CHALMERS
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Environmental impact from space efficient dwellings

Can space efficient multi-family dwellings be beneficial to reduce the environmental impact from housing?

Master's Thesis in the Master's Programme Industrial Ecology

ASTRID BERGLUND
DAVID CEDERBOM

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Department of Civil and Environmental Engineering
Division of Building Technology
Sustainable Building
Chalmers University of Technology
SE-412 96 Göteborg
Sweden
Telephone: + 46 (0)31-772 1000

Cover:
Folkboende, a conceptual multi-family dwelling by NCC.

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ABSTRACT

Today Sweden has a great housing shortage leading to a demand of 710 000 new dwellings until the year 2025. At the same time the Swedish climate targets is to reduce the greenhouse gas emissions with 40 percent until the year 2020 and with 85 % until the year 2050 compared to the emissions the year 1990. The aim of this study is to examine if space efficient dwellings can be a beneficial option for housing when aiming to reach Sweden's climate goal. The purpose of the study is to define space efficient housing and to investigate the environmental impact from space efficient multi-family dwellings in relation to average size multi-family dwellings. To do this a study investigating the size of newly built dwellings has ben made and a life cycle assessment of two conceptual dwellings has ben performed.

Space efficiency can be defined as a ratio of square meters per resident. With this definition, space efficiency can be calculated with the measure total floor area (BTA) per resident. From this study the recommendation is that space efficient dwellings have total floor area per resident lower than 41,5 square meters.

According to this study the average size dwelling had 23-109 percent higher emissions per resident compared to the space efficient dwelling depending on impact category. This is partly due to the more residents per heated area, the lower the emissions from energy use per resident. It can also be explained with the fact that more residents per total floor area leads to lower emissions per resident from construction materials due to lower material use per resident. The greenhouse gas emissions per resident is 18,3 percent lower for space efficient multi-family dwellings in comparison to average size multi-family dwellings. Space efficient dwellings can hence be one part of the solution to lower the emissions from housing in the aim to reach Sweden's climate target.

Key words: Space efficiency, housing, climate target, LCA, new dwellings, global warming, environmental impact, multi-family dwelling

Contents

Preface

This master thesis is part of the M.Sc. program Industrial ecology of 120 ECTS at Chalmers University of Technology in Gothenburg, Sweden. A master thesis of 30 ECTS has been performed during the spring 2017 at the Department of Civil and Environmental Engineering and the Division of Building Technology. The working process has resulted in many interesting meetings and discussions within the subject. We would like to give a special thanks to Andreas Wikman and Matilda Linse at NCC for giving us the opportunity to work with NCC. We would further like to show our appreciations towards our supervisor Jun Kono and our examiner Holger Wallbaum at the Department of Building Technology for helping us through the process and guiding us in the right direction.

Stockholm June 2017
Astrid Berglund
David Cederbom

Notations

A1-A3	Construction materials
A4	Transportation to site
A5	Construction/Installation process
B1-B5	Maintenance and material replacement
B6	Energy use
B7	Water use
C1-C4	Deconstruction

A_{temp}	Heated area in a building
BBR	Boverkets byggregler (Boverkets rules for buildings)
BOA	Living area
BTA	Total floor area
CFC11	Trichlorofluoromethane
CO_2	Carbon dioxide
EN	European standard
EPD	Environmental product declaration
EPS	Expanded polystyrene
EQ	Equivalents
IPCC	Intergovernmental Panel on Climate Change
ISO	International organization for standardization
KTH	Kungliga Tekniska Högskolan (Royal Institute of Technology)
kWh	Kilowatt hour
LCA	Life cycle assessment
MJ	Megajoule
PBF	Plan- och byggförordningen (2011:338)
PCR	Product categorization rule
PO_4	Phosphate
SCB	Statistiska centralbyrån (Statistics Sweden)
SO_2	Sulfur dioxide
TJ	Terajoule
UK	United Kingdom
XPS	Extruded polystyrene

1 Introduction

During the 20th century the population in the world has grown from 1,65 billion to 6 billion (Worldometers, 2017). This trend will continue in the 21st century but at a slower growth rate, leading to challenges for land cover and land use changes that will be the result of supplying the population with their necessities. Land-use change and land covers lead to transformations in the condition of the surface and thereby affect the water cycle and the heat balance (Deng, 2014). The urban expansion further causes aggravation of the urban heat island effect. Land-use change is a problem that is critical for a series of problems including extreme climate, biodiversity protection and food safety. In Europe it also exists a land use change from agricultural land to artificial surfaces (Eurostat, 2012). With 38 percent of the land use, housing is the sector with the highest share of land use. The major environmental labels that exist today within the housing sector does however not take into account the size of the building and the amount of people the building can house (Warfvinge, 2014; Bergman, 2012; USGBC, 2017; BREEAM, 2014). This might result to misleading information regarding the environmental performance of the building.

In the year 2050 it is assumed that 70 percent of the world population will live in cities (WWF, 2014). In Europe the fastest growing city is Stockholm with expected population growth of 11 percent between 2015 and 2020 (Stein, 2015). This increase will lead to an even greater housing shortage than the present situation in Sweden. In Sweden today, 94 percent of the population lives in municipalities where there is a housing shortage (Hyresgästföreningen, 2017). Last year the municipalities with housing shortage increased with tremendously 31 percent. The absence of housing is most extensive in metropolitan areas and cities with universities, due to the inflow of people and the great childbirth, but is also present in smaller municipalities. The shortage is greatest within small and cheap rental apartments but exist also within villas and condominiums. Hardest to find housing do young people and newcomers have but also elderly that wants to move from villas to smaller apartments. The housing situation is very problematic for the development of the municipalities and regions in Sweden. Job opportunities and people willing to move for work exists but not the housing to make it possible (Tottmar, 2014). It is also a threat against the welfare system when those working within health and social care cannot find housing within a reasonable distance from their workplace (Hyresgästföreningen, 2017).

1.1 Background

To meet the demand for housing it is estimated that 710 000 dwellings needs to be built until the year 2025 (Boverket, 2016a). The Government in Sweden aims to build at least 250 000 new dwellings by 2020 (Regeringen, 2016). The interim targets that the government has put up for the housings are as follow:

- Long-term sustainable constructions.
- Effective regulatory framework as well as other policy instruments that are derived from a life cycle perspective with the aim to create effective recourse- and energy usage and well functioned indoor environment within construction and management.
- A well-functioning competition in the construction and property sector.

To be able to meet the demand for housing in the cities and still live up to the interim target as well as Sweden's climate goal, the construction of space efficient apartments can be one part of the solution (Fossilfritt2050, 2017). Today there are no agreement on what defines space efficiency or at what premises a building could be called space efficient. It is therefore necessary to investigate what space efficiency is as well as if space efficient multi-family dwellings can be one solution to reach Sweden's climate goal.

NCC is one of the leading construction companies in Sweden. Their vision is to renew the construction industry and provide the best sustainable solutions (NCC, 2017a). One of NCCs strategic goal is to half their carbon emissions to 2020 compared to 2015 (IVA, 2014). To be able to reach their climate goal, life cycle assessment (LCA) is a necessary tool in order to quantify the emissions.

Folkboende and Quattro are two conceptual dwellings that NCC provides. To quantify their environmental impact a life cycle assessment is carried out in this study.

1.2 Purpose

The purpose of the study is to define space efficient housings and to investigate the environmental impact from space efficient multi-family dwellings in relation to average size multi-family dwellings. The aim is to examine if space efficient dwellings can be a beneficial option for housing when aiming to reach Sweden's climate goal.

1.3 Delimitation

The study is limited to Sweden and will only investigate multi-family dwellings and the environmental part of sustainability. No research will hence be done within social or economical sustainability. The emissions from the dwellings are further related to the Sweden’s climate target 2050 and do not consider possible future climate targets after 2050. The delimitation and assumptions that is relevant for the performance of the LCA will be presented in Section 7.1.1.4.

1.4 Framing of question

- What is space efficient housing?
- What is the environmental impact of building space efficient multi-family dwellings compared to average size multi-family dwellings?
- Can building space efficient dwellings be beneficial in the aim to reach Sweden's climate goals?

2 Method

The project started with a literature study to investigate earlier findings in the field of this analysis. The main focus in the literature study were the definition of space efficiency. The theoretical framework was carried out by reviewing scientific articles and by collecting data of newly built multi-family dwellings in the field of this projects subject. The intention was to draw a more precise definition of space efficient dwellings. Experiences from similar research were brought into this project. Data was gathered of number of residents, living area and total floor area in multi-family dwellings. In those areas where the literature was inadequate, interviews with experts in the field of the subject were held. The interviews were performed using a semi structured interview method. When the literature study was finished the focus was directed against data collection. Data was gathered to that extent that it was sufficient for the whole life cycle of the studied buildings with exceptions for the delimitations of the life cycle assessment. The data consisted of material used in the buildings, the buildings expected lifetime as well as energy and water consumption used during production and operational stage of the buildings. Where data was not found or sufficient, assumptions were made and motivated. When the data collection was completed, the life cycle assessment was carried out by using the software One Click. The life cycle assessment was performed on a building that represents a space efficient dwelling according to this report's definition and on a building that represent a newly built average size multi-family dwelling. Functional unit used for the life cycle assessment was "residents during building's lifetime". The results from the life cycle assessment of the buildings was then related to Sweden's climate target for those new 710 000 dwellings that are needed in Sweden to 2025. In the final stage the results were analyzed and discussed.

