Fastned

Chain Analysis: Fastned Charging Stations

CO$_2$-PRESTATIELADDER

1. Introduction

Fastned's mission is to accelerate the transition to sustainable mobility and provide better access to green electricity to EV drivers, therefore decreasing carbon emissions related to transportation.

However, we recognize our own carbon emissions within the value chain. In achieving Level 4 of the CO_2 Performance Ladder certification, in line with our sustainable mission, we are dedicated to understanding and reducing our carbon footprint. Presently, the construction of our stations is identified as a major contributor to our company's carbon footprint, which overshadows all other emission categories. Therefore, we conducted an LCA that focused on Fastned's station construction.

The Life Cycle Analysis or Assessment (LCA) is a comprehensive methodology used to evaluate the environmental impacts of a product, service, or process over its entire life cycle. An LCA involves assessing environmental impacts at all the stages of a project's life, from raw material extraction through materials processing, manufacturing, construction, use, operation, maintenance, renovation, demolition and recycling. The goal of an LCA is to identify and quantify CO_2 emissions to help guide decision-making toward more sustainable practices.

This document specifically focuses on emissions associated with station construction, detailing the current situation and proposing measures for better understanding and footprint reduction.

The structure of this analysis is organized as follows:

- Chapter 2: Explains the choice for this specific chain analysis
- Chapter 3: Focuses on identifying the various elements within the chain
- Chapter 4: Explains the calculation and data sources
- Chapter 5: Concentrates on quantifying the emissions within the chain
- Chapter 6: Looks at potential improvements in data
- Chapter 7: Discusses Fastned's objectives and measures

2. Scope

The Ladder requires the selection of a topic associated with the most substantial emissions, focusing on relevant emissions within the context of scope 3 as outlined in the GHG Protocol Scope 3 Standard. The criteria for this selection include the following:

- The scope of the emissions
- Influence of the company on the emissions
- Risks for the company
- Influence on sector
- Emissions identified by the sector as significant/relevant and others

For Fastned, the company's entire focus is on delivering public, premium, high speed charging stations accessible to all EV drivers, without differentiating among user groups. Consequently, there is a single, relevant Product-Market Combination (PMC): **Fast charging stations for electric vehicles.**

Therefore, in this document, we are focusing on the emission related with whole process of the construction of the stations: from purchased materials to transportation to construction itself.

3. Value chain

In conducting an LCA for Fastned's charging stations, it's important to understand the various elements that constitute the value chain. This LCA helps in identifying the environmental impact at each stage of development, from initial transport to final installation. Below is a detailed overview of the key components and materials involved in the construction and operation of Fastned's charging stations. This comprehensive breakdown provides insight into the resources used.

1. **Transport:**
    - HIAB truck: Used for transporting materials, with a focus on its average diesel consumption
    - Standard truck: Also involved in material transportation, with an average diesel consumption noted
2. **Construction:**
    - Fuel Consumption: The diesel used during the construction phase of the charging stations
3. **Foundations:**
    - Concrete: Fundamental material for station foundation
    - Steel: Used to reinforce the concrete foundations
4. **Canopy:**
    - Timber types: Used for constructing the canopy structure
    - Steel: Additional structural support for the canopy
5. **Canopy covers:**
    - Steel sheet metal
    - Stainless steel sheet metal
    - Aluminium
    - Polystyrol
    - Rubber
6. **PV modules:**
    - Materials used in the construction of solar panels
    - Solar cells
    - Aluminium
7. **Civil works:**
    - Various types of sand and concrete: Used in laying the groundwork and foundation for the charging stations
8. **Grid connection:**
    - Copper cables: Different types and sizes, for electrical connections
9. **Illumination:**
    - Station lighting
    - LED neon flex: Energy-efficient lighting solution
10. **Chargers:**
    - Alpitronic Hypercharger 300: The main charging units used at the stations

3.1 Station types

The size of the construction surface (number of modules) and the number of chargers at Fastned stations both have a significant impact on emissions per station. Larger construction surfaces require more materials and energy for development, leading to higher emissions from construction activities. This includes emissions from the production of construction materials like concrete and steel, and the operation of construction machinery.

In addition, the number of chargers at a station also influences emissions. More chargers mean increased manufacturing emissions, as each charger requires materials like metals, plastics, and electronic components. The production and assembly of these chargers involve energy-intensive processes, contributing to the carbon footprint.

Therefore, larger Fastned stations, with extensive construction surfaces and numerous chargers, generally have a higher initial environmental impact due to the increased materials and manufacturing emissions.

We have four different modular station types (type 4, type 5, type 6 and type 7). Then there is also some variety in number of modules and number of chargers per station. See here below examples of different station types.

