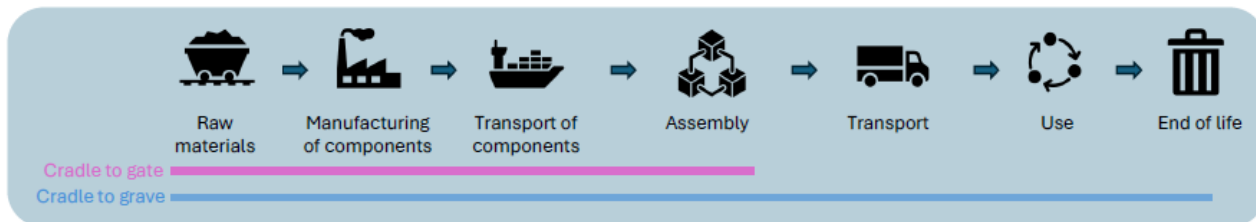


Life cycle assessment of Gracey 211/212XSI curette

What is the environmental impact of a Gracey curette?

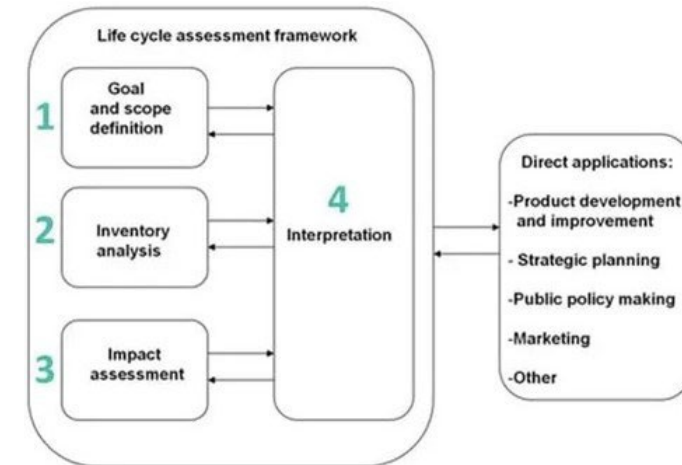
What is a life cycle assessment (LCA)?

- A life cycle assessment is a thorough method for assessing the potential environmental impacts of products and services across their entire life cycle.
- The results are used, among other things, to identify areas with potential for improvement, with the aim of initiating actions that lower the environmental impact of the product.



LCA is one of the most precise tools we have for assessing the environmental impact of something. Doing an LCA is an iterative process consisting of 4 phases (see figure). Through each phase you become smarter and can continuously improve your assumptions and make the study more precise.

The better data you have to map the product system, the more precise the interpretations and results you get in the end.



An LCA calculates the environmental impact across many different impact categories, and not just on CO2 emissions.



CLIMATE CHANGE



WATER USE



LAND USE



ACIDIFICATION

OZONE
DEPLETIONHUMAN TOXICITY
NON-CANCEREUTROPHICATION
MARINEECOTOXICITY
FRESHWATERRESOURCE USE
MINERALS AND
METALSHUMAN TOXICITY
CANCEREUTROPHICATION
TERRESTRIALIONISING
RADIATIONRESOURCE USE
FOSSILSPARTICULATE
MATTEREUTROPHICATION
FRESHWATERPHOTOCHEMICAL
OZONE FORMATION

Examples of impact categories include:

- Water consumption
- Resource consumption
- Acidification
- Land use
- Particulate pollution
- Ecotoxicity
- Human toxicity

Illustration: Greenhouse Sustainability

What are we measuring?

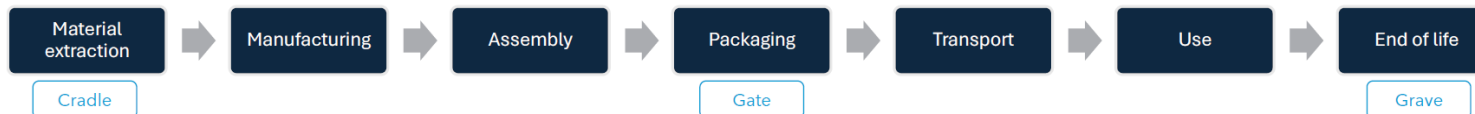
- *When doing an LCA, you always assess the function of the product or system from which you want to know the environmental impact. This is called a “Functional Unit”, while the “Reference Flow” is what is needed to deliver the function. In this LCA, the entire life cycle of the product from cradle to grave is included.*

Functional unit:

"Provision of periodontal therapy removing all supra and subgingival calculus on the mesial molars and premolars on 150 set of teeth in a Danish dental clinic.