3 Building terms

In this section, terms related to building that will be used in this report are explained.

3.1 BOA, BTA and utilization factor

BOA is a measure of the living area in an apartment or building and mostly used when leasing or selling apartments (Stockholm stad, 2016). The term BTA however refers to the total floor area and is often used for building permits. It is a measure of all surfaces above ground with some exceptions for balconies, parking lots in the basements and space for technology (such as space for elevator machine and for the fan system). BOA divided by BTA is a measure commonly used in the business to understand how much of the total area in the building that is used for living and often referred to as the utilization factor (Utilization factor = BOA / BTA). Figure 1 and 2 below shows examples of BOA and BTA.

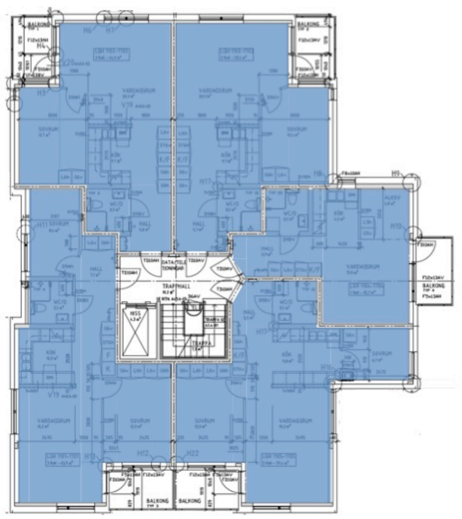

Figure 1. Example of BOA.

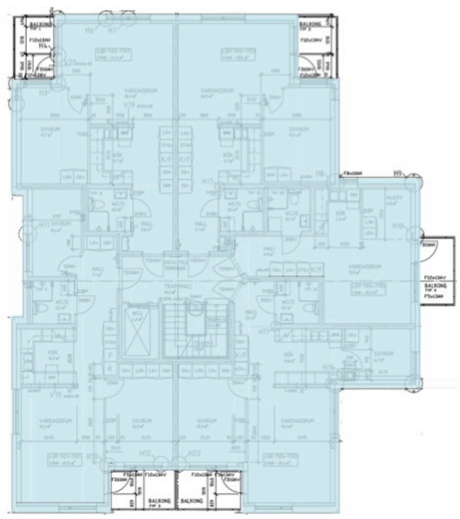

Figure 2. Example of BTA.

3.2 A_{temp}

A_{temp} is the internal area that is heated over ten degrees Celsius in the building and is measured in square meters. A_{temp} is the area used for calculation of the specific energy consumption for buildings (Boverket, 2014).

4 Limitation to space efficient housing

Sweden has a lot of regulations that is controlling the construction business and what functions a housing must consist (BFS 2016:13). How these regulations affect the aim to build space efficient and how the market interpret these regulations is presented below.

4.1 BBR

How big a housing must be, and hence also how small it may be, is affected by the requirements for housing design and accessibility, which is described in BBR (Boverket, 2016b). BBR contain both mandatory provisions and general recommendations. What functions the housing must contain is described in BBR 3:22. In BBR 3:146 there are regulations regarding the accessibility for people with reduced mobility (Boverket, 2015). There are also specific design rules for the following types of housing (Boverket, 2017).

- Housing larger than 55 m2 (section 3: 222).
- Housing larger than 35 m2 and no more than 55 m2 (section 3: 223).
- Housing of up to 35 m2 (section 3: 224).
- Student housing of up to 35 m2 (section 3: 225).
- Housing for a group of residents, for example, collective housing with common spaces (section 3: 226).
- Homes intended for a single person (section 3: 227).
- Special housing for the elderly (section 3: 228).

Dwellings with an area bigger than 55 square meters must be designed with consideration to the numbers of persons for which they are intended and dwellings with an area smaller than 55 square meters should be designed with consideration to the size of the dwelling.

In a new resident it must always be room for functions like sleep and rest, cooking, meals, daily living, personal hygiene and storage (Boverket, 2016b). It is possible to bring together certain functions in common areas but to what extent depends on the expected purpose of the accommodation (Boverket, 2017). There are also regulations regarding light in the building, thermal climate, fire protection, dangerous substance, room height and noise protection to mention a few. The rules aim to find the lowest level of requirement that still result in a functioning home with a good standard. It is further important that the housing should be dimensioned and disposed to favor a long-term use (Boverket, 2017).

The regulations of housings purpose are to ensure that all new residents have a design suitable for its purpose and that it allows a good living standard for the residents (Boverket, 2016b). This is something that permeates the whole regulatory system.

4.2 The construction industry's understanding of the regulations

The general view from the contractors is that the regulations in BBR complicate the construction of space efficient dwellings (Anheim, 2015; Karlman, 2016). However, if looking at the present regulations this is not the case according to Roxbergh[1] and Torngren[2] (Karlman, 2016). For about eight years ago the regulatory framework was stricter but this has gradually changed. According to Roxbergh and Torngren, it is today possible to construct apartments with one room and kitchen smaller than 35 square meters and an apartment with two rooms and kitchen smaller than 40 square meters. This makes it possible to design apartments optimized to add maximal value for the resident within quality of living and economy but also increase the architect's obligation to design dwellings where every square meter add quality to the residents.

4.3 Functions in multi-family dwellings over time

It is not a coincident that the regulations in Sweden are conducted in the present way. The existing rules and regulations are elaborated during a long time and reflect the history within house construction.

The standard in the Swedish homes was in the beginning of 20th century one of the worst in Europe, where overcrowding and the poor indoor environment was a big problem for the residents (Nylander, 2014). This led to a new movement, starting in the year 1930, stating that comfort should be present in all homes independent of what class the residents had (Nylander, 2013). One of the first steps from the government was to introduce a social housing project that helped those considered to have the worst housing situation, families with many kids (Nylander, 2014). During this period different rooms got different functions (Eriksson, 2015a). Previously it was common to have one room where the families did everything, now it started to get more common to have one room for sleep, one room for eating and one room to socialize. Also to have a bathroom inside the apartment got more usual during this period. The trend with higher standards was continuing and during the 40's the apartments standard was incrementally better. The social housing project was disappearing to instead include the whole population in Sweden (Nylander, 2014). As the Minister for Social Affairs put it "only the best is good enough". The housing constructed during this period was of the best quality. In the end of 1950 the broad quality approach was abandoned in favor for quantity. The support for industrialized construction increased and the projects grow bigger. Subsidies and building codes was governing the design, everything was standardized and regulated (Eriksson, 2015a). The size of an apartment increased continuously during the 60's and in 1967 the requirements for space standard were raised with a requirement of a kitchen, a living room and a room for sleep in a dwelling constructed for two people (Nylander, 2013). When the big investments on industrial production ended in beginning of 1970, Sweden was one of

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[1] Kristoffer Roxbergh, (Arkitekt, White Arkitekter) interviewed by the authors 11th april 2017

[2] Mikael Torngren, (Business manager, Lindbäcks Bygg AB) interviewed by the authors 13th april 2017

the best in Europe when it came to well-equipped and well-planned homes and there was no longer a housing shortage (Nylander, 2014).

One big change that took place during the 21st century was the instruction of accessibility requirement. The government in Sweden decided upon a strategy for the implementation of disability policies with the aim that the society should be designed so that everybody can participate indifferent to functional impairment.

4.4 Conclusion

The regulations have changed over the years with the aim to increase the standard of living in Sweden. The focus has been to build housings with a high living standard for all residents in Sweden. Historically a higher living standard have meant more spacious dwellings. Will this trend continue? Today Sweden has a lot of regulation within construction of housing. It is nevertheless still possible to construct small dwellings even though it increases architect's obligation to include all the required functions in a smaller area.

5 Space efficiency

This chapter will investigate how space efficiency can be measured within multi-family dwellings and how this measure can be used to define space efficient dwellings.

5.1 Multi-family dwellings in Sweden

This part will bring up information and statistics about new multi-family dwellings focusing on how much area per resident the dwellings are constructed for.

