1

Process Flow Diagram

Termokir PL 100 collective results by impact category



Termokir PL 100 results by impact category brogken down to main life cycle categories