re:profit

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Climate footprint of the Nova C seating series

Potential for improvements, carbon offsetting and degree of climate positiveness

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Summary

The purpose of this climate report has been to take a significant step towards the Paris climate accord and speed up the ambitions for a 1.5° C target within a 10 years period. We made an estimation of the carbon footprint for the production of Green Furniture's Nova C product life cycle according to the best available and reasonable knowledge. The result is the base for further actions for climate positiveness, and for making plans for further decrease of climate emissions from the product life cycle. The circular economy approach is a significant part of the plans to reduce climate and other environmental impact. Green Furniture aims to be climate positive as an organisation before 2025 and will approach this goal by calculating and set up climate action plans for each product life-cycles managed within the company. This report covers the first product life cycle and Green Furniture´s biggest product, The Nova C

By the current tree planting, by a tree for each Nova C module, the product life cycle is climate positive (overcompensated) by +76%, or up to +289% if the take-back offer of the furniture will be used by Green Furniture's clients at the end of the local product life.

A conservative approach, that every tree will assimilate carbon dioxide effectively under a limited period of time for 10 years is used. We believe this big overcompensation cover uncertainties in generic climate data or risks that some trees will not fulfil the expected assimilation of calculated atmospheric carbon dioxide, during their lifetime. We also believe that climate impact according to scope 1, that corresponds to the activities within our head office, is of less significance. The scope 1 impact from manufacturing companies like ours is reported to be around 5% of the total impact.

Suggested possible improvements of the CO_2 footprint are:

- Transportation with electric or renewable fuels
- Increase the share of recycled steel by the American suppliers
- Convince the customers to use the take-back business model

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1. Introduction and Background

1.1 What is a carbon or climate footprint?

For a business to reduce its carbon emissions, it first needs to be able to measure how much carbon it is emitting and what the biggest emission factors are. In this respect, it is the 'carbon footprint' of a business that would give an indication of its carbon impact.

Whilst the term 'carbon footprint' has varying definitions, for the purposes of assessing products it is widely accepted that 'carbon foot printing is the methodology to estimate the total emissions of greenhouse gases (GHG) in carbon equivalents from a product across its life cycle from the production of raw material used in its manufacture to the disposal of the finished product. These emissions may be caused directly or indirectly by a person, organisation, event or product.

When referring to "CO_2" we mean CO_2e (Carbon dioxide equivalents), which consider and include all climate gas emissions as defined in ISO 14021.

1.1.1 The two key forms of carbon footprint for businesses

- Organizational footprint. This may consist of emissions from all the activities across an organisation, including buildings, energy use, industrial processes and company vehicles, etc. depending on the organizational boundaries selected.
- Footprint of a product life cycle. This method, often based on a LCA (lifecycle analysis) calculates the emissions of a specific product during its entire lifecycle. The emissions from the extraction of raw materials and manufacturing of the product, potentially extending right through to its use and final reuse, recycling or disposal are often included.

The Green Furniture has chosen the "Footprint of a product life cycle" method to start with, which is motivated by the assumed relatively small footprint from the sales office compared to the manufacturing and the life cycle management (a comparison here can be the scope 1 and 2 emissions of the well CO_2 assessed Max Hamburgers is only 0,5% and 0,3% of their total emissions, see https://www.max.se/globalassets/download-files/se/max-metodrapport-och-resultat-klimat-2018-191030-final_ey.pdf). For manufacturing companies, Mc Kinsey has estimated that scope 1 represents no more than 5% of the total carbon footprint for all three scopes.

2. Aim, goals & method

The aim of the study is to measure the carbon footprint in order to 1/ understand the most cost-effective measures for mitigating climate change and for continuous improvement 2/ investigate what measures to be taken for being climate positive and 3/ as a service for GF client's sustainability reporting. 4/ demonstrate the climate benefits of a more circular business model with "products as a service" and a take-back system.

The analysis has used the LCA screening report Nova C[i] as a base, which in turn have used input data from the Ecoinvent 3[ii] database. The analysis has then in turn used modified data sets, when specific data is known, to better represent the final product.
The Nova C report have been analysed and corrected to adjust calculations and then applied to the North American market that was not included in the Nova C report.