Reference flow:

*1 LM Gracey 211/212XSI curette
150 cleaning cycles (washing and sterilization)*



LM

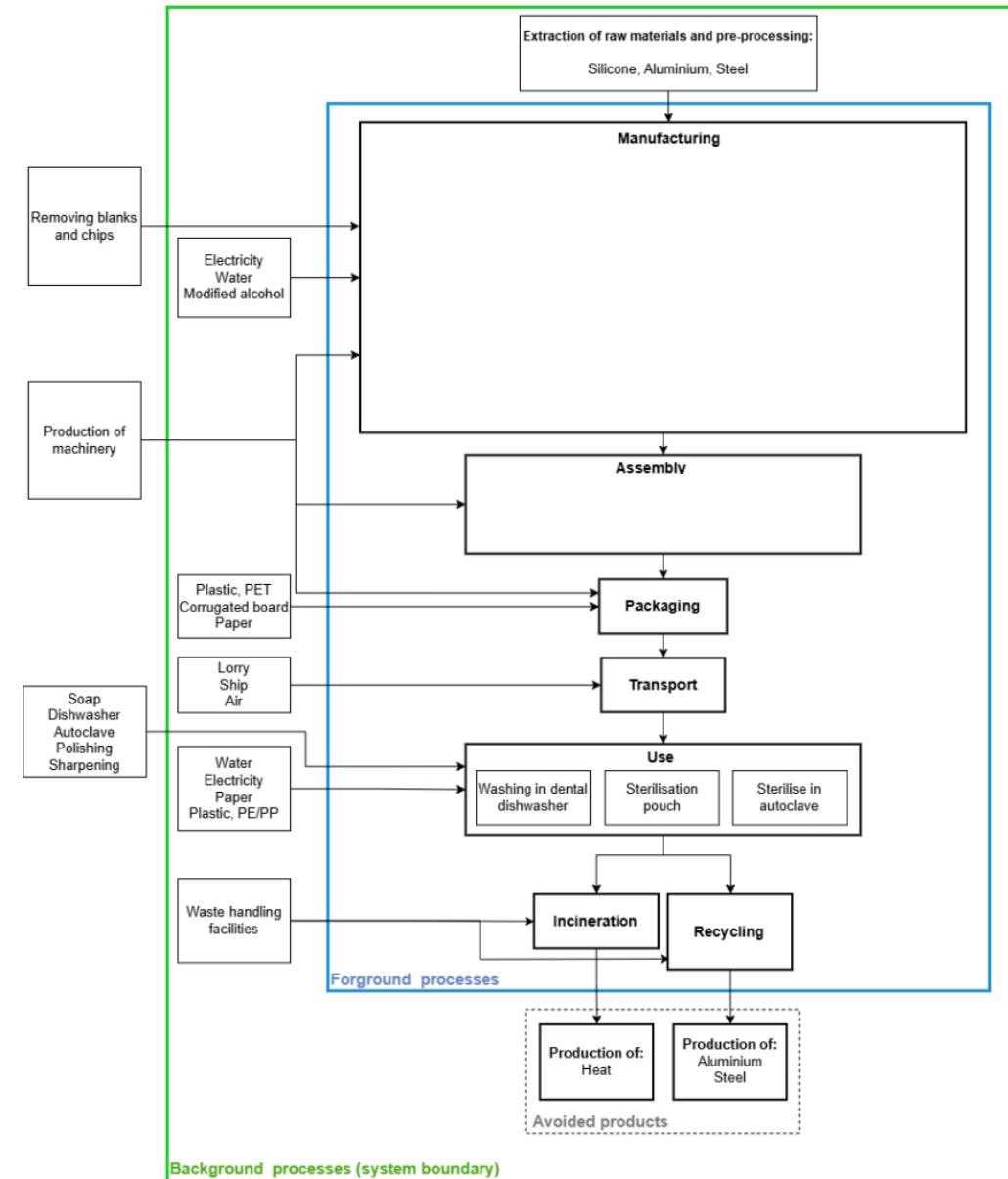
feel the
difference



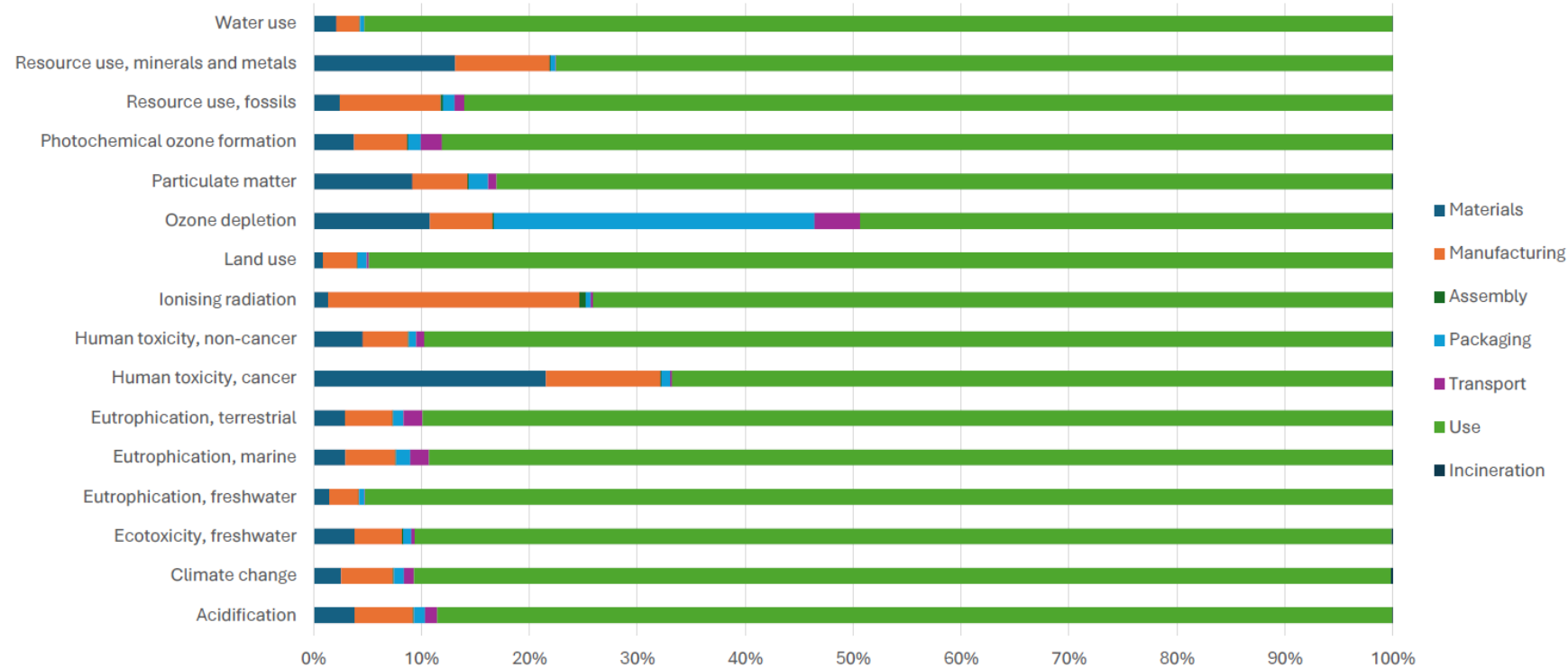
What is included in the LCA?

System Boundaries

- When you do an LCA, you define which parts of the system are included. This is called the “System Boundaries”. The things that are included in this LCA are illustrated in the figure (i.e. everything inside the green square is included).



