TERMOKIR

LCA

Life
Cycle
Assessment

Environmental Life Cycle Assessment

Termokir PL 180

Levelling coat for concrete and plaster

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

Table of Contents

Click for desired page

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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, or defined parts of the life cycle. It can include 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 policymaking, and to provide tools for decision making on reducing environmental impacts of products and services at the 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[1]" LCA study was performed to demonstrate an initial overview of the environmental impacts of Termokir PL 180.

The manufacturing process of the yield (kg/m²) needed to provide coverage of 1m² was analyzed, regarding several environmental impacts. The calculation method used was EN 15804+A2, and the selected impacts for display in the report include climate change, ozone depletion, photochemical ozone formation, acidification, eutrophication (freshwater, marine, terrestrial), and resource use (fossil fuels, minerals and metals). Like all LCA studies, the results are dependent on specific assumptions and parameters analyzed.

From examination of the results, it can be noted that the environmental impact is mainly due to the raw materials used for production, assumed to result mainly from their embodied energy and air borne emissions from their production, and from maritime and land transportation.

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1 The product's life cycle from raw material extraction to the point where it leaves the manufacturer

CHAPTER A

Summary of the Declaration for Environmental Life Cycle Assessment (LCA)

Environment Life Cycle Assessment (LCA) Practitioner	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 Email: yael@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 PL 180. a levelling coat for concrete and plaster..
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 of 1 m^2 of Termokir PL 180 delivered as powder and having a yield of 3.9 kg/m^2 for a layer 3 mm thick.
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	March 2022
Name of declarer	Yael Steinberg Environmental Project Manager Environmental & Safety Division Sher Consulting & Training Ltd. Sher Consulting & Training Ltd. Quality • Safety • Environment

CHAPTER B

Introduction, Goals & Standards

Life Cycle 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. Environmental declarations: • Provide LCA based information and additional information on the environmental aspects of the product. • Assist the buyer and user in making an intelligent comparison of products. The declarations themselves cannot be fully compared. • Encourage improvement of environmental performance. • Provide information for evaluation and analysis of the environmental effects of products along their full life cycle (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 of 1 m^2 of Termokir PL 180 delivered as powder and having a yield of 3.9 kg/m^2 for a layer 3 mm thick.

The Environmental Aspects Examined in the LCA

Main LCI Method	The EN 15804 standard covers Environmental Product Declarations (EPDs) of construction products. The method used here reflects its 2019 A2 revision. The standard aims to ensure consistency among EPDs of construction products, services and processes. It addresses 13 core environmental impact indicators and 6 additional environmental impact indicators.
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 Depletion 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 decreasing in the atmosphere, some releases of ozone depleting chemicals still occur. Ozone Depletion 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 of mol H+ eq (equivalents of molar concentration of the hydrogen ion). Products with a lower AP have an environmental advantage.
Eutrophication Potential (EP)	Eutrophication is the enrichment of a water body or soil 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. Eutrophication in freshwater is measured in units equivalent to a kg of phosphorous - P. Eutrophication in the marine environment is measured in units equivalent to a kg of nitrogen - N. Eutrophication in the terrestrial environment is measured in mol N eq. (equivalents of molar concentration of the nitrogen atom). Products with a lower EP have an environmental advantage.

Photochemical Ozone Formation	In atmospheres containing nitrogen oxides (NO_x, 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". Photochemical ozone formation potential is measured in units of kg NMVOC eq (kg equivalent of nonmethane volatile organic compounds). Products with a lower photochemical ozone formation potential have an environmental advantage.
Abiotic Depletion Potential (ADP)	Abiotic Depletion Potential refers to the use of resources. This impact category is concerned with protection of human welfare, human health and ecosystem health. It is related to extraction of minerals and fossil fuels due to inputs in the studied system. "ADP, fossils" is measured in MJ, net calorific value. "ADP, Minerals and Metals" is measured in kg antimony equivalents – kg Sb eq. Products with a lower ADP 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	2021
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.

CHAPTER E

Results

Impact Category per 1 m2	Unit	Termokir PL180
Global Warming Potential - Total	kg CO_2 eq	8.75E-01
Ozone Depletion Potential	kg CFC 11 eq	5.55E-08
Acidification Potential	mol H^+ eq	2.71E-03
Eutrophication Potential - Freshwater	kg P eq	6.93E-05
Eutrophication Potential - Marine	kg N eq	7.54E-04
Eutrophication Potential - Terrestrial	mol N eq	8.26E-03
Photochemical Ozone Formation	kg NMVOC eq	2.32E-03
Abiotic Depletion Potential (Resource Use) - Fossils	MJ	8.49E+00
Abiotic Depletion Potential (Resource Use) - Minerals and Metals	kg Sb eq	5.48E-06

Interpretation and Conclusions:

The greatest contributors to the environmental impacts calculated for Termokir PL 180 are the material inputs and the transportation. Of the material inputs, cement, an inorganic additive and a polymeric additive are of particular importance. Together the raw materials contribute 28-80% of the different environmental impacts, and the maritime and land transport contribute together 15-64%.