2.1.1 The calculations comply with the definitions in ISO 14021. The emissions of CO2 in scope 2 and 3 have been taken account for in the data from Ecoinvent. Scope

A cradle to grave and a cradle to refurbish/reuse scenario including maintenance under the use phase. Green Furniture have a vision to establish a take-back system and wants to encourage their clients by demonstrating the profits of doing that. We have therefore also assessed the carbon footprint for a module for an assumed refurbish scenario.

The climate impact data within scope 2 and 3 are covered with the generic data from the Ecoinvent database and the more specific data we have looked for outside the database. The scope 1 data is however not investigated, but estimated to be maximum 5% of the total emissions for manufacturing companies according to credible reporting from McKinsey[iii].

2.1.2 Unit

One module; one-meter Nova C with a product life cycle of 15 years, which corresponds to the warranty period of time.

2.1.3 Delimitations

This declaration is delimited to climate gas emissions (CO_2), but including maintenance and cleaning at the customer during 15 years. Other social or environmental aspects are not evaluated in this report. We have used the best available data for assumptions of the carbon footprint and offsetting. Intended user is not known, but assumed upon earlier data for transportation.

2.2 Adjustments of the preliminary report

2.2.1 Recycled Steel

The Nova C report had no available data for recycled steel and did not take into account the lesser CO2 impact of steel manufactured in Swedeniv. This have been corrected in our declaration. Recycled steel has about 87% less climate impact when used in production vs non recycled steel. References for the adjusted climate impact from steel is based on a number of trustworthy sourcesv from which we have calculated the average impact.

2.2.2 Transports

The Nova C report had calculated transports of the finished product to end customer based on one transport per 1m module. But our analysis shows that an average order for America consisted of 22 units / meter module and for the EU market 27 units which affect the total transportation impact per unit. The average transportation for America was set to 2500 km and for EU market 2000 km using a 7-14 ton lorry. CO_2 emissions was calculated[vi]

The shipping of glides from Sweden to Canada for assembling have been left out from the report as it is probably an insignificantly small impact otherwise (0,33% CO_2) of the total impact of the unit and 100% recycled of 0,1 kg HDPE plastics.

2.2.3 Climate declaration scenario for the take-back system

The climate calculations for the take-back scenario had following assumptions: 20% ribs needs to be shifted, but all of them with new finish. The steel parts needs some abrasive blastering[vii] and new painting that corresponds to a surface of 0,1m^2, 10% of the steel fasteners are shifted. 25% of the glides are shifted. The packagings as well as transportation of the finished product will however be the same.

2.3 Carbon offsetting and climate positiveness

Green Furniture already have ongoing tree plantings in South America they are personally involved in and visit them self on spot. In order to calculate the negative emissions from these trees we have chosen to calculate the expected annual uptake per year[viii]. That number has been calculated to 22.6 kg CO_2 per year for 1(one) tree. The estimated lifetime tree effectively binds CO_2 is debated and varies between various trees. We have chosen the lowest estimation and the most common in reference to tropical trees which is 10 (ten) years.

However, it is common in Gold standard certified offsetting projects to deduct some percent to cover the risks that some trees will not survive though to accidental fires, storms, illegal deforesting

or similar events. In order to be no less thorough than Gold Standard we have therefore deducted 25% for such scenarios (many traditional projects only deduct 15-20%) leaving us with the number of **16.95kg** CO_2 per year.

3. CO2 footprint calculation results

The carbon footprint of the finished product has been calculated, for both the first PLC (Product Life Cycle) and the second PLC when just refurbished, on the following components and activities:

- Waxed Ribs
- Coated Strips
- Coated Legs
- Steel fasteners
- Glides
- Packaging
- Unspecific CO_2: The carbon footprints for the finished product for activities that are unrelated to specific components such as transportations and maintenance.

Figure 1Nova C, module

The estimated carbon footprint for a module Nova C with 15 years of use, which corresponds to the warranty period of time.