Environmental impact from Gracey 211/212XSI curette - from cradle to grave

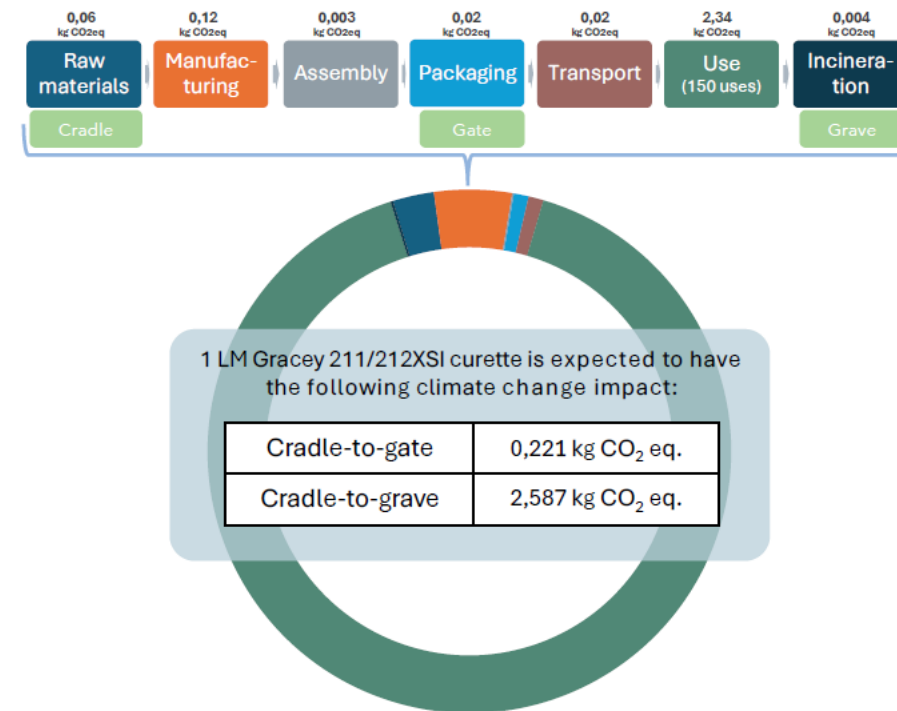


The results show...

...how much the environmental impact from the different life cycle phases constitutes in percentage in each impact category. They show that the actual use of the curette (150 treatments) (light green) is the largest contributor to the total environmental impact of the curette across all impact categories.

