Value Chain Analysis

CO2 Performance Ladder level 5 requirement

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1 Introduction

1.1 What is a value chain analysis?

The purpose of this scope 3 value chain analysis is to gain insight into the most material scope 3 emissions in tonnes of CO_2-eq (GWP) and where they occur in the chain. In order to identify effective opportunities to reduce scope 3 emissions and what so-called chain partners should be approached for this.

A value chain is defined as a certain line of supplying and purchasing companies and organisations. It represents a sequence of interconnected activities that contribute to the creation of a product or the delivery of a service. Value chain analysis is an analysis of CO2 emissions in one of the value chains that an organisation is active in. By understanding these emissions, companies can implement strategies to reduce their carbon footprint and enhance sustainability.

FCC Construcción is considered a small company (base year 2020 and up following year 2021) and to comply with the CO2 performance ladder has executed one value chain analysis. In order to demonstrate our ambition and meet the demands of a large company, this report includes not one, but two value chain analyses. By conducting these analyses, we aim to gain deeper insights into our operations and enhance our overall performance. Based on the observations, specific reduction options are formulated. This complies to the CO2 Performance ladder requirement 4.A.1, 5.A.1, 5.A.2-2 and 5.A.3.

1.2 Activities FCC Construcción SA (NL)

FCC Construcción, as per the KVK records, engages in general civil engineering and road construction. Their activities span a wide spectrum, including the design, planning, and execution of civil engineering projects. From constructing roads and bridges to managing infrastructure development, FCC Construcción plays a vital role in shaping our built environment. Their expertise contributes to the efficient transportation networks and essential infrastructure that underpin modern societies. By participating in these critical sectors, FCC Construcción demonstrates its commitment to enhancing connectivity, safety, and sustainable development.

The work by FCC Construcción S.A. (NL), VeenIX BaHo BV, contains study, contracting, construction, execution, management, maintenance and operation of all kinds of public or private works. FCC Construcción S.A. (NL) engages in thorough research and analysis.
They study the feasibility, environmental impact, and technical aspects of proposed projects. This initial phase lays the groundwork for informed decision-making.
As for the construction phase, FCC is negotiates agreements with suppliers, subcontractors, and other stakeholders. This involves ensuring compliance with legal requirements, cost-effectiveness, and quality standards.
FCC Construcción S.A. (NL) is hands-on in the construction phase. They oversee the actual building process, coordinating various teams, materials, and equipment. Whether it’s erecting buildings, bridges, or roads, their expertise ensures successful execution.
Effective project management is crucial. The company handles scheduling, resource allocation, risk mitigation, and quality control. Their skilled project managers keep everything on track.
Beyond construction, they take responsibility for the long-term well-being of the infrastructure. Maintenance involves regular inspections, repairs, and upgrades. Operation entails ensuring smooth functionality, whether it’s a water treatment plant, a highway, or a public building.

In summary, FCC Construcción S.A. (NL) plays pivotal roles in shaping our built environment, from inception to ongoing operation. Their multifaceted contributions enhance our daily lives and drive sustainable development.

1.3 Procurement materials

The value chain analysis encompasses several critical components. Firstly, it includes the procurement component, which involves discussions related to sourcing materials, services, and resources. Secondly, it covers materials processing, where raw materials are transformed into usable products. Lastly, transportation plays a pivotal role in moving goods efficiently within the value chain. All three components are integral to the work of FCC Construcción S.A. (NL) and are evident in the VeenIX BaHo A9 project. For detailed insights into the value chain analyses and the A9 project, please refer to Chapter 2, which outlines the methodology for conducting these analyses within the project.

2 Total value chain of project

To accurately map CO2 emissions, we employ various calculations. Our initial calibration took place in 2020, and the results are visualized in the figure. Subsequently, we conducted new calculations based on three distinct methods. These adjustments account for deviations over time in planning, procurement, and actual execution. By the project's conclusion, these numbers will align once again. Given the project's extensive scope and diverse material flows, we have grouped them into several material categories: soil, asphalt, concrete, steel, and other. This comprehensive approach ensures a holistic understanding of our environmental impact and guides our efforts toward sustainability.