We have calculated the footprints for four different scenarios. For the European and American sites/market in the first PLC (Product Life Cycle) and if/when the Nova C has been taken back, being refurbished and redistributed:

For Europe, the first PLC (Product Life Cycle): 67 kg CO_2

For America, the first PLC (Product Life Cycle): 96 kg CO_2

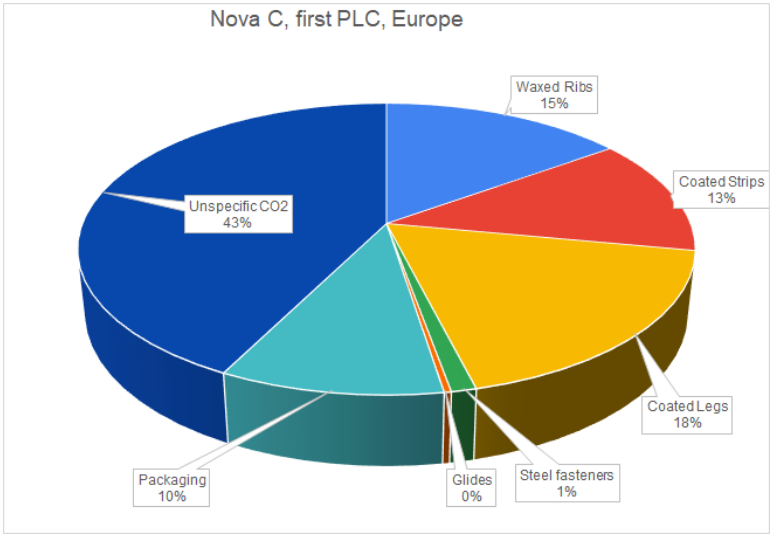

Figure 2 Distribution of the carbon footprints, first PLC, Europe

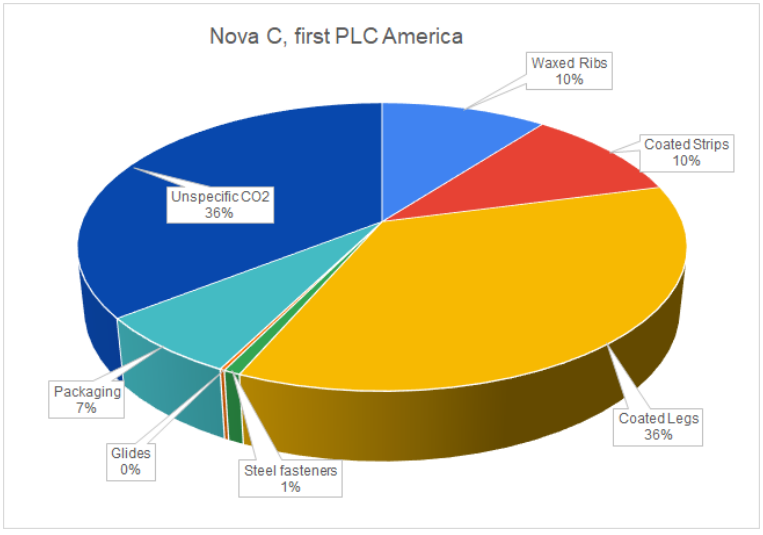

Figure 3Distribution of the carbon footprints, first PLC, America

The estimated carbon footprint for a refurbished module Nova C with 15 years of use behind and prepared for another 15 years of use is