Environmental impact from Gracey 211/212XSI curette – from cradle to grave

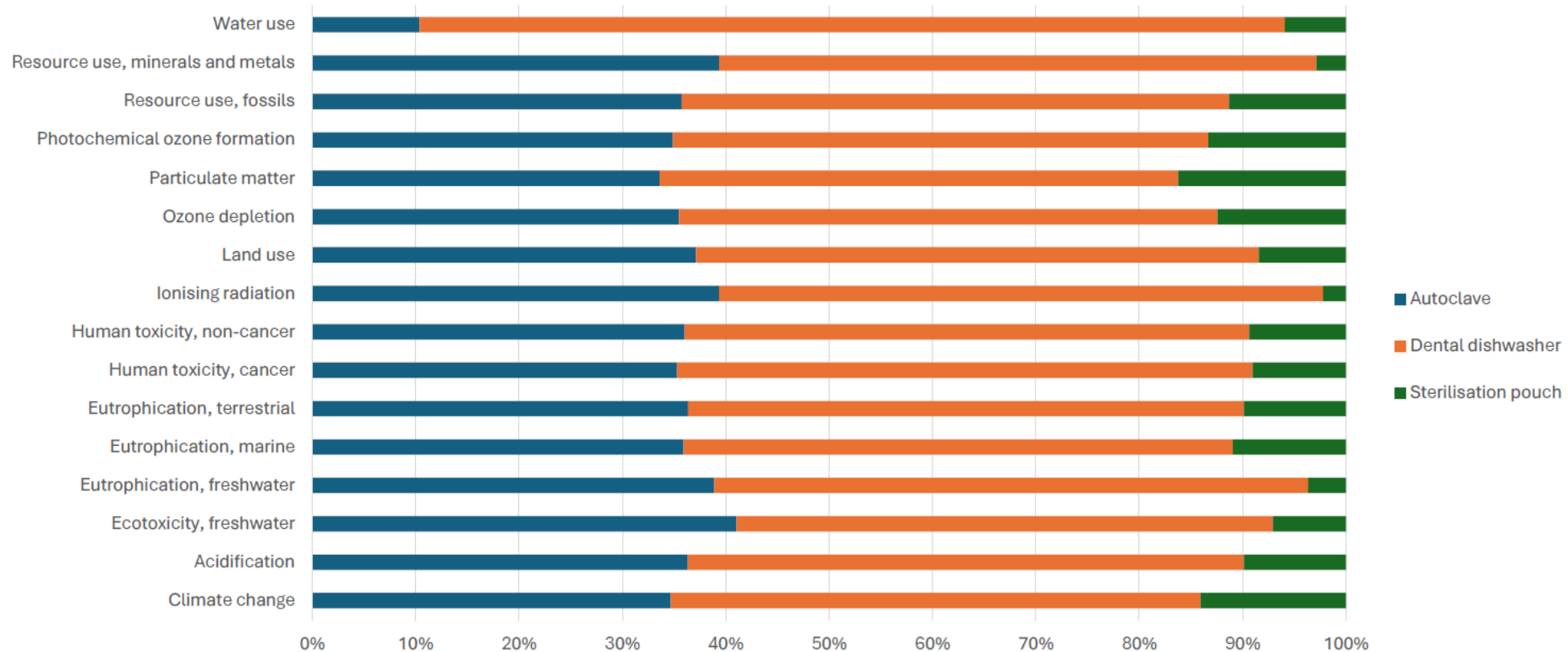
Impact category	Reference unit	Impacts – Cradle to grave
Acidification	mol H+ eq	1,01E-02
Climate change	kg CO2 eq	2,59E+00
Ecotoxicity, freshwater	CTUe	6,23E+01
Eutrophication, marine	kg N eq	1,67E-03
Eutrophication, freshwater	kg P eq	2,23E-03
Eutrophication, terrestrial	mol N eq	2,41E-02
Human toxicity, cancer	CTUh	1,95E-09
Human toxicity, non-cancer	CTUh	4,09E-08
Ionising radiation	kBq U-235 eq	6,90E-01
Land use	Pt	4,05E+01
Ozone depletion	kg CFC11 eq	1,29E-07
Particulate matter	disease inc.	7,09E-08
Photochemical ozone formation	kg NMVOC eq	5,87E-03
Resource use, fossils	MJ	3,75E+01
Resource use, minerals and metals	kg Sb eq	3,59E-05
Water use	m3 depriv.	2,33E+00



The results show...

...the actual environmental impacts for the different impact categories in their legal units (left). In addition, the results for CO₂eq emissions (climate change) are highlighted both from cradle-to-gate and from cradle-to-grave (right), as this is often the result that is requested.

Environmental impacts associated with the use phase of the Gracey 211/212XSI



The results show...

...that when we zoom in on the use phase, it is emissions associated with the dental dishwasher (orange) and sterilization with autoclave (dark blue) that, over a lifetime of 150 treatments, have the greatest impact on the overall environmental impact in the use phase.

Assumptions and limitations of the LCA

- The silicone material used to model the instrument handle is based on an average market process for silicone products due to a lack of supplier-specific data.
- The use phase is assumed to take place in Denmark -if the curette is used in another country, the electric mix may vary and therefore affect the results. If the LCA is to be used in a global context, only the cradle-to-gate results should be used.
- The number of times the curette will be washed during its lifetime before disposal can vary greatly. This may affect the results of the use phase. It is assumed that the curette is used 150 times in this study.
- Environmental impacts related to grinding and polishing of the instrument are not included.
- Environmental impacts related to the production of large machines, such as production machines, the dishwasher and the autoclave are not included.
- It is assumed that the curette is sent for incineration at the end of its life.
- Many of LM-Dental's hand instruments may look similar but have different tips and variations in handle design. The environmental impact of other instrument models may not be exactly the same as the results from this study due to potential variations in raw materials and manufacturing processes.