Figure 1. Station type 4.2: Oude Riet, A7, Nuis

Figure 2. Station type 4.6: Bochum-Stahlhausen

4. Calculations

The conducted LCA for constructing a charging station is based on both primary and secondary data, as detailed in the table provided. Primary data is preferred for its direct relevance, but secondary data is utilized to ensure a complete assessment when the former is not available. This data aids in quantifying the carbon footprint, measured in CO_2, associated with the materials and processes outlined in the table, from the start to the end of the construction phase.

Element	Material	Unit	EF (in KG)	Source
Transport				
	HIAB truck (average diesel consumption)	Liter	3,468	CO2emissiefactoren.nl
	Standard truck (average diesel consumption)	Liter	3,468	CO2emissiefactoren.nl
Construction				
	Fuel consumption during construction (diesel)	Liter	3,468	CO2emissiefactoren.nl
Foundations				
	Concrete	m3	214	primary data from supplier
	Steel	kg	2,34	primary data from supplier
Canopy				
	Glulam timber Larch	m3	87,2	primary data from supplier
	Glulam timber Spruce	m3	87,2	primary data from supplier
	Steel	kg	2,34	primary data from supplier
Canopy Covers				
	Steel sheet metal	kg	2,34	primary data from supplier
	Stainless steel sheet metal	kg	2,34	primary data from supplier
	Aluminium	kg	7,5	Eco-invent (see tab 'canopy covers')
	Polystyrol	kg	24,02	Eco-invent (see tab 'canopy covers')
	Rubber	kg	2,37	Eco-invent (see tab 'canopy covers')
PV Modules				
	TVG (heat-strengthened) glass	kg	1	GER-waardenlijst
	PVB lamination foil	m2	0,65	GER-waardenlijst
	Aluminium	kg	7,5	Eco-invent
	Panel PV modules	pcs	200	enie.nl kennisbank
Civil Works				
	Puinbed	m3	1,44	GER-waardenlijst
	Brekerszand	m3	1,44	GER-waardenlijst
	Schoonzand	m3	1,44	GER-waardenlijst
	Klinkers (Concrete)	m3	168	GER-waardenlijst

Electrical Installation				
	Copper cables (single core, cross section 150mm²)	m	1,9	GER-waardenlijst
	Copper cables (5G2,5)	m	1,9	GER-waardenlijst
Chargers				
	Alpitronic Hypercharger 300	pcs	13039,16	FFE

5. Emissions

To accurately measure Fastned's CO_2 emissions, we first calculated the emissions for each station type across various categories. This approach considers factors like construction materials, fuel use and material transportation, as described in the previous chapter.

Station type	Emissions per station type in kg CO_2 (excluding transport and charger)
4	55,805
5	3,752
6	29,149
7	49,875

The variety in station types is evident in the number of chargers and modules they offer, resulting in a diverse range of station setups. For detailed information, please refer to our Life Cycle Assessment (LCA) document. We have calculated that each charger contributes 13,039 kilograms (~13.04 tonnes) of CO_2 emissions. Additionally, the emissions from transportation vary depending on the specific location of each station.

See Figure 3, below, for a breakdown of the emissions of station type 4.2.

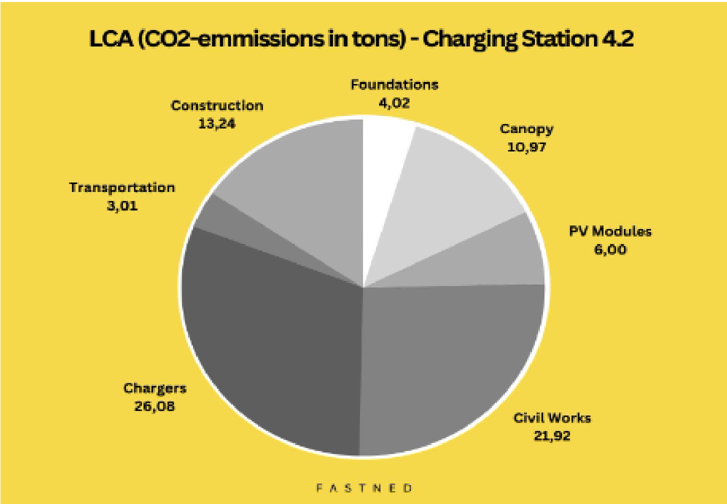

Fig 3. Emissions in tonnes CO_2 per material type/category for station type 4.2

After determining the emissions per station type, we then extrapolated these figures to all stations built in 2022. This step is key to estimating the total environmental impact of our network expansion in that year.