For Europe, the second PLC (Product Life Cycle) and refurbished: 44 kg CO_2

For America, the second PLC (Product Life Cycle) and refurbished: 50 kg CO_2

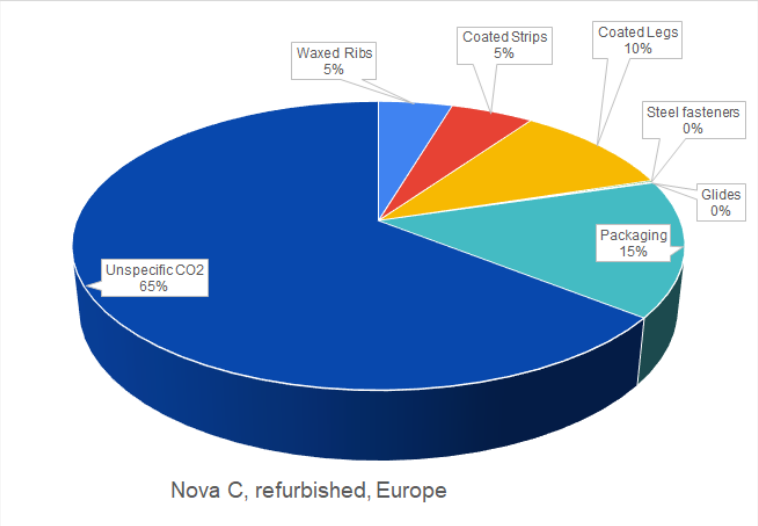

Figure 4Distribution of the carbon footprints, second PLC, Europe

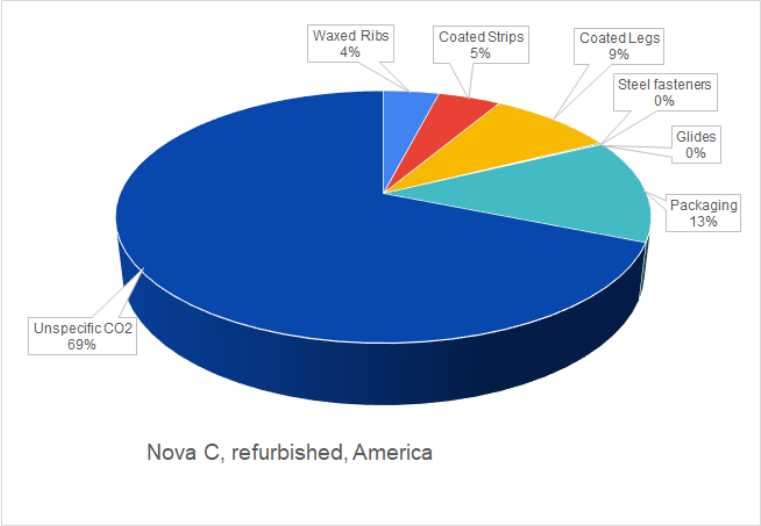

Figure 5Distribution of the carbon footprints, second PLC, America

The detailed figures are presented in appendix 1

4. Discussion and recommendations

The purpose of this climate declaration has been to make an estimation of the carbon footprint according to the best available knowledge, and with focus on the most important data. The motto have been to better start with something than waiting for the perfect, as complying with the Paris 1,5C-target goal is very urgent. That is why Green Furniture rather put their resources in more carbon excess offsetting for the money than in to even more detailed calculations for what in the end can only generate minor differentiations.

From this report, The Green Furniture will understand what kind of actions that will is most likely to minimize the climate impact and how much carbon offsetting that is needed to cover their own footprint and more.

4.1 What the calculations shows

For a new Nova C module, the dominating CO_2 footprint are the steel legs and the unspecific part that includes transportation. The different footprints in Europe vs America are mainly due to content of recycled steel. 88% recycled Swedish steel vs 20% recycled American steel. In comparison

with the original screening report, we have made some important adjustments: Lowered the CO_2 figures according to specific data for recycled steel and lowered the CO_2 figures for transportation in accordance with real data for the effective load of trucks. The screening report estimated just one module/transportation.

It is however quite clear that the next challenge is the transportation. It is even more obvious when you look at the diagrams for the refurbished modules, see Appendix 1. Even if the footprint has lowered drastically, the footprints for packaging and transportation of the module to customers are the very same.

4.2 Recommendations for further action

The big potential for improvement of the footprints are the following:

- Transportation with electric or renewable fuels
- Increase the share of recycled steel from American suppliers
- Convince the customers to use the take-back business model

4.3 The degree of climate positiveness

By climate compensation and claim climate neutrality, you are required to compensate your emissions by 100%. But if you are climate positive by e.g 20%, it means a climate compensation by 120%. And hence, as Green Furniture plants one tree per Nova C module with a planned product life cycle (PLC) and warranty of 15 years, it equals being climate positive by:

The different sites/markets for first and second PLC (Product Life Cycle) respectively.	One tree/Nova C: Degree of climate positivity, how much above climate neutrality:
Nova C, first PLC, Europe	+154%
Nova C, first PLC, America	+ 76%

Nova C, second PLC-refurbished, Europe	+ 289%
Nova C, second PLC-refurbished, America	+ 240%

Stockholm, September 2020.