It is assumed that the environmental impacts of the cement and the additives are mainly due to their embodied energy and to air borne emissions from their production. The significant impact of cement 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 inorganic additive is produced in a process which requires intensive heating and involves a chemical change that releases carbon dioxide. The influence of the polymeric additive is assumed to be in large part due to the energy required for its high-pressure production process, and due to hydrocarbon emissions during production. The mineral and metal resource use is associated with capital goods.

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 PRé Consultants.

◆ ISO 14040

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

◆ EN 15804+A2

The EN 15804 standard covers Environmental Product Declarations (EPDs) of construction products. The Simapro calculation methodology by PRé Consultants, based on this standard, reflects its 2019 A2 revision.

ANNEX 1

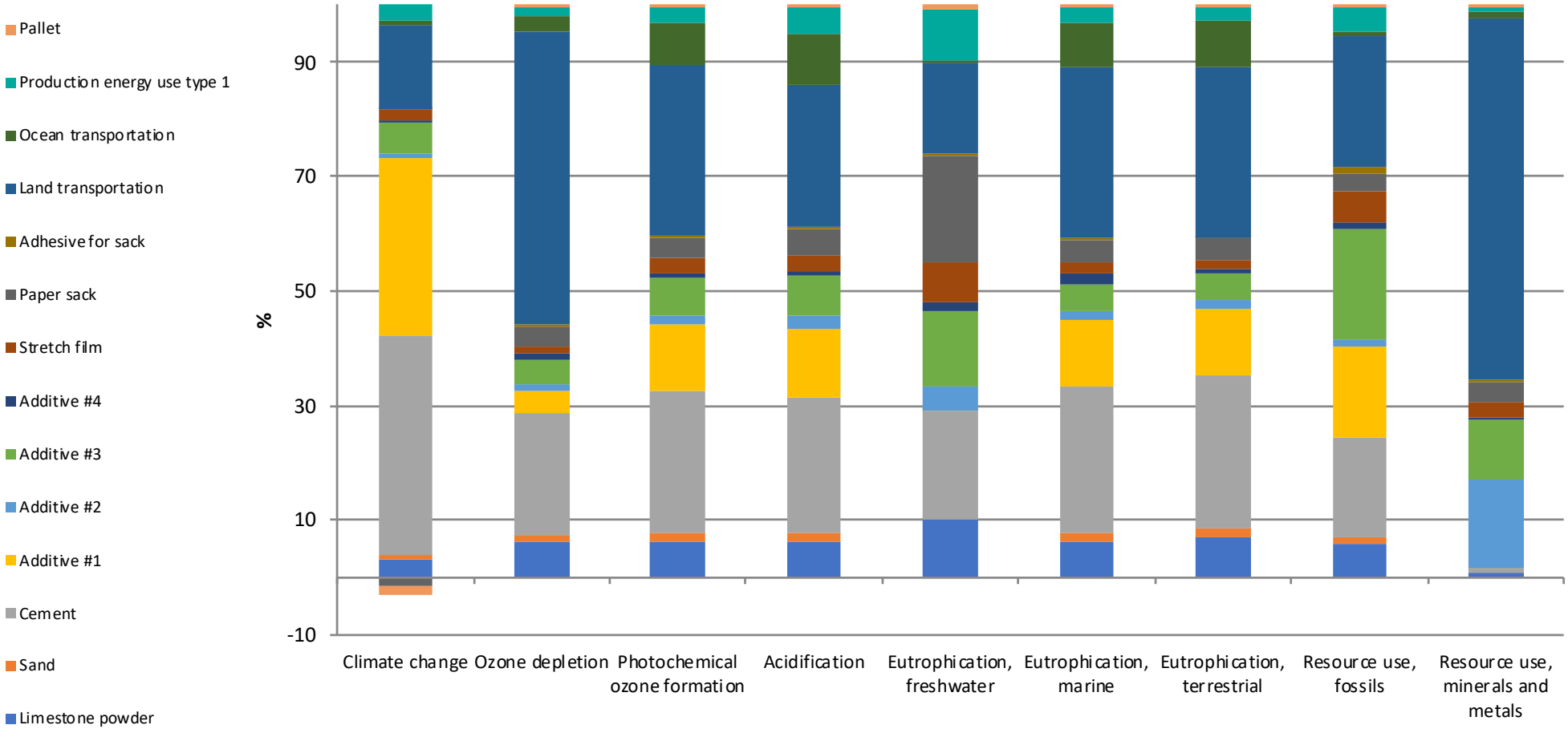
Process Flow Diagram

Raw Material
Extraction

Transport of
Raw material

Manufacturing
& Packaging

Termokir PL 180 collective results by impact catagory



Termokir PL 180 results by impact catagory broken down to main life cycle catagories