In 2022, we constructed 57 stations across different European countries. By applying the emissions data to these 57 stations, we estimated the total 2022 carbon footprint for the construction of Fastned stations to be approximately **7,165 tonnes** of CO_2. This figure reflects the environmental impact of our expansion and is a significant aspect of our overall sustainability evaluation.

6. Possibilities for improvement

Improving our LCA will not directly contribute to the reduction of our carbon footprint. However, it will significantly help us understand our situation better, and therefore build a more effective strategy. It will also help us set a better basis for the monitoring of our progress in the future.

Possibilities for improving the LCA:

1. **Clarify system boundaries:**
   - Determine the most relevant analysis method (cradle-to-gate, to-grave, to-cradle) for our context.
2. **Refine functional unit choice:**
   - With growth and potential additions like shops and batteries, our carbon footprint will increase. We could reevaluate our functional unit (e.g., kWh sold, EVSE, station built). Currently, it's one station type 4 modular unit (station 4.2).
3. **Expand inventory components:**
   - Include previously omitted components like transformer substations, CCTV and connectivity equipment in our inventory for a more comprehensive analysis.
4. **Model our process:**
   - Visualize all inputs and outputs using a specialized software tool like openLCA or SimaPro.
5. **Enhance data collection for impact assessment:**
   - Deepen discussions with suppliers to collect detailed data, including Environmental Product Declarations.
   - Obtain precise values for product impact assessment, like Global Warming Potential, and understand the methodology behind these calculations.
   - Consider using European-level reference databases as a credible source for unavailable data.
   - Make data provision ability a criterion in supplier selection.
6. **Assess data quality and uncertainty:**
   - Incorporate data quality and uncertainty considerations into our decision-making process.
7. **Document and file supporting documentation:**
   - Maintain records to track and monitor our progress over time.

These steps will enhance the accuracy and comprehensiveness of Fastned's LCA, aligning it more closely with our sustainability goals and ensuring a more robust environmental impact assessment.

7. Objectives & Measures

The goals set for reducing CO_2 emissions per kilowatt-hour (kWh) sold are substantial and indicative of a commitment to environmental sustainability. The first objective for our charging stations construction is to achieve a 25% reduction in CO_2 emissions per kWh by 2025, using 2022 as the baseline.

The second goal is more extensive, aiming for a 50% reduction by 2030, again using 2022 as the baseline. This long-term target suggests a deeper commitment to reducing the environmental impact over the next eight years.

Overall, these targets are aligned with global efforts to address climate change, setting a clear path towards reducing greenhouse gas emissions and enhancing sustainability.

- By 2025, reduce CO_2 emissions/kWh sold by **25%** (compared to 2022 as base year)
- By 2030, reduce CO_2 emissions/kWh sold by **50%** (compared to 2022 as base year)

7.1 Measures
To not only improve our understanding but to also actively reduce carbon emissions in the construction process, we need to initiate specific measures. Various approaches can be adopted to achieve this:

1. **Material research and development:**
    - Prioritize the development of materials with a smaller carbon footprint. Focus on components with the largest footprint where we can make the most significant impact.
2. **Design optimization:**
    - Refine the design of parts and stations to enhance efficiency and reduce material usage.
3. **Supply chain management:**
    - Reevaluate material sourcing to minimize transportation needs, especially as we expand our construction to multiple countries across northern and southern Europe.

The following key measures are proposed to reduce our carbon footprint, based on our current understanding of the situation. It's important to note that these measures should be dynamic and evolve as we gain a deeper insight and investigate further in the coming years.

To effectively reduce carbon emissions in construction, we focus on the following key areas:

1. **Foundations:**
    - Explore sustainable concrete alternatives suggested by suppliers.
    - Optimize foundation block dimensions to reduce concrete use, while considering stock management complexities.

2. **Canopy (wood structure, steel frames, and covers):**
    - Investigate design optimizations for steel frames to reduce usage, potentially substituting with wood.
    - Seek local wood suppliers in various European countries to minimize transportation distances.
3. **PV modules and chargers:**
    - Engage with manufacturers for innovations and support their efforts in reducing carbon footprint, acknowledging our dependency on them for these products.
4. **Civil works:**
    - Research sustainable pavement options like Biophalt.
    - Design stations to minimize paved areas and maximize green spaces, considering disabled access and vehicle circulation.
5. **Construction:**
    - Continue exploring more energy-efficient and electric machinery for on-site operations.
6. **Transportation:**
    - Broaden supplier base for alternative, locally sourced materials.
    - Advocate for more energy-efficient vehicles (including electric) among suppliers.