5.1.1 Average number of residents in apartments

Sveby is developing a program for the Swedish branch organization for building and real estate business (Sveby, 2017). They have established standardized inputs for the branch organization. In their report they give recommendations for the number of residents per apartment of different sizes, in Table 1 the recommendations from Sveby is presented (Andréasson, 2012). This recommendation is used later in this report to calculate the number of residents in the different multi-family dwellings that is studied.

Table 1. Recommended number of residents per apartment of different sizes (Andréasson, 2012).

Number of rooms	Residents
1 Room & kitchen	1,42
2 Rooms & kitchen	1,63
3 Rooms & kitchen	2,18
4 Rooms & kitchen	2,79

5.1.2 New multi-family dwelling

In this section, statistics of completed multi-family dwelling in metropolitan areas in Sweden 2014 will be presented with the aim to investigate how the average dwelling is constructed today focusing on the amount of rooms and the size of the apartments.

In the metropolitan areas in Sweden, 11 114 apartments were completed in 2014. The majority of the apartments had one to four number of rooms and how many of each apartment size is presented in Table 2.

Table 2. Apartments in multi-family dwellings completed in Sweden 2014 and their size of number of rooms (SCB, 2015a).

	Total apartments	**1 room & kitchen**	**2 rooms & kitchen**	**3 rooms & kitchen**	**4 rooms & kitchen**
Metropolitan area [pcs]	11114	1328	4179	3643	1964
Percentage [%]	100	12	38	33	17

The average living area (BOA) for the different apartment sizes is listed in Table 3, the average BOA for all completed apartments is 68 square meters for the new constructed multi- family dwellings completed in Sweden 2014.

Table 3. Average living area for apartments in multi-family dwellings with a size of 1-4 rooms and kitchen (SCB 2015a).

	All apartments	**1 room & kitchen**	**2 rooms & kitchen**	**3 rooms & kitchen**	**4 rooms & kitchen**
Average BOA [m^2]	68	37	56	78	97

5.1.3 Average hypothetical building

If a hypothetical multi-family dwelling would be build with 30 apartments and have the apartment sizes and average BOA as the completed multi-family dwellings from 2014 it would have the properties as presented in Table 4. The total BOA for the building with these properties would be 2029 square meters. This building will be referred to as the "average hypothetical building". In chapter 5.2.3 the building will be compared with dwellings marketed as space efficient, in terms of size and residents per area.

Table 4. The hypothetical new average multi-family dwelling (with 30 apartments) with the average BOA and apartment size as for completed new built multi-family dwellings.

Number of rooms	**Average BOA [m^2]**	**Units [pcs]**
1 Room & Kitchen	37	4
2 Rooms & Kitchen	56	11
3 Rooms & Kitchen	78	10
4 Rooms & Kitchen	97	5

According to a study from Bygganalys and KTH the average utilization factor (BOA/BTA) is 0,703 in new built dwellings in Sweden 2005 (Li, 2005). If assumed that the average hypothetical building has that utilization factor, the total area (BTA) for the hypothetical building would be 2886 square meters (BTA=BOA/Utilization factor =2029/0,703= 2886 square meters).

The total amount of residents in the average hypothetical building and the number of residents per area is presented in Table 5. To calculate the total amount of residents in the buildings the recommended amount of residents per apartment of different sizes, explained in Section 5.1.1, is used (Andréasson, 2012).

Table 5. Areas, residents and ratio of area and residents for the average hypothetical building.

	Total Residents	**Total BTA[m^2]**	**Total BOA[m^2]**	**BTA/Residents [m^2/resident]**	**BOA/Residents [m^2/resident]**
Average	59	2886	2029	48,62	34,18

As presented in Table 5, a resident use 34,18 square meters living area and 48,62 square meters of total floor area in an average new dwelling. This data will be further analyzed in Section 5.2.3.

5.2 Space efficient housing

In this section the definition of space efficiency will be investigated. Since the amount of literature within this area is poor space efficiency will be studied by looking at new dwellings in Sweden that is marketed as space efficient and compare them in terms of area per resident. This will be done with a similar method used by Skanska to optimize office buildings.

5.2.1 General information

Sweden has one of the biggest living areas per person in Europe. The accommodation space year 2012, measured as living area, is 42 square meters per person (SCB, 2013). At the same time the average living area per person in European union is only 32,2 square meters (Eurostat, 2017). There are also big differences within Sweden. In Emmaboda people live on an average of 54 square meters, which is highest in Sweden (SCB, 2016). The least floor area per person do people in Stockholm have with 33 square meters per person.

During the last ten years the average size of an apartment in Sweden has decreased by 8.6 percent (Bennewitz, 2012). Statistics from SCB shows that the size of an average apartment has shrunk from 81 square meters in the year 2001 to 68 square meters in 2014 in the metropolitan areas in Sweden (SCB, 2016). The shrinking depends partly on more space efficient apartments, to fit more in less area. In an interview held by Stockholms Byggnyheter with Runnäs[3], project manager for HSB, he states that the customer’s requests more space efficient apartments (Ståhl, 2015). Runnäs also confirm that the customers demand more rooms on less area. The sustainability committee of National Institute of Building Sciences in United States gives the

[3] Michael Runnäs, (Project Manager, HSB) interviewed by Stockholms Byggnyheter 2015

recommendation to reduce the overall building size by optimizing the functional relationships of the building and configuring individual spaces to accommodate several complementary functions when designing new buildings (WBDG Sustainable Committee, 2016).

There is no strict definition for space efficiency in the building sector. Ebab, a technical consultant company in the construction sector, define space efficiency as the utilization factor (the relationship between BOA/BTA) for a building to be preferably 0,85 but no less than 0,82 to be a space efficient building (Löfdahl, 2013). In an evaluation of optimized development of an office building, Skanska measured the space efficiency for the building as the ratio of total floor area (BTA) per office workplace with the goal to increase office workplaces per square meter BTA, according to Andersson[4].

5.2.2 According to actors in the construction business

In this section multi-family dwellings marketed as space efficient will be presented. The dwellings will in tables be presented in number of rooms in the apartments, the residential living area and number of apartments.

5.2.2.1 Size and area of new dwellings marketed as space efficient

Wästbygg is a building developer and construction company (Wästbygg, 2017). Wästbygg builds new multi- family dwelling with 109 apartments in central Jakobsberg, outside of Stockholm, that will be completed during 2017 for HSB (HSB, 2017). According to HSB, the new multi- family dwelling Mandarinen is space efficient. This is characterized by functional apartments with a smart layout where every square meter is exploited. The apartments have one to three rooms and the area varies from 32 to 69 square meters. The total floor area for the multi- family dwelling is 1578 square meters and the total living area is 1145 square meters.

Table 6. Amount of rooms, average BOA for the apartments and units for Mandarinen (HSB, 2016).

Number of rooms	BOA [m^2]	Units [pcs]
1 room and kitchen	32	3
2 rooms and kitchen	50,5	10
3 rooms and kitchen	68	8

PEAB is one of the largest construction companies and building developer in Sweden (PEAB, 2017). With the compact house Capella PEABs goal was to create small space efficient apartments for one and two persons (SABO, 2014). The aim was that

[4] Martin Andersson, (Sustainable Business Development, Skanska) interviewed by the authors 2nd march 2017.

people living in the apartment would have room for much on a small space. The apartments have one to two rooms and an area that varies from 35 to 45 square meters. The total floor area for the multi-family dwelling is 1400 square meter and the total living area is 965 square meters.

Table 7. Amount of rooms, average BOA for the apartments and units for Capella (SABO, 2014).

Number of rooms	BOA [m^2]	Units [pcs]
1 room and kitchen	35	7
2 rooms and kitchen	45	16

Nyhem delivers building systems with space efficient apartments for developers and organizations (Nyhem, 2017). Their lamellar building are built in five levels and have apartments with one to two rooms with an area that differ between 27 and 40 square meters. The total floor area for the multi- family dwelling is 3400 square meters and the total useful floor area is 2600 square meters.

Table 8. Amount of rooms, average BOA for the apartments and units for Nyhem (Nyhem, 2017).

Number of rooms	BOA [m^2]	Units [pcs]
1 room and kitchen	27	35
2 rooms and kitchen	40	20

NCC is one of the largest construction companies in Sweden (NCC, 2017a). Folkboende is their concept building designed for optimal apartment solutions (NCC, 2017b). The apartment is planned for space efficiency and high quality living. The concept has several different floor plans. The apartments have one to three rooms and an area that varies from 36 to 64 square meters (NCC, 2015). The total floor area for the multi- family dwelling model Folkboende 5536 is 2703 square meters and the total living area is 1980 square meters. The total floor area for the multi- family dwelling model Folkboende 6436 is 3490 square meters and the total living area is 2631 square meters.

Table 9. Amount of rooms, average BOA for the apartments and units for Folkboende 5536 (NCC, 2015).

Number of rooms	BOA [m^2]	Units [pcs]
1 room and kitchen	36	7
2 rooms and kitchen	53,75	16
3 rooms and kitchen	62	14

Table 10. Amount of rooms, average BOA for the apartments and units for 6436 (NCC, 2015).