Figure to be developed

The three methods used to make calculations are as follows:

1. Bill of Finance;
2. Bill of Quantities;
3. Bill of Materials.

In the first method, we refer to the Bill of Finance and examine the DO and UO. The quantities specified in these orders serve as assumptions for our calculations. Both designs encompass all materials required for the entire project. However, a significant disadvantage lies in the potential deviation from reality. Actual usage may differ from what was initially planned.
The second method relies on purchased quantities extracted from the Bill of Quantities. These quantities are obtained from the procurement department. Unfortunately, this approach has limitations. It does not account for raw materials that were purchased but remained unused or were resold, leading to discrepancies in the recorded quantities.
The third and final method involves using the Bill of Materials for calculations. This method is the most accurate because it aligns closely with actual usage. However, there's a trade-off: calculations can only occur at the project's end. Only then can we definitively determine whether all materials were utilized as planned.

An overview of the volume calculations can be seen in the table below.

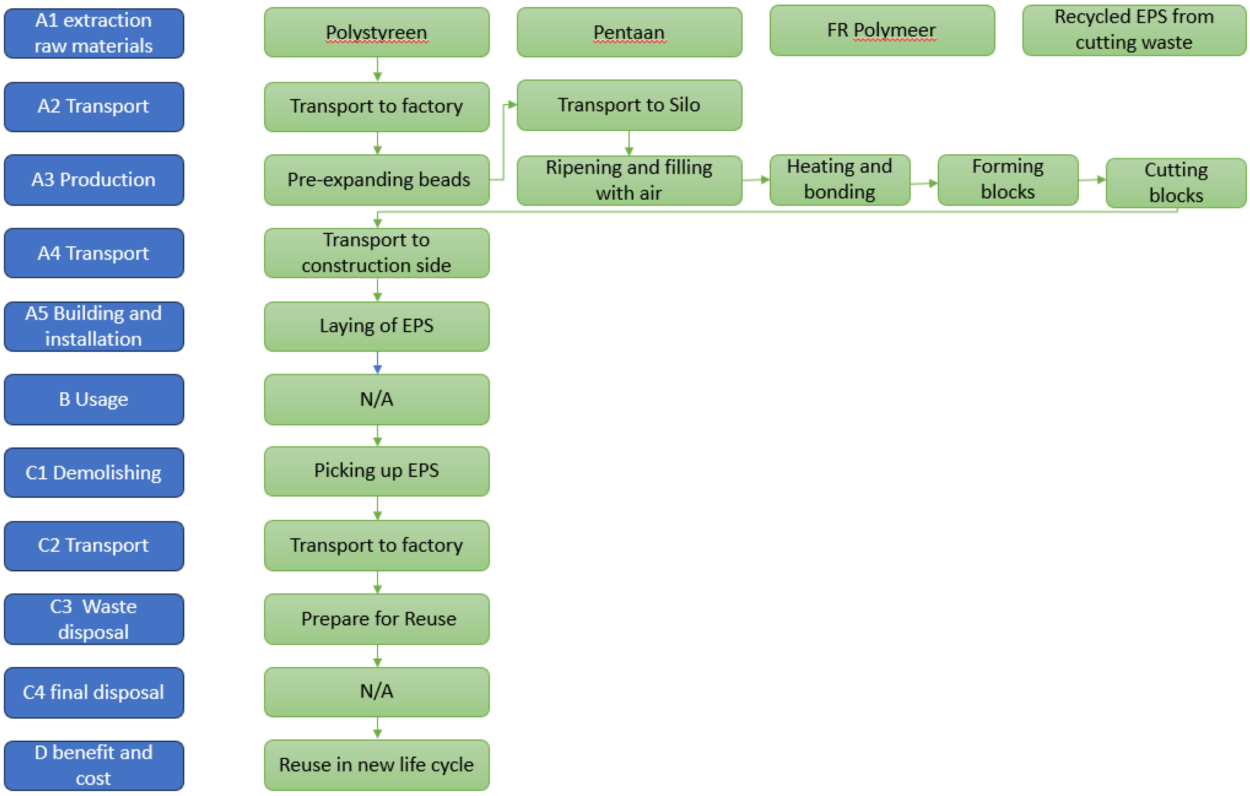
Material	BoF	BoQ	BoM
Asphalt	204	To be developed	To be developed
Concrete	2301		
Ground	7727		
Steel	1506		
Other	67		

3 Value chain analysis: ground

This chapter focuses on value chain analyses of ground. Ground is FCC's largest emission stream because of the use of EPS instead of soil. This chapter is the first to explain the value chain. Then the relevant scope 3 emissions are explained. Then the chain partners relevant to this value chain are named. Finally, this chapter discusses the quantification of the scope 3 emissions.

