

UP2CIRC ONLINE WORKSHOP: UNDERSTANDING CO₂ FOOTPRINTING FOR BUSINESSES AND PRODUCTS

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Topics

- Why should companies address their climate impact?
- How to measure climate impacts? Examples
- How to start the process? Practical steps, tools available

Let's get to know each other 😳



Why? What do you think?

Reasons driving companies to address their carbon footprint



Society's expectations



Benefit to the company



Regulations

MANAGING CLIMATE IMPACTS



How?



A company's carbon footprint



- https://ghgprotocol.org/
- Greenhouse Gas Protocol Corporate Accounting and Reporting Standard¹
- Annual data
- 3 scopes
- Result: absolute GHG emissions (CO2e) divided into 3 scopes and relevant categories
- Possible to convert per revenue, turnover, employees, m2 – but not a perfect approach for division

Examples of results: depending on sector



- Scope 1: fuels and energy
- Scope 2: purchased electricity
- Scope 3: purchased goods (mainly milk)

• **Scope 1:** combustion of energy sources

But what about Scope 4?

- Relatively new concept
- Similar as <u>"handprint" approach</u>
- Similar as consequential LCA
- Emissions reductions achieved through the use of a company's products or services
- Very important for communication, communicated separately

The Carbon Handprint of one refurbished phone is 61.7 kg CO₂-eq



In other words, by buying a refurbished phone from Foxway instead of purchasing a brand new phone, a customer will avoid ca 62 kg CO₂-eq worth of emissions.

Carbon footprint of product or service Life Cycle Assessment (LCA)

- ISO standards: ISO 14000 series, mainly 14040 ja 14044, 14067 + additionally sectorial standards may apply
- System boundaries: Cradle to gate, cradle to grave or cradle to cradle – depending on the purpose of the analysis
- Various impact categories (not necessarily only CO2e)

Important steps: 1. Goal and scope definition 2. Inventory analyses

- 3. Impact assessment
- 4. Interpretation



Result: CO2e per product/service unit Identification of hot-spots

A good understanding of product performance More detailed assessment = more work, in case of large variety of different product



Environmental Product Declaration

- Based on LCA + additional specific standards and methodological rules
- Standardized format of results
- Especially important for building sector
- Verified reports are published by EPD program operators

P	Product		Assembly			Use stage								ife sta	Beyond the				
	stage stag			ige													system		
																bou	unda	ries	
A1	A2	A3	A4	A5	81	B2	B3	B4	B5	B6	B7	а	C2	C3	C4	D	D	D	
×	×	x	x	×	MND	MND	MND	MND	MND	MND	MND	×	x	x	x	x	x	х	
Geo	grapi	ıy, by	two-l	letter	ISO cou	ntry co	de or re	gions. ⁻	The Inte	ernation	al EPD :	Syste	m on	ly.					
EU	EU	EU	EU	EU	-	-	-	-	-	-	-	EU	EU	EU	EU		EU		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./dem	Transport	Waste processi	Disposal	Reuse	Recovery	Recycling	



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ENVIRONMENTAL IMPACT DATA

The result is valid for the declared unit, 1 meter of circular ventilation duct dimension 125mm. LCA results for other dimensions is presented in Annex I "LCA results for different product variations"