Number of rooms	BOA [m^2]	Units [pcs]
1 room and kitchen	-	0
2 rooms and kitchen	54	14
3 rooms and kitchen	62,5	30

Lindbäcks bygg AB is according to their website the leader in Sweden within industrial construction of multi- family dwelling (Lindbäcks bygg, 2017). Lindbäcks concept building Aurora is developed for space efficiency. The architect of the concept Henric Munde states that every square meter is used to its full potential (SABO, 2014). The apartments have one to two rooms and an area that varies from 35 to 45 square meters. The total floor area for the multi- family dwelling is 1680 square meters and the total living area is 1140 square meters.

Table 11. Amount of rooms, average BOA for the apartments and units for Aurora (SABO, 2014).

Number of rooms	BOA [m^2]	Units [pcs]
1 room and kitchen	35	12
2 rooms and kitchen	45	16

IKANO is a construction company that aims to construct the living of the future (IKANO, 2017a). About their new project Brf Dekorera in Gustavsberg IKANO states that the apartments are built space efficient so that the residents can get the most out of the area (IKANO, 2017b). The apartments have two to three rooms and kitchen and the area varies from 42 to 72 square meters. The total floor area for the multi-family dwelling is 1600 square meters and the total living area is 1098 square meters.

Table 12. Amount of rooms, average BOA for the apartments and units for Brf Dekorera (IKANO, 2017b).

Number of rooms	BOA [m^2]	Units [pcs]
2 rooms and kitchen	42	9
3 rooms and kitchen	72	10

5.2.2.2 Residents and area statistics of dwellings marketed as space efficient

The total amount of residents in the dwellings marketed as space efficient, and residents per area is presented in Table 13. For the calculations of the total amount of residents in the buildings the recommendations on the number of residents per apartment of different sizes is used (Andréasson, 2012). The dwellings areas are comparable with the average hypothetical building presented earlier, since they have the same functions regarding storage, washing possibilities etc. within the total floor area of the building.

Table 13. Total residents and area per resident of multi- family dwellings marketed as space efficient.

Dwelling	**Total Residents**	**BTA / Residents [m^2/resident]**	**BOA / Residents [m^2/resident]**
Mandarinen	38	41,52	30,13
Capella	36	38,87	26,79
Nyhem	82	41,31	31,59
Folkboende 5336	67	40,62	29,76
Folkboende 6436	88	39,56	29,82
Aurora	43	38,96	26,43
Brf Dekora	36	43,87	30,11
Average space efficient dwelling		40,67	29,23

As can be seen in Table 13 BOA per residents varies with 5,16 square meters between the highest and lowest measure. Further do BTA per residents varies with 5,00 square meters. The average total floor area per resident is 40,67 square meters per resident and 29,23 square meters living area per resident for the space efficient buildings.

5.2.3 In relation to new multi-family dwellings

In Section 5.1.3 and 5.2.2 the residents per area of new multi-family dwellings was presented. In Table 14 there is a compilation of the average values for buildings marketed as space efficient and the average hypothetical building

Table 14. Comparison of area per resident between average new built multi-family dwelling and average dwelling marketed as space efficient.

Average	**BTA / Resident [m^2/resident]**	**BOA / Resident [m^2/resident]**
New multi-family dwelling	48,62	34,18
Marketed as space efficient	40,67	29,23

The table is conducted to make a comparison possible between the BTA per residents and BOA per residents. According to Table 14 the space efficient dwelling has 8 square meters less total floor area per resident and have 5 square meters less living area per resident than the average new built multi-family dwelling.

5.3 Conclusion

There is no clear definition of space efficiency neither in the literature nor within the construction business. In the literature space efficiency is defined in a diffuse and imprecise way and by actors in the construction business space efficiency is described as “fitting more in less area” or “to get more out of less space”. The focus is to get more out of the area in the apartment, rather than the amount of residents the dwelling can house. To get a more precise definition of space efficiency and to make the term usable in the comparison between dwellings, conclusions can be drawn from the study of dwellings presented in earlier chapters. The suggested recommendation for space efficiency is inspired by Skanska’s solution for optimization of an office building.

Space efficiency can be defined as a ratio of square meters per resident. With this definition, space efficiency can be calculated either with the measure BTA per residents or BOA per resident. The lower the ratio is the more space efficient the building is, which means that each resident use less floor area. Which ratio that best describes space efficiency depends on what functions that is situated in the dwellings and apartments. If using the ratio BOA per residents it is important that the apartment contains the same functions within the BOA to be comparable. The storage room can for instance either be placed inside the apartment or in the basement of the building and the space to do laundry can either be places inside the apartment or in separate washing rooms for sharing. This makes the usage of BOA per residents as a measure of space efficiency uncertain and unreliably. The usage of BTA per resident as a measure for space efficiency will meet equal uncertainties. The recycling or bicycling storage can for instance be placed either in a separate room inside the dwelling or in a separate house in connection to the dwelling.

The author’s recommendation is therefore to use BTA per resident as a measure for space efficiency but to be observant that all required functions are present in that area. If a required function is placed in a construction outside the residential building this construction should also be included in the BTA that is used to measure space efficiency. It is further important to take into consideration present optional functions that might be included in a construction. If the building is housing bicycle storage this will for instant make the BTA per person higher in comparison with a building without such storage. This makes it impossible to measure space efficiency in absolute terms since other functions in the building might give additional social and environmental values. If having this understanding of the definition, the quota BTA per resident will give a good measure of how space efficient a building is.

Within dwellings marketed as space efficient the average BTA per resident is 40,67 square meters. Of the seven dwellings used in this study, one has a BTA that is higher than 43 square meters per resident. Except for this dwelling no other building has a BTA higher than 41,52 square meters per resident. The authors of this research will therefore recommend that space efficiency will be defined as to include dwellings with a BTA per resident lower than 41,5 square meters. This can be compared with the average new built multi-family dwelling where BTA per residents is 48,62 square meters.

6 Framework of life cycle assessment

In this chapter an introduction of the Life cycle assessment framework will take place. Further, other studies within the subject are presented. This is done to get an overview of the assessment method used in this study as well as previous work done within the area.

6.1 LCA procedure

Life cycle assessment (LCA) has been brought forward as a comprehensive method for analysis of the environmental impact of products and services (Baumann, 2004). The product or service is followed from where the raw materials are extracted from the natural resources through the production and use to the disposal and waste management of the product or service. The natural resource use and pollutant emissions are in quantitative terms described and presented.

LCA is defined through the procedure of performing an LCA (Baumann, 2004). The LCA process according to ISO 14040 is illustrated in Figure 3 below as how such studies are carried out.

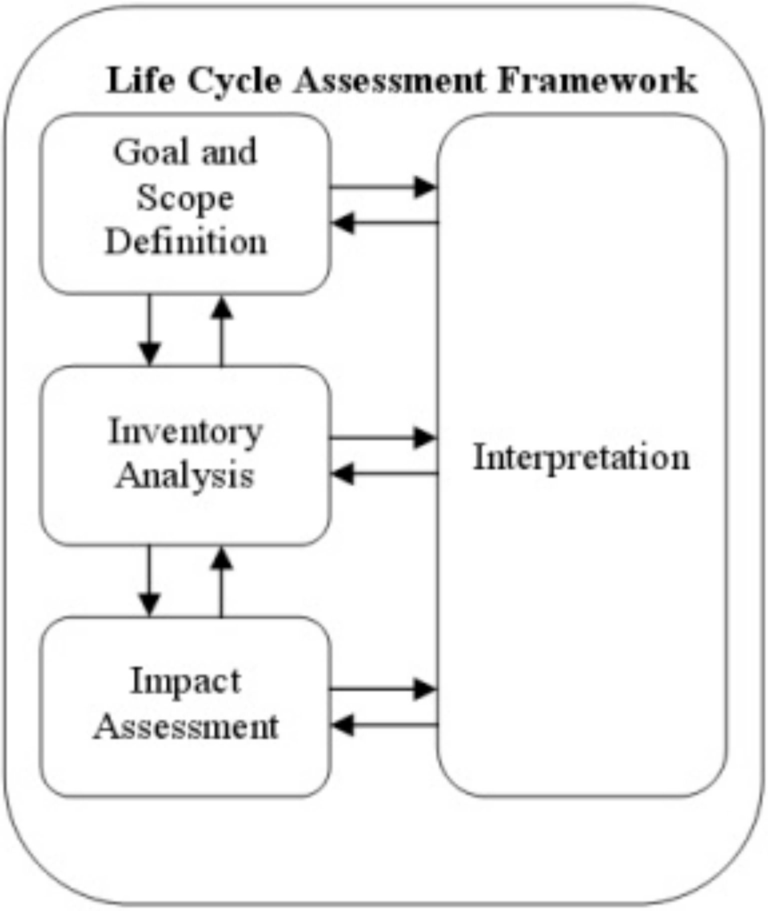

Figure 3. The LCA procedure (Pavement interactive, 2012).

