



SUSTAINABILITY IN BUSINESS

34th Swiss LCA Discussion Forum 'LCA vs. GHG footprint'

The Relation between LCA and GHG Accounting

(14040, 14064, GHG protocol, GHG credits accounting)

Content:

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5. Conclusion & Outlook

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1. The starting point

There are two basic approaches to calculate GHG emissions

- Product LCA, based on ISO 14040
- GHG accounting, based on ISO 14064 (≈ GHG prot.)

Both methods define how to measure EMISSIONS. ISO 1406x and the GHG-P also define measurement of GHG emission REDUCTIONS.



Emission



Reduction
= credit



Practical:

- a) To become carbon neutral: Can I use either approach (LCA or GHG-P)?

Methodological:

- b) What are the key differences?
- c) (How) Can I use data from one approach in an analysis of the other type?

Communication:

- d) What are the differences in meaning?

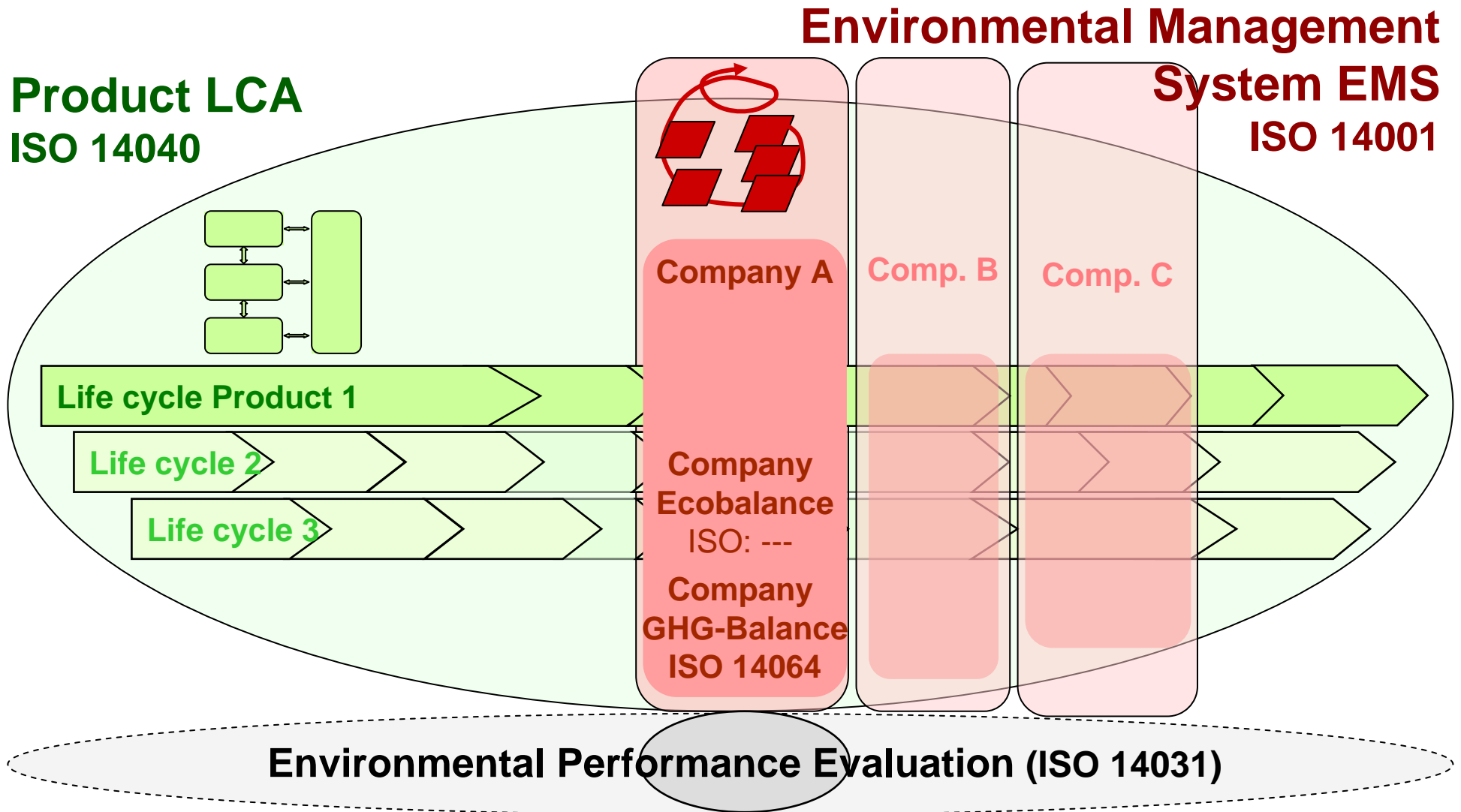
LCA has been focusing on product (and service) life cycle assessment for 30+ years.