CORE ENVIRONMENTAL IMPACT INDICATORS - EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total	kg CO2e	4,29E0	1,85E-1	-1,91E-1	4,28E0	9,17E-2	2,5E-1	MND	3,3E-3	1,37E-2	1,62E-1	4,22E-4	-2,67E0						
GWP – fossil	kg CO2e	4,25E0	1,85E-1	5,91E-2	4,49E0	9,25E-2	0E0	MND	3,3E-3	1,37E-2	1,64E-1	4,21E-4	-2,68E0						
GWP – biogenic	kg CO2e	3,32E-2	6,2E-5	-2,5E-1	-2,17E-1	4,94E-5	2,5E-1	MND	9,17E-7	0E0	-2,15E-3	8,35E-7	8,48E-3						
GWP – LULUC	kg CO2e	4,34E-3	1,02E-4	2,22E-4	4,66E-3	3,28E-5	0E0	MND	2,79E-7	4,85E-6	4,28E-5	1,25E-7	-6,76E-4						
Ozone depletion pot.	kg CFC.11e	3,35E-7	3,94E-8	8,12E-9	3,82E-7	2,1E-8	0E0	MND	7,12E-10	3,11E-9	5,5E-9	1,73E-10	-8,81E-8						
Acidification potential	mol H*e	1,37E-1	2,19E-3	4E-4	1,39E-1	3,78E-4	0E0	MND	3,45E-5	5,59E-5	4,71E-4	4E-6	-1,32E-2						
EP-freshwater ³⁾	kg Pe	2,78E-4	1,73E-6	2,65E-6	2,82E-4	7,74E-7	0E0	MND	1,33E-8	1,15E-7	2,6E-6	5,09E-9	-1,61E-4						
EP-marine	kg Ne	8,16E-3	5,96E-4	9,89E-5	8,85E-3	1,12E-4	0E0	MND	1,52E-5	1,66E-5	1,08E-4	1,38E-6	-2,55E-3						
EP-terrestrial	mol Ne	5,59E-1	6,61E-3	1,09E-3	5,67E-1	1,24E-3	0E0	MND	1,67E-4	1,83E-4	1,25E-3	1,52E-5	-2,9E-2						
POCP ("smog")	kg NMVOCe	2,04E-2	1,8E-3	3,92E-4	2,26E-2	3,8E-4	0E0	MND	4,59E-5	5,62E-5	3,38E-4	4,4E-6	-1,38E-2						
ADP-minerals & metals	kg Sbe	8,98E-5	5,61E-6	7,56E-7	9,62E-5	2,5E-6	0E0	MND	5,03E-9	3,7E-7	2,1E-6	3,85E-9	-4,81E-5						
ADP-fossil resources	MJ	4,08E1	3E0	1,08E0	4,48E1	1,39E0	0E0	MND	4,54E-2	2,06E-1	5,31E-1	1,18E-2	-2,23E1						
Water use ²⁾	m³e depr.	2,69E0	9,78E-3	1,49E-2	2,71E0	4,49E-3	0E0	MND	8,46E-5	6,64E-4	7,61E-3	5,45E-4	-1,25E0						

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical azone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionising radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.



Questions?



Practical challenges?

How to start managing the carbon footprint?



Measuring

- Preparations
- Understand your purpose, main requirements of relevant standards, assessment scope, identify questions and challenges, ask external advice if needed
- Identify what data you have and where it is (preliminary mapping by categories/processes)? Where are the data gaps and how to solve it?
- Identify the tools and databases needed for the process (operational data units should match with the emission factors later)
- Set the plan and timeline (who is doing what and when)
- Get all parties involved to the process "around the same table" especially the people who collect operational data!
- Data collection
- Impact assessment calculations
- Results report
- Strategy and impact reduction plan



These are just a few examples!

Tools and emission factors databases

Free sources -> usually scope 3 is limited (suitable for service company) or based on monetary emission factors

- UK Emission factors database (not a tool, but long list of EFs)
- Estonian GHG calculation tool for organisations (in Estonian)
- Business Carbon Calculator
- <u>Sustaxo</u> Tool for organisations
- <u>Tallinn University of Technology (TalTech) carbon footprint</u> <u>calculator for organisations</u>
- Lots of tools for agriculture (free for the farmer), i.e <u>Farm</u> <u>Carbon Toolkit</u>, Cool Farm Tool<u>https://coolfarm.org/</u>

Tools for purchase:

- <u>https://www.climatiq.io/</u>
- <u>https://greenspect.eu/</u>
- etc

LCA tools:

- 1. Software: SimaPro, GaBi, OpenLCA
- 2. Databases: Ecoinvent + others. NB Must fit with the