First, in the LCA procedure is the goal and scope definition where the product of study and the purpose of the LCA are specified (Baumann, 2004). Construction model of the products life cycle are presented in the inventory analysis also the calculation of emissions produced and the resources used during the life cycle is done in this phase. In the impact assessment, the resources and emissions are classified to various environmental problems and later interpreted in appropriate way for the study.

6.1.1 Functional unit

To make the LCA study comparable with other analyses, all modeled flows must be corresponding to one reference flow (Baumann, 2004). This reference flow is referred to as the functional unit of the study. Even though a construction or construction material does not have just one function, one functional unit must be chosen. Flooring for example could be compared with a functional unit that reflects the function of the load bearing capacity. The flooring does however have other properties that could be equally important, for example noise reduction and fire protection. Since all the inputs and outputs of the study will correspond to the functional unit, the result of the study is highly dependent on which function it represent. It is therefore very important that the functional unit is relevant and reflects a fair comparison.

6.2 Application of LCA

LCA is one assessment tool useful to derive the environmental impact of products and services (Baumann, 2004). LCA studies the whole product system and the results are related to the function of a product, which allows comparisons between alternatives. A comparison could for example be made between an electrified car and a car driven on fossil fuel. Since economical and social aspects are not included in an LCA only the environment is of concern. Baumann mention the following applications for LCA:

- Decision making, e.g.
  - Product/process design and development.
  - Purchasing.
  - Support for regulatory measures and policy instruments.
- Learning and exploration, e.g.
  - Identification of improvement possibilities.
  - Selection of environmental performance indicators.
  - Characterization of production systems.
- Communication, e.g.
  - LCA-based eco-labeling.
  - Environmental product declarations.
  - Benchmarking.

6.3 LCA in construction industry

In construction industry the LCA study is often very complex (Buyle, 2013). This is due to several issues, for example:

- Long lifespan for the building (50-100 years).
- A shorter lifespan for some elements and components of the building.
- The use of many different materials and processes.
- The unique character of each building.

The longer lifespan leads to more assumptions and thereby the uncertainty increases which can influence the credibility of the results (Buyle, 2013). A lot of the LCA studies made in the construction industry are simplified, only a few of the studies consider other impact categories than energy. There are studies that cover the whole life cycle but most of them only cover some life cycle stages. Also not all studies cover the same life cycle stages. This makes the different studies less comparable. Aspects like transportation, water use, waste and maintenance are often excluded. The accuracy also tends to differ in the studies, some studies are not as detailed and only takes account the most obvious products and processes. Previous studies have focused on the use phase and come to the conclusion that 60-90 percent of the environmental burden can be derived from this phase, mainly with contribution to Global warming potential. New buildings are designed for being more energy-efficient. The next step for the research is thereby to consider the relevance for all phases in the life cycle of a building.

The replacements of components are in the studies often predicted to be exchanged after the assumed technical lifespan by the same components (Buyle, 2013). In reality the components are more likely to be replaced by new technology with better performance and more radical renovations will often be carried out to meet the new comfort demands. These aspects will clearly influence the use phase and need to be taken into account to give a realistic result but since LCA is a static tool this is often not handled. One way to include new technology in the study would be to including different scenarios.

Most of the studies carried out today are executed according the framework described in the ISO 14040 series (Buyle, 2013). Even though, buildings are not directly comparable. There are initiatives at various levels in the industry working to improve the comparability of the studies. ISO the international standard organization is working on developing their standard for LCA on buildings. European union has also developed a method for LCA to make the studies of building comparable. Environmental product declaration is another incentive that gives information of a product's environmental impact in a transparent way. These incentives are further described below.

6.3.1 ISO 14040 and 14044

ISO 14040:2006, Environmental management — Life cycle assessment — Principles and framework describes the principles and framework for conducting and reporting LCA studies (ISO, 2016a). The following stages are included.

- Definition of goal and scope.

- Life cycle inventory.
- Life cycle impact assessment.
- Interpretation.
- Reporting and critical review.
- Limitations.
- Relationship between stages.
- Conditions for value choices and optional elements.

ISO 14044, Environmental management — Life cycle assessment — Requirements and guidelines specifies the requirements and provides guidelines for the stages mentioned above (ISO, 2016b).

6.3.2 EPD and PCR

Environmental product declaration (EPD) is an independent verified and registered document that gives transparent and comparable information about a product's environmental impact in a life cycle perspective (EPD International, 2017a). EPD is created and verified in accordance to the standard ISO 14025 and EN 15804.

Product category rules (PCR) are a set of rules, guidelines and requirements for developing EPD for one or more product categories, e.g. construction materials (EPD International, 2017b). They are important for EPDs as they give transparency and comparability between different EPDs based on the same PCR (EPD International, 2017b).

6.3.3 EN 15978 and EN 15804

EN 15978 is the European Standard that specifies calculation methods based on LCA (European Standard, 2011). It is used to assess the environmental performance of a building and gives means for communicating and reporting the outcome of the assessment. The assessment covers all stages of the buildings life cycle and is based on data obtained from EPDs. It includes all building related construction products, processes and services over the life cycle for the building (Svensk standard, 2011). The standard gives:

- Description of the object of assessment.
- System boundaries applied at the building level.
- Procedure to be used on inventory analysis.
- The list of indicators and procedure to calculate the indicators.
- Requirements for presentation and communication of the results.
- Requirements for the data necessary for the calculation.

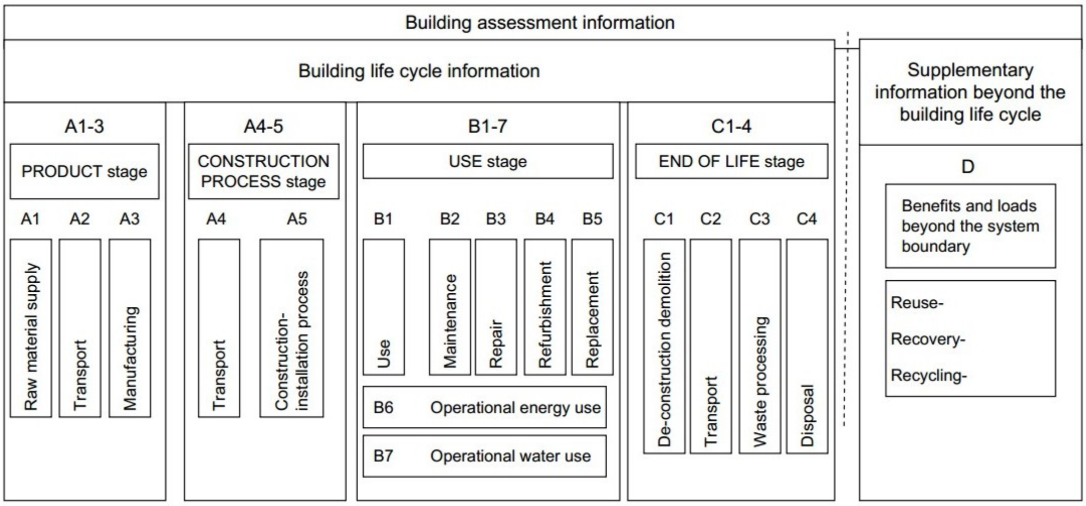

Figure 4. Life cycle stages of a building according EN 15978 (Giesekam, 2015).

EN 15804 is the European Standard that regulates how the set of rules in the Product category rules (PCR) should be set for any construction type or construction service (European Standard, 2013). The standard defines:

- The parameters to be declared and how they are collected and reported.
- The product's life cycle stages and processes considered to be included in the EPD.
- The rules for scenarios.
- The rules for calculating the life cycle inventory and life cycle impact assessment for the EPD.
- The specification of the quality of the data to be applied.
- Rules for reporting environmental and health information not covered by the LCA.
- Conditions for the products to be compared based on the information provided by the EPD.

6.4 Similar studies

In this section other studies performed on the subject will be presented to get an overview on what has already been investigated within the area.

6.4.1 Environmental impacts of the UK residential sector

In the article *Environmental impacts of the UK residential sector: Life cycle assessment of houses* Cuéllar-Franca and Azapagic investigate the environmental impact from the housing sector in UK using life cycle assessment (Cuéllar-Franca, 2012). To do this the three most common dwelling types (detached, semi- detached and terraced) in UK were analyzed and compared. Together these types of dwellings represent a major part (72 percent) of the total stock. The size and characteristics of each dwelling type used in the analysis are typical for each construction.