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5. Appendix 1

Appendix 1, The CO_2 figures for Nova C from European/American factory and Nova C Refurbished, respectively.

Table 1 Detailed figures for Nova C first PLC

From European Factory, first product life cycle						
		CO2 extraction				
Components	**Recycled %**	**raw materials**	**processing**	**Finishing**	**Transportation**	**Total**
Waxed Ribs		4,2	5,3		0,1	9,6
Coated Strips	20%	5,6	1,7	0,8	0,04	8,2
Coated Legs	100%	4,2	5,5	1,6	0,2	11,5
Steel fasteners		0,7				0,7
Glides	100%	0,1	0,1			0,2
Packaging		6,3	0,04			6,3
Unspecific CO2						**27**
						63

From North-American factory, first product life cycle						
		CO2 extraction				
Components	**Recycled %**	**raw materials**	**processing**	**Finishing**	**Transportation**	**Total**
Waxed Ribs		4,2	5,3		0,1	9,6
Coated Strips	0%	7,1	1,7	0,8	0,04	9,6
Coated Legs	25%	25,5	5,5	1,6	0,2	32,8
Steel fasteners		0,7				0,7
Glides	100%	0,1	0,1			0,2
Packaging		6,3	0,04			6,3
Unspecific CO2						**32,72**
						92

Table 2 Detailed figures for Nova C second PLC

From European factory, second (refurbished) product life cycle		
Components	**Total**	**Refurbish scenario**
Waxed Ribs	1,9	20% of the ribs are exchanged and the rest is refurbished
Coated Strips	2,1	milder (50%) blastering process for 0.1 sqm
Coated Legs	4,3	standard (100%) blastering process for 0.1 sqm
Steel fasteners	0,1	10% of fasteners are exchanged
Glides	0,1	25% of gliders are exchanged
Packaging	6,3	same packagings
Unspecific CO2	**26,7**	same transportation
	41,5	

From American factory, second (refurbished) product life cycle		
Components	**Total**	**Refurbish scenario**
Waxed Ribs	1,9	20% of the ribs are exchanged and the rest is refurbished
Coated Strips	2,1	milder (50%) blastering process for 0.1 sqm
Coated Legs	4,3	standard (100%) blastering process for 0.1 sqm
Steel fasteners	0,1	10% of fasteners are exchanged
Glides	0,1	25% of gliders are exchanged
Packaging	6,3	same packagings
Unspecific CO2	**32,7**	same transportation
	47,5	

6. Sources

[i] *Nova C-Screening LCA Final Report v2 20190520,* Ecoinvent 3

[ii] https://www.ecoinvent.org/

[iii] Anne-Titia Bové and Steven Swartz (2016) “Starting at the source: Sustainability in supply chains”, published by McKinsey & Company on https://www.mckinsey.com/business-functions/sustainability/our-insights/starting-at-the-source-sustainability-in-supply-chains (last checked 2020-09-11)

[iv] SSAB *Vitbok SSAB och koldioxidutsläppen*

[v] www.recycling.se/klimat

B 2356 klimatpåverkan från olika avfallsfraktioner

IVL B 2217 Byggandets klimatpåverkan

[vi] transportmeasures.org

[vii] Lauren R. Millman and James W. Giancaspro (2012). "Environmental Evaluation of Abrasive Blasting with Sand, Water, and Dry Ice." International Journal of Architecture, Engineering and Construction, 1(3), 174-182

[viii] SkogsSverige:

https://www.skogssverige.se/hur-manga-kilo-co2-forbrukar-ett-trad-per-ar

https://greenearthappeal.org/co2-verification/

https://www.grow-trees.com/offset.php