ISO 14001 → need for a framework for organisations

- . Company approach by Müller-Wenk and myself in 1993
- . ISO 14031
- . ISO 14040 'gate-to-gate' analysis
- . Scandinavian frameworks

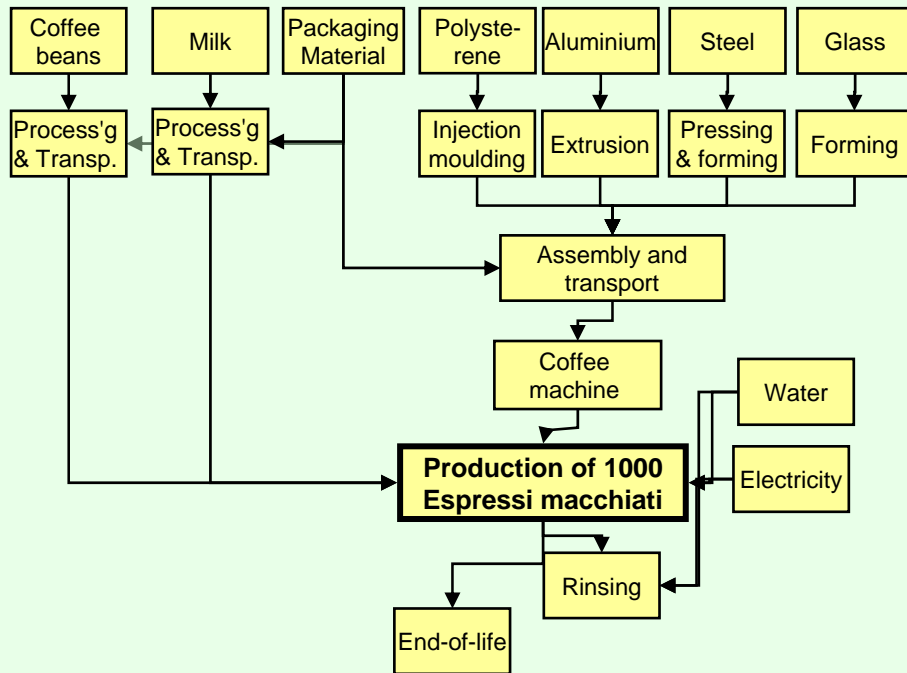
Valuable, but no international standard

2. A look back (ff.)



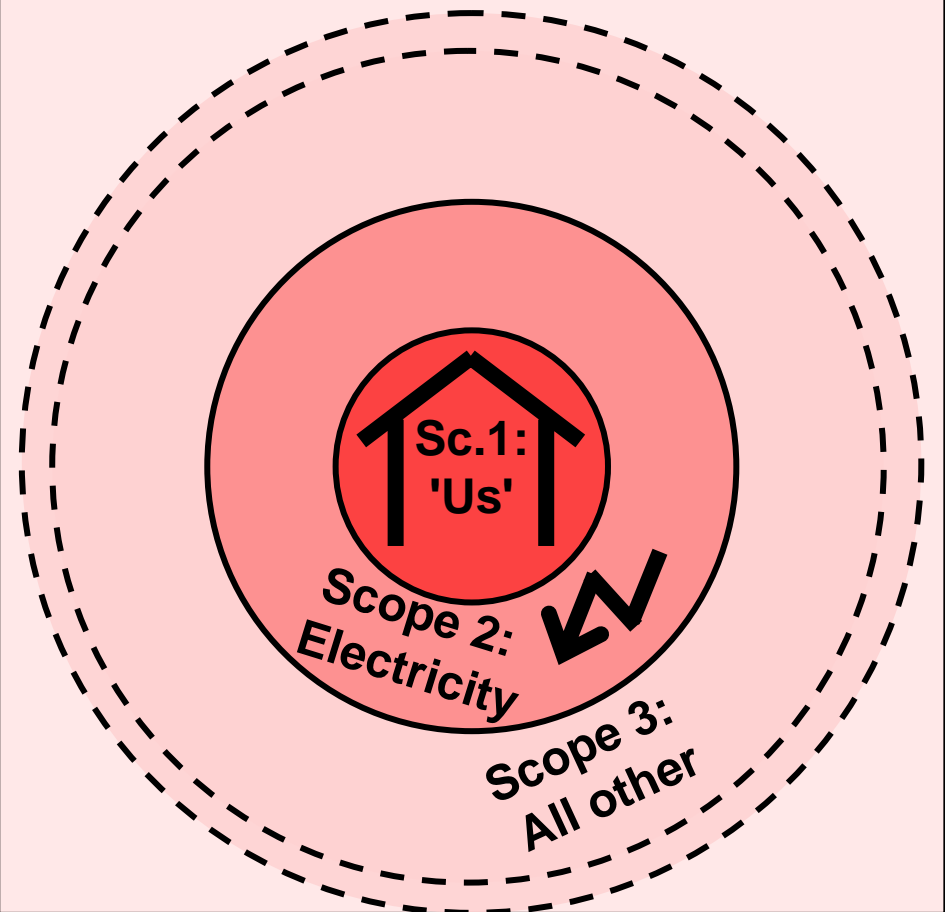
3. LCA vs. GHG Accounting

LCA: The product or service life cycle (process chain)



Example based on:
Pré, Ecoindicator'99,
Manual for designers

GHG Accounting: The Footprint of the Organisation



3. LCA vs. GHG Accounting: The basic questions

LCA:

**The product or service life cycle
(process chain)**

- 1) What is**
 - the total environmental footprint**
 - of a product / service (funct' unit)?**

- 2) Where are its hot spots?**

- 3) How does it compare to alternatives?**

GHG Accounting:

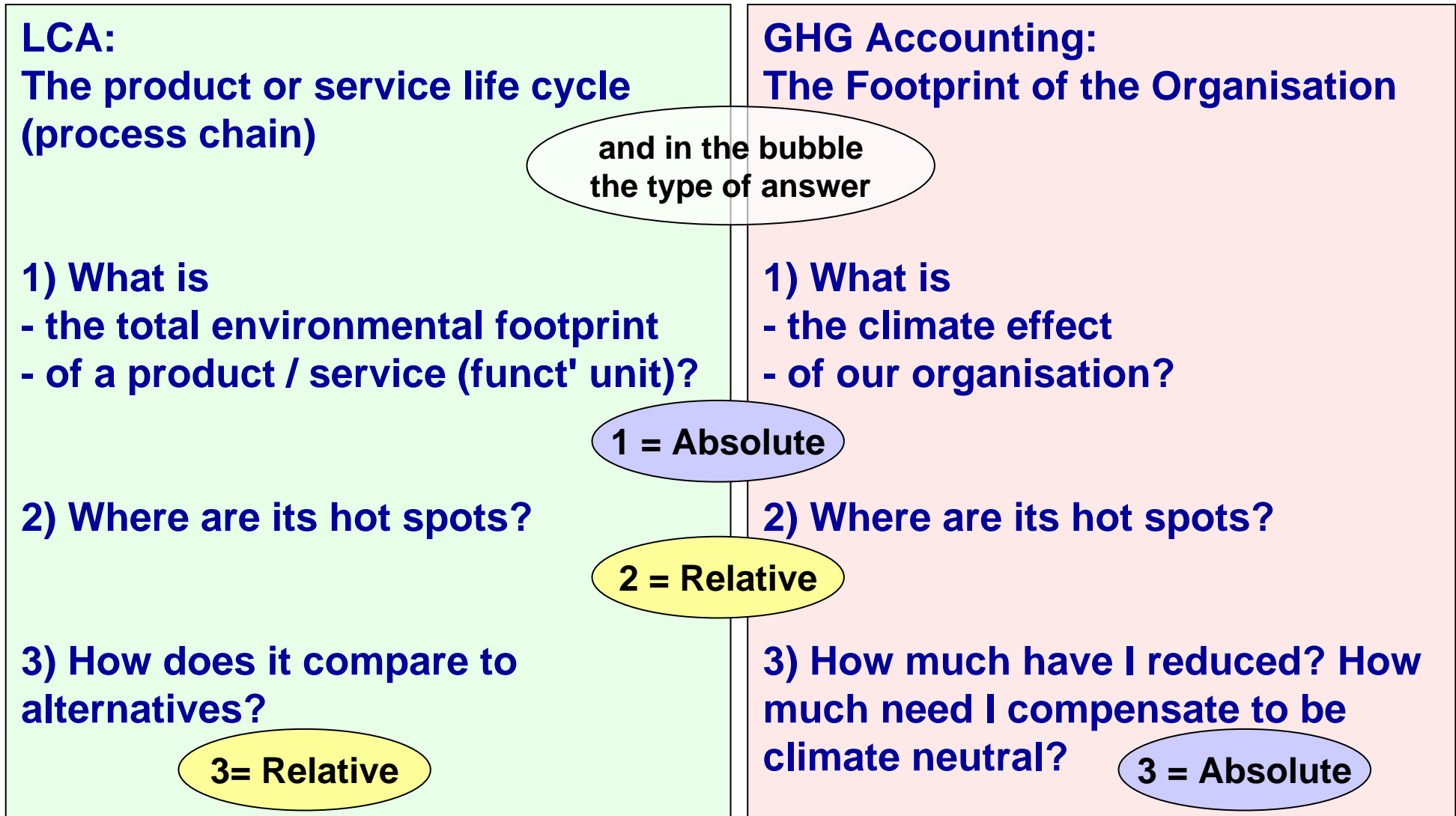
The Footprint of the Organisation

- 1) What is**
 - the climate effect**
 - of our organisation?**

- 2) Where are its hot spots?**

- 3) How much have I reduced? How much need I compensate to be climate neutral?**

3. LCA vs. GHG Accounting: The basic questions



3. LCA vs. GHG Accounting: Structural differences

	LCA:	GHG Accounting:
Basis for comparison	<u>Functional</u> unit, defined by the study	<u>Annual</u> activity, defined per organigram or ownership
Responsibility	Spread over multiple org's	<u>The</u> organisation
Time frame	synthetic (processes ran at undefined times)	A <u>specific</u> year
Geographic frame	Disperse, global, or unspecified (even where relevant)	specific (but irrelevant)
Environmental Scope	'All' impacts, incl. all GHG	Six GHG (possibly all GHG)
Cut-off appr.	Mass, impact or value	'Materiality' of GHG emissions

3. LCA vs. GHG Accounting: Inventory questions

	LCA:	GHG Account'g (Sc. 1 + 2):
Allocation needs	Co-production processes	Partly owned subsidiaries
Electricity models	<ul style="list-style-type: none"> . Various grid models; . Emission factors at Consumption ('EFC', emissions per electricity arriving at the <u>consumer</u>, i.e. incl. transmission losses) 	<ul style="list-style-type: none"> . Various grid models; . Emission factors at generation ('EFG'; emissions per electricity <u>produced</u>, i.e. excl. transmission losses)
Fuel emissions	Full supply chain	Own emissions only
Process emissions	Own emissions & supply chain of materials (if relevant)	Own emissions only
E-o-life issues (recycl., waste)	Considered; often relevant (e.g. for water pollution)	Usually not considered; mostly no big GHG issue

4. Hypothetical Case Study 'Hotel Alpina'

(all data are assumptions!)

Key figures:

- 30'000 guest nights p.a.
- 4,5 Mio CHF turnover

Guest F&B Services:

- 30'000 breakfasts
- 75'000 hot meals

Staff services:

- 7'000 staff nights
- 21'000 staff meals

Input & Output:

- 75'000 l heating oil
- 1 Mio kWh electricity CH-grid
- 10'000 m³ fresh water
- 6 t cleaning agents
- 150 t waste
- 4'000 l fuel (hotel bus/cars)



How much GHG (CO₂-eq.) does this system emit?