3.1 Description of the chain

'**A9BH-PW-0000-PC-SU-RP Value Chain Analysis on Soil'** describes the process of transporting soil. According to **'Scope 3 Dominance Analysis 2022'**, soil is still an important material used in the ground-works. Therefore, the process described here is still applicable. Additionally, adjustments have come to the design. As a result, EPS was chosen for the soil layer. EPS is a Styrofoam that can be used as a foundation. Normally, when soil is laid, it first needs to sink in. This sinking in takes several weeks. When using EPS, the sinking in no longer needs to take place, allowing work to continue immediately. This process is described **in the visual below.**



3.2 Relevant scope 3 emissions.

We may not directly control the production process itself, but we do have the ability to make choices regarding the materials used. These materials can emit varying amounts of CO2 during production. Consequently, we meticulously track all emissions stemming from the production process. Additionally, we engage in discussions with our supply chain partners to explore sustainable transportation options. Furthermore, our choice of materials can significantly impact downstream emissions. This comprehensive approach is why we meticulously map the entire life cycle, as detailed in Chapter 3.4.

3.3 Chain partner

In **'Scope 3 Dominance Analysis 2022'** a list of A-suppliers for the emission stream 'ground' is given. From this list JdB is selected as the main chain partner of our value chain analysis. JdB is by far the largest supplier of land to FCC as can be seen in the list of A-suppliers. Other partners are also described there, but their impact is much lower. Therefore we would focus on JdB. JdB is used to transport ground, building materials and building supplies to and from the project sites. This includes, for example, the transport of mobile equipment as well as the provision of transport for the delivery and removal of soil and building materials to and from the project sites.

Besides JdB, Joosten Kunststoffen B.V. is the main supplier in this chain. Joosten is a lot smaller than JdB, but is still included in the chain analysis because of the raw material it supplies. In fact, Joosten does not supply soil, but EPS. Since the impact of EPS is much larger than the impact of soil, it is important to include this supplier.

3.4 Quantification scope 3 emissions

As described before, there are three methods to do the calculations and quantify the scope 3 emissions. The figure below describes EPS emissions. From this we again assumed the BoF, BoQ and BoM. We also used several methods to calculate the amount of emissions.

Figure to be developed

Method 1 – to be developed
Method 2 – to be developed
Method 3 – to be developed

4 Value chain analysis: asphalt

This section contains the value chain analyses of asphalt. Asphalt is one of FCC's largest emission streams because of the large amount of raw materials used in the project. This chapter is as first an explanation of the value chain. Then the relevant scope 3 emissions are explained. Then the chain partners relevant to this value chain are named. Finally, this chapter discusses the quantification of the scope 3 emissions.

4.1 Description of chain

1. Raw Material Extraction:
   a. Bitumen (derived from crude oil) and aggregates (such as crushed stone) are extracted.
   b. Bitumen provides the binding properties, while aggregates add strength.
2. Asphalt Mix Production:
   a. Bitumen and aggregates are combined in asphalt plants.
   b. The mixture is heated, blended, and transformed into asphalt mix.
3. Transportation and Placement:
   a. Asphalt mix is transported to the construction site.
   b. It's spread and compacted using heavy machinery to form the road surface.
4. Curing and Strength Development:
   a. The freshly placed asphalt undergoes a curing period (6-12 months).
   b. During this time, it hardens and gains durability.
5. Maintenance and Rehabilitation:
   a. Regular maintenance (e.g., crack filling) preserves the pavement.
   b. Periodic treatments (e.g., slurry seals) maintain its condition.
   c. Rehabilitation corrects severe defects (e.g., overlays).
6. End-of-Life Considerations:
   a. Eventually, the asphalt road reaches the end of its life cycle.
   b. Proper maintenance extends its longevity, but reconstruction may be necessary.