The dwelling were compared both with the functional unit "per square meter over its lifetime" and "construction and occupation of a house over its lifetime" (Cuéllar-Franca, 2012). The lifetime of the buildings was estimated to 50 years and it was assumed that each house is occupied by the average UK household size, consisting of 2,3 people. The energy use spanned from 160 to 194 kWh per square meter and year, as a comparison the regulated limit for new houses of the same types in Sweden span from 50 to 130 kWH per square meter and year depending on climate zones (BFS 2016:13) (Cuellar-Franca, 2012). The modeling was carried out with GaBi V4.3 and the method CML 2001 was used to study the environmental impact. A full LCA with construction stage, user stage, demolition stage and transport was applied. The impact categories included in the study are Global warming potential, Acidification potential, Abiotic depletion potential, Eutrophication potential, Ozone layer depletion potential, Human toxicity potential, Terrestrial ecotoxicity potential, Freshwater aquatic ecotoxicity potential, Marine aquatic ecotoxicity potential and Photochemical ozone creation potential.

The result indicated that the emissions connected to cooking, appliances and water heating are connected to the number of people living in the house while the emissions from lighting and heating mostly depends on the construction properties of the house such as material, size and type, etc (Cuéllar-Franca, 2012). If using the functional unit "the house over its lifetime" the most significant impact within all impact categories except ozone layer depletion potential originated from the user stage. Also the smaller the house is, the lower the impact is. This is demonstrated in the report showing the result from the Global warming potential but the effect is stated to be similar in the other impact categories as well.

When studying the impacts per unit of floor area the house with the biggest floor area have the lowest impact (Cuéllar-Franca, 2012). This is due to most of the environmental impacts are greatly influenced by the use of energy. The use of energy depends both on the type of house, the size of the house and the household size. The lighting and the space heating is for example functions which depend on the size and the type of house, which varies in this study. The cooking, use of domestic appliances and water heating however are functions that relate to the household size, which are the same for all houses in this study. It is therefore not surprising that a larger floor area will have a lower impact than a smaller one. This was true for all factors except for the ozone layer depletion, which is not dependent on energy but the construction material that is more or less proportional to the size of the house.

The LCA conducted on these houses were then used to investigate the life cycle impact from the whole house stock in UK (Cuéllar-Franca, 2012). The number of houses of each type is used together with the LCA result to get the total amount of emissions. This gave an estimation of 72 percent of emissions from the existing stocks. This was done for all impact categories.

6.4.2 Analysis of three building types in a residential area in Lisbon

Bastos, Batterman and Freire present the life-cycle energy and greenhouse gas emission for three residential buildings in Lisbon in the article *Life-cycle energy and greenhouse gas analysis of three building types in a residential area in Lisbon* (Bastos, 2014). The buildings that were considered are situated in the same area and consist of low rent dwellings. The construction method was standardized and the same types of dwellings, buildings and techniques were used repeatedly. The three buildings have different areas (total gross area span from 122 to 472 square meter with building type 2 being the smallest and type 9 the biggest) but situate the same amount of apartments on each floor. Two different functional units were analyzed: "per floor area per year" and "per inhabitant per year". The life span of the building was set to 75 year, due to the construction year 1940, and an average occupancy of 1.5 persons per dwelling unit were assumed, average for urban areas. The study took into account the construction stage, use stage and retrofit phase (Replacement of wooden floors and windows in about 50 percent of the buildings, additional insulation, replacement of roof tiles, partial replacement of wall masonry). Inventory of carbon and energy (ice) version 2.0 was used to estimate the embodied energy and greenhouse gas emission in the construction face. The result was first presented separately for each stage of the process.

In the construction phase the study indicate that on square meter basis larger buildings result in lower embodied energy and greenhouse gas (Bastos, 2014). This was primary due to smaller contribution of walls. If looking at the total emissions per house the larger house will contribute to larger emissions due to the larger amount of material needed in the construction. The same tendency can be seen in the retrofit phase. This can be explained with the higher ratio of building envelope per floor area that is the case in smaller apartments.

When studying the user stage, the smallest buildings stand for the lowest energy requirements and greenhouse gas emissions per person (Bastos, 2014). If observing the impact per square meter however, the bigger the house was, the less energy and greenhouse gas emissions. This was due to the area per volume and area per occupancy ratios. The higher living area there was in a dwelling the more building envelope surface there were, leading to higher energy need. Also the larger the area was per inhabitant, the lower energy consumption per square meter.

The result from the different stages of the life cycle was also summed up and presented as the total amount both for the energy and the greenhouse gases as well as for the two chosen functional units (Bastos, 2014). See Figure 5 and Figure 6 below.

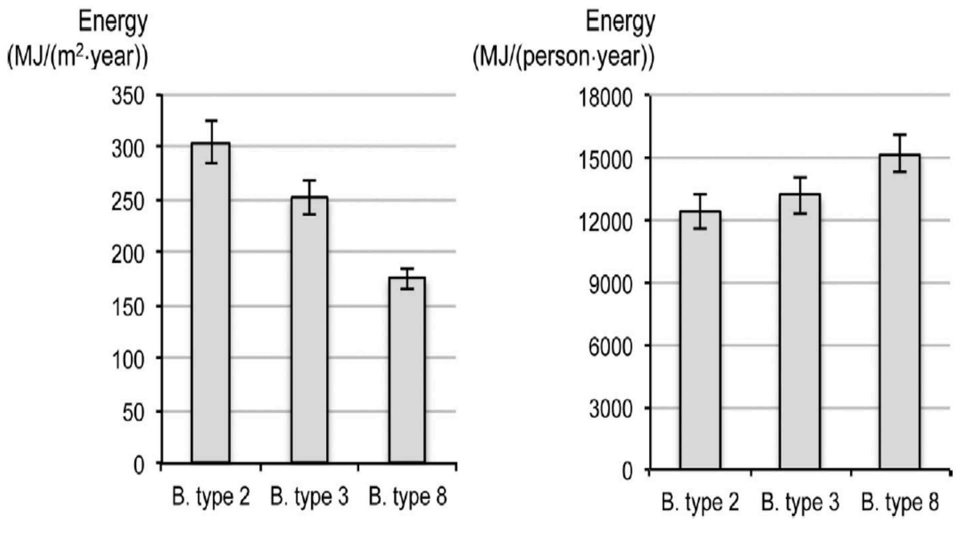

Figure 5. Energy demand presented per square meter and per person (Bastos, 2014)

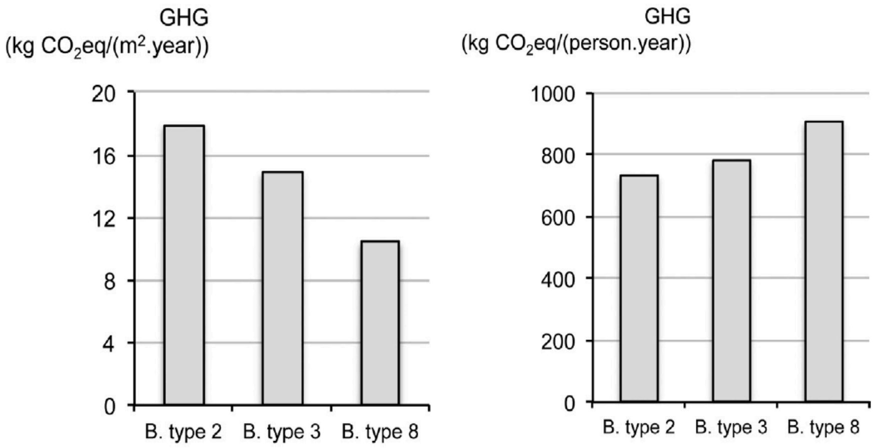

Figure 6. Greenhouse gas emissions presented per square meter and per person (Bastos, 2014).

From this result the article highlights the importance of the functional unit when comparing housing. The authors also recommend to use both occupancy- and area based functional units to account for site-specific differences.

6.4.3 Comparing high and low residential density in North America

In the study Comparing high and low residential density: life-cycle analysis of energy use and greenhouse gas emissions, Journal of Urban Planning and Development Norman et al compare the environmental impact between high and low residential density in North America (Norman, 2006). This was done using two different cases and comparing them in an LCA study. To represent the high- density dwelling, a new construction with 15 floors located close to Toronto's downtown core was used. This is reflecting a density of 150 dwellings per hectare of land use. The low-density case was represented by 161 units of single-detached dwellings that are located near the border of the City of Toronto, representing the density of 19-dwellings per hectare. All houses are constructed with a wooden structure and primarily brick façade. Both the studied cases are considered to be typical for the current and upcoming residential structure.

In the LCA study the authors have chosen to include the following elements due to their relevance to urban energy use and greenhouse gas emissions:

- All activities associated with resource extraction due to material production within infrastructure (buildings, utility road material etc).
- The operational requirements (electricity, heating and cooling).
- The personal transportation and public transportation operational requirements.