The answers based on an LCA approach and the GHG-Protocol, respectively.

4. Hypothetical Case Study: Processes of Scopes

	LCA approach		GHG-P approach		
			Scope 1	Scope 2	Scope 3
Guest Breakfasts (F&B)	X				X
Guest Hot Meals (F&B)	X				X
Staff Hot Meals (F&B)	X				X
Heating oil	X		X		
Heating Oil Precombustion	X				X
Electricity	X			X	
Electricity Precombustion	X				X
Cooling Agents emission	X		(x)		
Water use, waste water	X				X
Municipal Waste treatment	X				X
Cleaning agents production	X				X
Hotel bus fuel use	X		X		
Staff cars fuel use	X		X		
Fuel Precombustion	X				X

4. Case Study: The functional units

	LCA approach	GHG-P approach		
		Scope 1	Scope 2	Scope 3
Guest Breakfasts (F&B)	X			X
Guest Hot Meals (F&B)	X			X
Staff Hot Meals (F&B)	X			X
Heating oil	X	X		
Heating Oil Precombustion	X			X
Electricity	X		X	
Electricity Precombustion	X			X
Cooling Agents emission	X	(x)		
Water use (delivery)				X
Municipal Waste treatment				X
Cleaning agents production				X
Hotel bus fuel use				
Staff cars fuel use		X		
Fuel Precombustion	X			X

The **function**
'Hotel stay'

The **organisation**
'Hotel'

4. Case Study: Emission factors

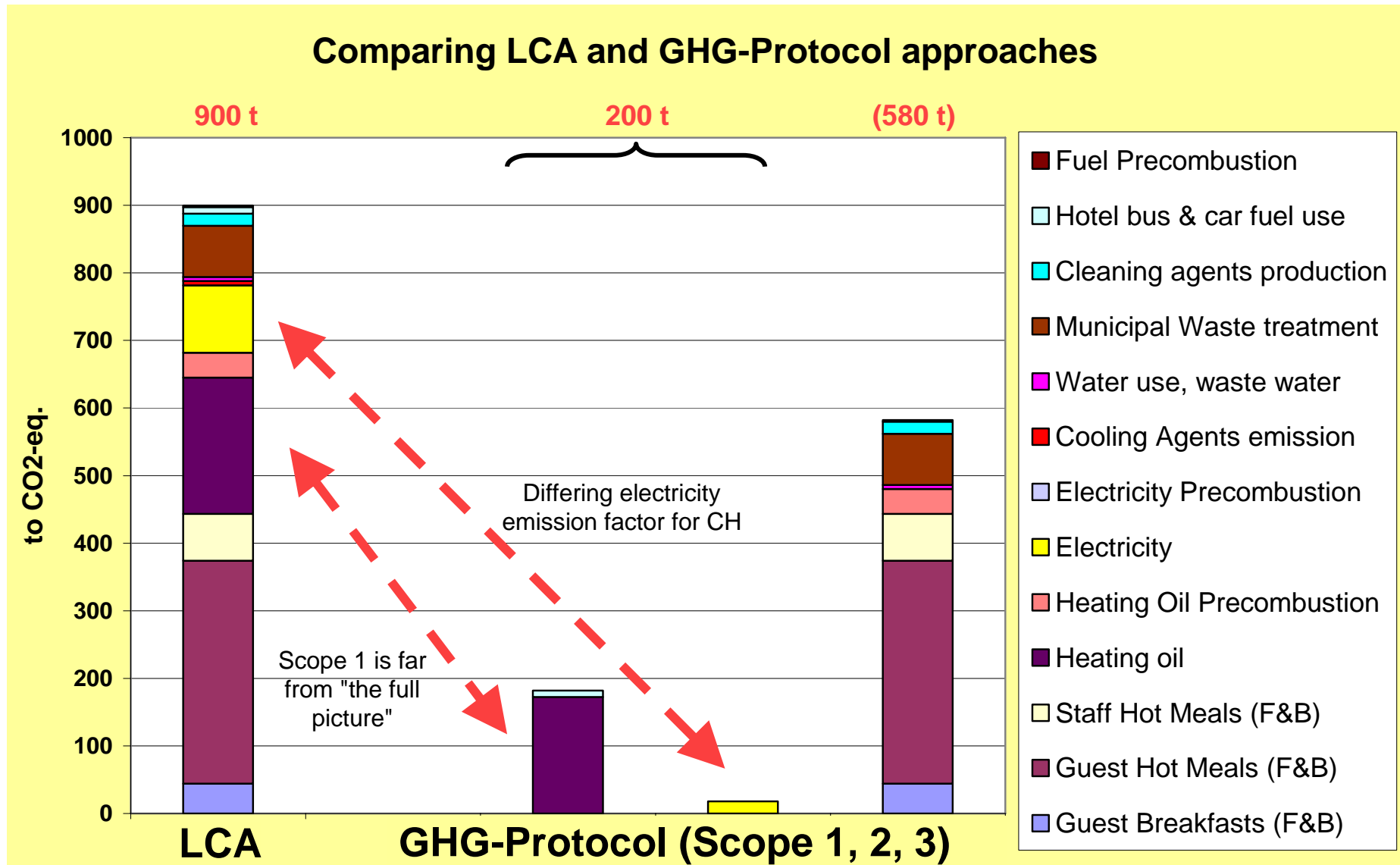
Below are the GHG emission factors according to available sources, for an LCA and a GHG-P approach respectively. The GHG-Protocol gives specific data for Scopes 1 and 2. As there is no mandatory guidance for scope 3, we may use the identical LCA data there.