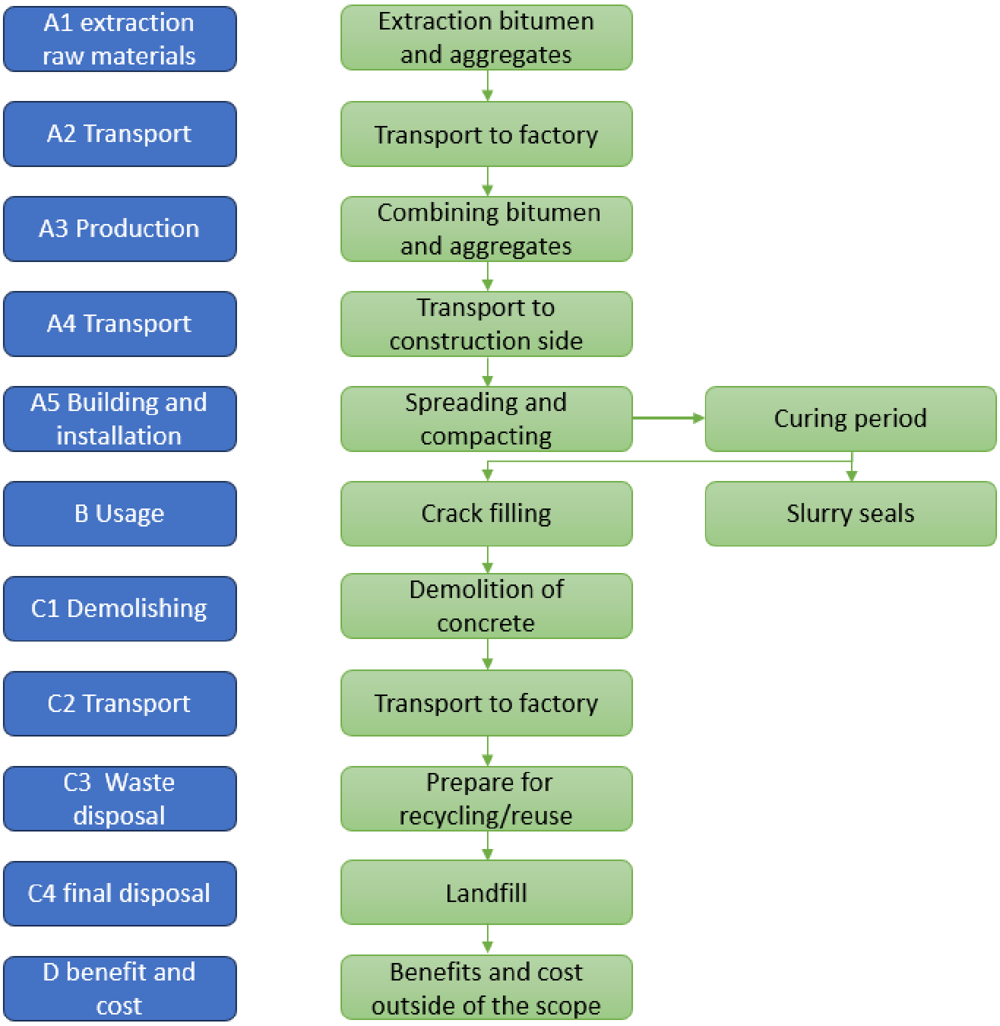


Figure 1 Production process concrete

4.2 Relevant scope 3 emissions

We may not directly control the production process itself, but we do have the ability to make choices regarding the materials used. These materials can emit varying amounts of CO2 during production. Consequently, we meticulously track all emissions stemming from the production process. Additionally, we engage in discussions with our supply chain partners to explore sustainable transportation options. Furthermore, our choice of materials can significantly impact downstream emissions. This comprehensive approach is why we meticulously map the entire life cycle, as detailed in Chapter 4.4.

4.3 Chain partner

As described in **'Scope 3 Dominance Analysis 2022'**, the only value chain partner involved in this project for asphalt is Heijmans. They supply asphalt for the project and are responsible for delivering the asphalt. Additionally, they provide the necessary equipment for asphalt placement. Various asphalt mixtures can be used within the project, and Heijmans serves as a collaborative partner, indicating the available mixtures they can supply and discussing their respective impacts.

4.4 Quantification of scope 3 emissions

To be devloped

5 Scope 3 emissions and subject analyses

In accordance with the guidelines in the GHG protocol and the CO2 Performance Ladder Handbook 3.1, the analysis of scope 3 was carried out on the basis of an analysis of 15 categories. Subsequently, the choice of the value chain is based on an identification of the most material scope 3 emissions done in Scope 3 Dominance Analysis document.