Software! E.g https://nexus.openlca.org/databases



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Navigation	Welcome					- 0
agribalyse v3.0.1						
Projects	I Chicken pasta					
- Product systems						
A Chicken pasta	 Impact analysis: ReCiPe 2016 Midpoint (H) 					
> Processes	Strategic Street State (State State State State State					
🗉 🖬 Flows	Subgroup by processes 😥 Don't show < 1 👘 %					
Indicators and parameters						
- Impact assessment methods	Name	Category	Inventory result	Impact factor	Impact result Unit	^
(AWARE	~ III Ozone formation, Human health				0.00801 kg NDx	
(* BEES+	 P Diesel combustion, in tractor/kg - FR 	Others / Transformation			0.00154 kg NOx	
(# Berger et al 2014 (Water Sci	F Nitrogen oxides	Emission to air / low population density	0.00153 kg	1.00000 kg NOx eq/*	0.00153 kg NOx	
r Boulay et al 2011 (Human H	F NMVOC, non-methane volatile organic compounds, unspecified o	Emission to air / low population density	9.67953E-5 kg	0.18000 kg NOx eq/	1.74231E-5 kg NOx	
(# Boulay et al 2011 (Water Sc.	 P market for transport, freight, sea, transoceanic ship - GLO 	Others / Ecoinvent.cut-off 5 copy			0.00056 kg NDx	
CML-IA baseline	Nitrogen oxides	Emission to air / low population density	0.00054 kg	1.00000 kg NOx eq/	0.00054 kg NOx	
(* CML-IA non-baseline	F NMVOC, non-methane volatile organic compounds, unspecified o	Emission to air / low population density	3.50436E-5 kg	0.18000 kg NOx eq/_	6.45184E-6 kg NDx	
P Cumulative Energy Demand	P Spring wheat grain, at farm (WFLDB 3.1) - CA	Cereais / Transformation			0.00047 kg NOx	
P Cumulative Energy Demand	» P Maize grain, conventional, 28% moisture, national average, animal fe	Cereals / Transformation			0.00046 kg NOx	
Cumulative Exergy Demand	P market for transport, freight, lony, unspecified - GLO	Others / Ecoinvent cut-off 5 copy			0.00044 kg NOx	
@ EDIP 2003	P Soft wheat grain, conventional, national average, animal feed, at fam	Cereals / Transformation			0.00031 kg NOx	
(P EF Method (adapted)	P market for electricity, low voltage - BR	Others / Ecoinvent cut-off S copy			0.00028 kg NOx	
(# EPD (2018)	P combine harvesting - CH	Others / Ecoinvent cut-off 5 copy			0.00026 kg NOx	
(# EPS 2015d	P market group for electricity, low voltage - RER	Others / Ecoinvent cut-off 5 copy			0.00026 kg NOv	
(* EPS 2015dx	P transport, freight, long with refrigeration machine, 7.5-16 ton, EURO5	Others / Ecoinvent cut-off 5 copy			0.00025 kg NOx	
C Ecological Scarcity 2006 (W	P packaging film production, low density polyethylene - RER	Others / Ecoinvent cut-off S copy			0.00025 kg NOx	
(P Ecological Scarcity 2013	P Soybean grain crushing, processing - BR	Agricultural / Feedstuff processing			0.00018 kg NOx	
P Ecosystem Damage Potenti-	P market for transport, freight train - US	Others / Ecoinvent cut-off 5 copy			0.00016 kg NOx	
P Environmental Prices	P transport, freight, lorry >32 metric ton, EURO3 - RER	Others / Ecoinvent cut-off 5 copy			0.00014 kg NOx	
(Greenhouse Gas Protocol	P Rapeseed, conventional, 9% moisture, national average, animal feed.	Oil seeds / Transformation			0.00014 kg NOx	
Hoekstra et al 2012 (Water :	P clear-cutting, primary forest to arable land BR_modified - BR	Extraction / Transformation			0.00014 kg NOx	
(# ILCD 2011 Midpoint+	P polystyrene production, expandable - RER.	Others / Ecoinvent cut-off S copy			0.00012 kg NOx	
(IMPACT 2002 +	P Broiler, conventional, at farm gate - FR	Avian / Transformation			0.00012 kg NDx	
(# IPCC 2013 GWP 100a	P market for transport, freight, lony 16-32 metric ton, EURO4 - GLO	Others / Ecoinvent cut-off 5 copy			0.00011 kg NOv	
(# IPCC 2013 GWP 20a	P heat production, light fuel oil, at boiler 10kW, non-modulating - CH	Others / Ecoinvent cut-off 5 copy			9.23883E-5 kg NOx	
P Motoshita et al 2010 (Huma	> III Mineral resource scarcity				0.03494 kg Cu eg	
Plister et al 2009 (Eco-indic.	> E Global warming				3.20743 kg CO2 -	
Pfister et al 2009 (Water Sca	> El Ionizing radiation				0.38059 kBq Co	
Pfister et al 2010 (ReCiPe)	3 IE Fossil resource scarcity				0.58597 kg oil eg	~
· Rectille 2016 Endeniet (E)	· · · · · · · · · · · · · · · · · · ·					

Tips and tricks for your measurement journey

GENERAL SUGGESTIONS

- In the long term it is wise to build up internal capacity, but mostly external help is used at least at the first time
- If you intend to purchase a tool usage license, be critical what you actually get (1 demo is may not be enough)
- Industries and services that include physical materials/products -> freely available tools not suitable for Scope 3 based on my experiences

SPECIFIC QUESTIONS

- Scope 2 electricity/heat emission factors -> are they specific for your country?
- Scope 3 included what is specifically included (sometimes only business travel and wastes; if materials needed – what exactly is available in tool)
- Scope 3 is calculation based on monetary units or physical/volume units?
- How are the final results presented? Too aggregated is not good.

Remember - it's a journey not a destination 🙂



Questions?