The maintenance, construction processes and infrastructure as well as the end of life stage was not included in the study (Norman, 2006). Neither was infrastructure maintenance, traffic congestion or loss of forestland. The chosen elements are though expected to be the most relevant and perhaps the most significant factors for this study.

Two functional units were chosen: “Living area” and “peopled housed”. It was assumed that the high-density dwelling is housing 1.8 people per unit and that the low- density dwelling is housing 3.0 people per unit. This is based on data from Statistics Canada census form 1996.

The study was looking at energy and greenhouse gas emissions and U.S. EIO-LCA was used to estimate the environmental impact of material production (Norman, 2006). In the operational stage public available data was used to estimate the energy use and greenhouse gases from the operation of the building. Also the personal transports using vehicle and public transport was analyzed and estimated.

The result was presented both as emissions per person and emissions per square meter for the low-density dwelling as well as the high-density dwellings (Norman, 2006). In the construction phase (the materials) both the greenhouse gases and energy usage was highest for low- density dwellings when presented as per person but highest for high- density when presented as per square meter.

When the emissions and energy consumption from transport, building operation and materials are presented together however, the low- density dwellings accounts for highest emissions for both functional units (Norman, 2006). As can be seen in Figure 7 the major impact comes from transportation.

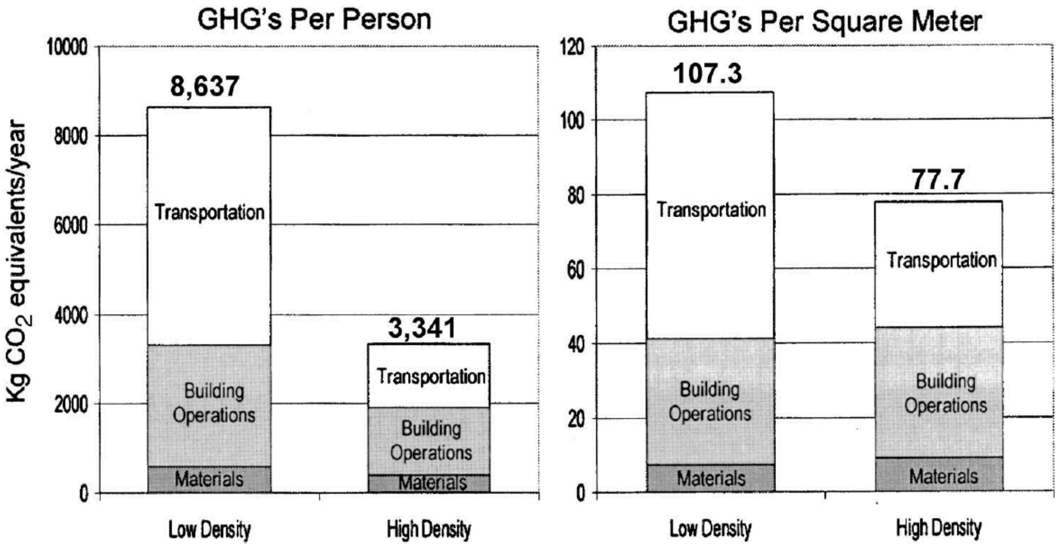

Figure 7. Greenhouse gas emissions presented per square meter and per person (Norman, 2006)

However, if disregarding the result from the transportation the same trend as in previous papers can be seen showing that higher living area per person lead to lower emissions per square meter and higher emissions per resident, even though the different is not excessive in this study.

6.4.4 Functional units

Within housing there are no standardized functional unit. There have been numerous attempts to standardize the functional unit of the building with no success this far (Khasreen, 2009). When comparing houses, it is common to use the functional unit living floor area per year or the entire building (Buyle, 2013). This is a reasonable functional unit when comparing different types of housings and construction methods within housing and can answer questions regarding which building method that have the greatest impact within a certain impact category (Bastos, 2014). The functional unit does not however relate to the primary function of the building, the possibility to live in the housing or the possibility to live many on a small area. An occupancy based functional units bring into the discussion value judgments about whether or not the individual's "right to space" or "right to comfortable shelter" are at question (Norman, 2006). The individual living space as a privilege is implicit to this choice of functional unit. Also there is a need to regulate the basic performance of a housing. Regulations with the aim to provide a high basic standard on all housings are though something that is very well developed in Sweden (BFS 2016:13).

Using occupancy based functional units might further overlook the buildings performance (Bastos, 2014). High occupancy in a housing could compensate for poor environmental performance of the construction. If comparing two dwellings or construction method, it could provide comprehensive and useful insight to use both area based and occupational based functional units. In Table 15 different analysis and their functional unit is presented.

Table 15. LCA studies and their functional unit.

Author	Year	Analysis	Case study	Functional unit
Norman, MacLean and Kennedy	2006	Comparing High and Low Residential Density: Life-Cycle Analysis of Energy Use and Greenhouse Gas Emissions	Apartment building and detached dwellings	1 m2 x year, 1 person x year
Bastos, Batterman and Freire	2014	Life-cycle energy and greenhouse gas analysis of three building types in a residential area in Lisbon	3 different dwelling types	1 m2 x year, 1 person per year
Cuéllar-Franca and Azapagic	2012	Environmental impacts of the UK residential sector: Life cycle assessment of houses	3 different dwelling types	1 m2 x 50 years, construction and occupation of a house over its lifetime
Citherlet and Defaux	2007	Energy and environmental comparison of three variants of a family house during its whole life span	3 variants of a Single- family house	1 m2 x year
Gustavsson and Joelsson	2010	Life cycle primary energy analysis of residential buildings	11 buildings	1 m2 x 50 years
Ortiz-Rodriguez, Castells and Sonnemann	2010	Life cycle assessment of two dwellings: One in Spain, a developed country, and one in Colombia, a country under development	2 single- family houses	1 m2
Blengini	2009	Life cycle of buildings, demolition and recycling potential: A case study in Turin, Italy	Apartment buildings	1 m2 x year

6.5 Conclusion

If summarizing the previous studies, they indicate that the bigger the building is the lower will the impact be per square meter in all impact categories. If presenting the result in impact per person the result was proven to be reversed. All the studies consider in different ways the number of residents in a household. Cuéllar-Franca and Azapagic for example use it in their study as a background for how much energy that is used during the use stage, but presented the result as the impact of the whole house. Norman et al as well as Bastos, Batterman and Freire use it to calculate the impact per person to make a comparison between different construction types.

The biggest impact in all studies came from the user stage, with exception for photochemical ozone creation potential. It must though be taken in consideration that the energy consumption for dwellings in UK, Portugal and North America is different from newly built houses in Sweden. If assuming that the amount of energy from cooking, appliances and water heating connected to the amount of people living in the housing are the same while the energy needed for space heating decrease, the environmental impact per square meter would differ even more in the study performed by Cuéllar-Franca and Azapagic when comparing dwellings with different sizes.

If using a functional unit referring to the amount of people the building is housing, and designing the dwelling with the aim to lower the emissions per resident it is important to be aware of what standards and functions the dwelling has is satisfying. In Sweden however, the regulations are strict on what functions a dwelling are expected to have. The approach to use a functional unit referring to the number of residents should therefore not be problematic in the Swedish market.

7 Life cycle assessment of two multi-family dwellings

In this chapter a life cycle assessment of two multi-family dwellings is performed to study the environmental impact.

7.1 Goal and scope

The goal of the study is to assess the environmental impact from a multi-family dwelling that is representing a space efficient dwelling and a dwelling that is representing an average size new built multi-family dwelling. In the study the dwellings are referred to Folkboende (space efficient) and Quattro (average size). The aim is to use the result to quantify the total environmental impact when constructing the 710 000 new dwellings that are needed until the year 2025 in Sweden. The results will then be compared and related to Sweden's climate target. The target is to reduce the greenhouse gas emission with 40 percent compared to 1990 until the year 2020 and with 85 percent until the year 2050 (Fossilfritt2050, 2017). The result is meant to be used as a guideline when constructing dwellings and are focusing on the output of residents rather than the environmental output per house or square meter. The authors hope that this result will be used by construction companies and architects when designing dwellings and also by authorities when new standards and guidelines are set. The following question will be answered in the study:

- Which dwelling will cause the highest environmental impact of Quattro and Folkboende per resident?

7.1.1 Scope of the study

The scope of the study is to perform an attributional life-cycle assessment from cradle to grave. The assessment will be performed according to the European Standard EN 15978 and hence include the stages A1-3, A4-5, B1-7 and C1-4 over the building's lifetime. The study will be performed using the software One Click LCA and analyze the impact categories Global warming (ton CO_2 eq), Acidification (kg SO_2 eq), Eutrophication (kg PO_4 eq), Ozone depletion potential (g CFC11eq), Formation of tropospheric ozone, (ton ethylene eq), and Primary energy (TJ).