5.1 Choice for the value chain analysis

The VeenIX A9BAHO project is a large infrastructure construction project that is the entire scope of FCC Construcción (NL). Therefore, the majority of the project's emissions are related to upstream scope 3 activities, which are related to the purchasing of goods, capital goods, fuel and energy related activities and transportation. The full list of activities can be found in '**Scope 3 Dominance Analysis 2022'.**

Examining the 2022 scope 3 emissions, we have made several noteworthy observations. Based on the financial equity approach of 2022, the largest scope 3 emissions are due to the category purchased goods and services, as can be seen in '**Scope 3 Dominance Analysis 2022'.** This resulted in a total of 13.823,48 (87,63% of the total) tons CO2 emissions. The difference between the total in euros and the total in tons is caused by using different methods. The methods are explained in Chapter 2 of this report.

To tackle the emissions of the project effectively, we looked at the impact of all materials individually. In table 1 is this visualised.

For each material we also conducted a study as it came from mutliple suppliers. We have been looking for specific LCA's of each material. This to give a better understanding of all emissions within every phase of the life cycle. We are keeping track of all LCA's available to us which can be seen in Figure 2 overview LCA's'. The list below is continuesly updated in the file '**Overview LCA's and hours'** . By having complete LCA's we can really look what the CO_2 emissions are for each material and in which phases we can make the most impact. These LCA's go beyond CO_2 and give also indications of other environmental impact categories. This gives a better understanding of the total evironmental impact this project makes.

Although we are working on getting a good understanding of the total value chain of this project, we decided that for 2022 we will focus on ground and asphalt only. This is because these materials have the most impact and these materials are used earlier in the project timeline.

Number	LCA name	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
015	AC 22 Base Bin 35/50 60% PR BeStone [AP20060]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
016	AC 22 Base Bin 40/60 60% PR Greenway LE [AP2006	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
017	AC 22 Bin/Base 30/45 70% PR Bestone [AP20070]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
018	2L-ZOAB 8 PMB BeStone Twinlay [AP83407]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
019	2L-ZOAB 8 PMB 40% PR Twinlay [AP83447]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
110	DZOAB 16 70/100 BSt voorheen mengselcode [AP84	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
111	D-ZOAB 16 50/70 60% PR BeStone [AP84961]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
021	underwater concrete C20/25																	
022	concrete mixture C30/37																	
023	concreet mixture C35/45																	
024	Concrete mixture C45/55																	
025	Concrete mixture C67/75																	
026	Betonmengsel A9 C25 X0 SF1	x	x	x	x	?								?	x	x		x
031	Land sand																	
032	Ground																	
033	Hydraulic granulate																	
034	EPS																	
041	Reinforcement steel																	
042	Reinforcement steel																	
043	Scheetpile (fixed, temporary)																	
043	Scheetpile (fixed, temporary)																	
044	Wapeningsstaal voor toepassing ingewapende beton	x	x	x														
045	EcoSheetPile™ Plus - Green Electricity	x	x	x		x								x	x	x	x	x
045	EcoSheetPiles™ - Traditional Electricity	x	x	x		x								x	x	x	x	x
046	XCarb® Recycled and renewablyproduced structural s	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x
047	EcoSheetPiles™	x	x	x			x	x	x	x	x				x	x		x
048	Hot-rolled steel sheet piling																	
044	Profile steel (galvanised)																	
045	Anchors																	
046	Anchors																	
047	Barriers																	
048	Structural Steel: Sections and Plates																	
049	Formwork																	
051	Granuliet	x	x	x	x										x	x		x
052	Graniet 16/22	x	x	x	x										x	x		x
053	Graniet 8/16	x	x	x	x										x	x		x
054	Graniet 4/22	x	x	x	x										x	x		x
055	Graniet 4/16	x	x	x	x										x	x		x
056	Graniet 2/8	x	x	x	x										x	x		x
057	Graniet 0/4	x	x	x	x										x	x		x
058	Graniet 0/0,5	x	x	x	x										x	x		x
59	ISOBOUW POWERBLOCK EPS 150, MET TERUGNAME GARANTIE																	
061	CEM III/B 42,5 N	x	x	x														
062	CEM I 52,5 R	x	x	x														

Figure 2 overview LCA's