Input / Process	Unit (kg CO2eq per...)	LCA Data		GHG-P Data Source	Values		
		Source	Values		Sc 1	Sc 2	Sc 3
Breakfasts	unit	(Ademe)	1.5	id.			1.5
Guest Hot Meals	unit	(Ademe)	4.4	id.			4.4
Staff Hot Meals	unit	(Ademe)	3.3	id.			3.3
Heating Oil use	kWh	EMIS	0.27	GHG-P	0.23		
Heating Oil precombust.	kWh	EMIS	0.05	id.			0.05
Electricity Swiss	kWh	EMIS	0.13	GHG-P		0.024	
R134a emission	kg	EMIS	1300	id.	1300		
Fresh water prep. & waste water treatm't	m3	EMIS	0.59	id.			0.59
Municipal waste incineration	kg	EMIS	0.51	id.			0.51
Cleaning Agents	kg	(EMIS)	3	id.			3
Fuel use (Euro3)	liter	EMIS	2.4	GHG-P	2.34		
Fuel Precombustion	liter	EMIS	0.59	id.			0.59

Notes:

- Ademe = Data adapted from ADEME, Bilan Carbone Entreprises et Collectivités, Guide des facteurs d'émissions, V5, Jan. 2007
- EMIS = LCA Data from Swiss LCA Software EMIS (by Carbotech), containing e.g. the ecoinvent 2.0 data
- GHG-P = Data from excel worksheets from www.ghgprotocol.org
- Sc = Scope
- id = identical sources and values used for both approaches
- Bold values = differing values
- Values in brackets, (Ademe) and (EMIS), are assumed averages, based on various data from these sources
- R134a emission: For GHG-P either Scope 1 or 3, as it is no Kyoto gas

4. Case Study: Function = 900 t, organisation = 200 t



- Emission factors for similar systems differ (ecoinvent, GHG-P, Adème, ..)
- Both approaches make sense, but they express different concepts:
 - .. LCA = full supply chain responsibility
 - .. GHG-P = own process responsibility
- With the GHG-P, many decision responsibilities are hidden in Scope 3 (e.g. own selection of 3rd party transport means)
- LCA creates stronger communication basis towards clients
- GHG-P is budgetary correct, as organisations can be added up
- LCA covers additional environmental issues
- GHG-P covers reduction calculation (relative to baseline technology, additionality check, annual values)

5. Conclusions & Outlook

- Use Scope 1 & 2 for defining minimal GHG compensation
 - Use LCA approach (or "supply and consumption scope 3") for marketing claims on products & services
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- LCA can be structured along 'Scopes 1, 2, 3'
Possibly this could create compatibility.
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- No single data base contains all data one would want.
 - Data bases are of differing quality (sources, data age, transparency). There is a need for reviews and standardisation.