7.1.1.1 Functional unit

The functional unit of the study is ”residents over the dwellings lifetime“ and the expected lifetime of the dwellings is by NCC set to 60 years.

7.1.1.2 System boundary

The stage D including benefits and loads beyond the system boundary will not be taken into consideration in this assessment. Further everything inside the building area is included in the study. This means for example that earth and groundwork, except for drainage system and the foundation, is excluded in this study due to lack of data and difficulties to make accurate assumptions due to large variations in this area.

7.1.1.3 Choice of data

The study will be performed mainly using EPDs but also some average values are included. Since not all suppliers have certified their products using a certifying systems for EPDs, the declarations used in this study is not per se for the actual product, but rather a product as similar as possible to the actual case. The main EPD programs used in this study is as stated below.

- IBU, ift rosenheim and OKOBAUDAT (Germany), 42,0 percent.
- EPD Norge (Norway), 27,7 percent.
- International EPD System (Sweden), 11,5 percent.
- Bionova, 5,6 percent.
- Other, 13,2 percent.

Further is the lifetime of the actual materials in the dwellings in most cases assumed to be the same as the material that is chosen in One click. However, when encounter material with a known lifetime the actual materials lifetime was chosen in the software.

7.1.1.4 Delimitations and assumptions

Bionova Ltd, the creator of One Click LCA, supplies the average data that is used in the study. The amount of material is quantified by using the size of the multi-family dwellings measured in BTA. Average data is used for the ventilation system with steel pipes, drainage system, electricity cabling, heating system (steel pipes and heat distribution center) and pipe systems for hot and cold water supply.

Since a comparison will be performed, great emphasis has been put into making the buildings comparable. If information regarding one building have not been available for the other construction, the information available have been transformed to where it is missing in a way that is reasonable regarding the size of the construction and function of the material. This is the case for input data such as the entrée doormat, downpipes and toilet accessories.

It has further been necessary to do some simplification due to lack of relevant EPD. The ventilator with heat recovery that is used in Folkboende is change in favor of five smaller ventilators in order to reach the demanded airflow.

In One Click LCA it is possible to use default values for transportation distances, stage A4, or a value set by the user for each material in the dwelling. In this study default values was set to Nordic transportation distances for all materials in the dwellings except for materials where transportation distance were known. These materials and their transportation distance is listed in Table 16.

Table 16. Materials and their transportation distance (stage A4) according to Elstig[5].

Material	**Transportation distance [km]**
Ready-mix concrete	20
Reinforcement steel	160
Bricks	100

7.2 Object of study

One of the studied objects in the life cycle assessment is Folkboende, presented in Section 5.2.2.1 as Folkboende 5336. Folkboende is chosen to be assessed due to the dwelling represents a space efficient dwelling according to this studies' definition The other object of study is Quattro, see Appendix B for building design. Quattro is representing a new built average size multi-family dwelling.

Folkboende is an eight storey dwelling, the total floor area is 2703 square meters. Quattro is a four storey dwelling, the total floor area is 1162 square meters. Quattro is a building constructed by NCC that have a BTA of 48,92 square meters per resident and a BOA of 33,94 square meters per resident. Folkboende have a BOA of 29,76 square meters per resident and a BTA of 40,62 square meters per residents, see Table 17. This means that Quattro have a total floor area per resident that is 20,0 percent larger than Folkboende and total living area per resident that is 14,0 percent larger.

Table 17. Comparison of area per residents of average new built hypothetical building, Folkboende and Quattro.

Dwelling	**BTA / Resident [m²/resident]**	**BOA / Resident [m²/resident]**
Average new dwelling	48,62	34,18
Folkboende	40,62	29,76
Quattro	48,92	33,94

7.2.1 Construction compartments

There are some differences in the construction technique between Quattro and Folkboende. The major differences will be described here.

5 Sandra Elsitg, (Purchaser, NCC AB), interviewed held by the authors 3rd march 2017

7.2.1.1 Ground slab and floor

The ground slab and floor compartments for Quattro and Folkboende are described below.

- Quattro from upper part to bottom:
- 14 mm parquet
- Combi floor mat (Foundation foam and vapour control layer)
- 100 mm reinforced concrete
- 300 mm XPS foam

Folkboende from upper part to bottom:

- Vinyl floor carpet
- 120 mm reinforced concrete
- 100 mm EPS/XPS foam

Quattro have 200 mm thicker XPS insulation than Folkboende, but 20 mm thinner concrete slab. In Quattro the floor is 14 mm parquet while Folkboende have a Vinyl carpet.

7.2.1.2 Floor slab

The floor slab compartments for Quattro and Folkboende are described below.

- Quattro from upper part to lower:
- 14 mm parquet
- Combi floor mat (Floor foam and vapour control layer)
- 200 mm reinforced concrete
- 50 mm precast concrete slab

Folkboende from upper part to lower:

- Vinyl floor carpet
- Screed
- 220 mm reinforced concrete

Quattro have a surface layer that consists of parquet while Folkboende have a vinyl floor carpet. Quattro have a 50 millimeters precast concrete slab and 200 millimeters reinforced concrete on the top of the precast slab while Folkboende have a 220 millimeters reinforced concrete slab and screed on top of the concrete slab.

7.2.1.3 Façade

The facade compartments for Quattro and Folkboende are described below.

Quattro from outside to inside:

- 10 mm plaster on reinforced mesh fabric glass
- 120 mm XPS foam
- 150 mm reinforced concrete
- 120 mm XPS foam
- 25 mm vertical steel profile
- 13 mm gypsum plasterboard

Folkboende from outside to inside:

- 87 mm brick facade
- 80 mm facade insulation with kraft paper lining
- 45 x 145 mm vertical wood stud
- 145 mm glass wool insulation
- 0,2 mm plastic vapor control layer
- 45 x 45 mm horizontal wood stud
- 45 mm glass wool insulation
- 13 mm gypsum plasterboard

Quattro have a plaster facade on reinforced mesh fabric glass and load bearing structure of reinforced concrete while the facade in Folkboende consists of a curtain wall made of brick. The total thickness of insulation of the external wall for Quattro is 240 millimeters and consists of XPS foam. The total thickness of insulation for Folkboende is 270 millimeters and consists of glass wool. The differences in wall construction also result in the fact that Quattro use more steel than Folkboende and that Folkboende use more wood material than Quattro beyond the differences of materials in the facade.

7.2.1.4 Roof

The roof compartments for Quattro and Folkboende are described below.

Quattro from upper part to lower:

- Bitumen membrane roofing layer
- Sarking
- 18 mm plywood
- Timber roof truss
- 500 mm blowing wool

Folkboende from upper part to lower:

- Bitumen membrane roofing layer
- Sarking

- 23 mm tongue and groove
- Timber roof truss
- 450 mm blowing wool

The differences in the roof construction are that Quattro uses 18 millimeters plywood above the roof truss while Folkboende instead consists of 23 millimeters tongue and groove. The other difference is that Quattro consists of 500 millimeters thick layer of blowing wool while Folkboende's layer is 450 millimeters thick.

7.2.1.5 Load bearing internal walls

The load bearing internal walls for both Quattro and Folkboende consists of 200 millimeters reinforced insitu concrete except for 9 walls in Quattro that consists of 100 millimeters precast concrete elements plus 100 millimeters reinforced insitu concrete.

7.2.1.6 Ventilation system

The ventilation systems in the buildings are conducted differently. In Quattro an air exchanger with heat recovery is used in every apartment while in Folkboende one big ventilator with heat recovery is used for all apartments.

7.2.1.7 Furnishings

Example of furnishings that is included in the analysis is cabinet interior, floor and roof beading, clothing shelf etc. White goods and other home electronic devices is excluded in the study. The furnishing is similar in Quattro and Folkboende, which makes the life cycle assessment and comparison between more accurate.

7.2.1.8 Energy consumption

The energy consumption for the buildings is listed below.

Energy consumption for Quattro (Olsson, 2017)

- Heated area: 924 m2
- District heating for heating = 35,1 kWh/m2, year
- District heating for tap water = 25 kWh/m2, year
- Building electricity use = 6,4 kWh/m2, year

Energy consumption for Folkboende (Johannesson, 2014)

- Heated area: 2478 m2
- District heating for heating = 31,2 kWh/m2, year
- District heating for tap water = 25 kWh/m2, year
- Building electricity use = 7,3 kWh/m2, year

In the energy consumption the energy used for heating the house, the heating of tap water and the electricity needed for the building system to function is included. The household electricity (lighting, cooking, use of domestic appliance etc.) is however not included.

7.3 Inventory analysis

In this section the technical systems for the buildings is presented in a flowchart for the dwellings.

7.3.1 Flowchart

In Figure 8 the flowchart is presented. The flowchart is a model of the technical system for the dwellings from cradle to grave. The flowchart shows all activities for the analyzed system in this study.

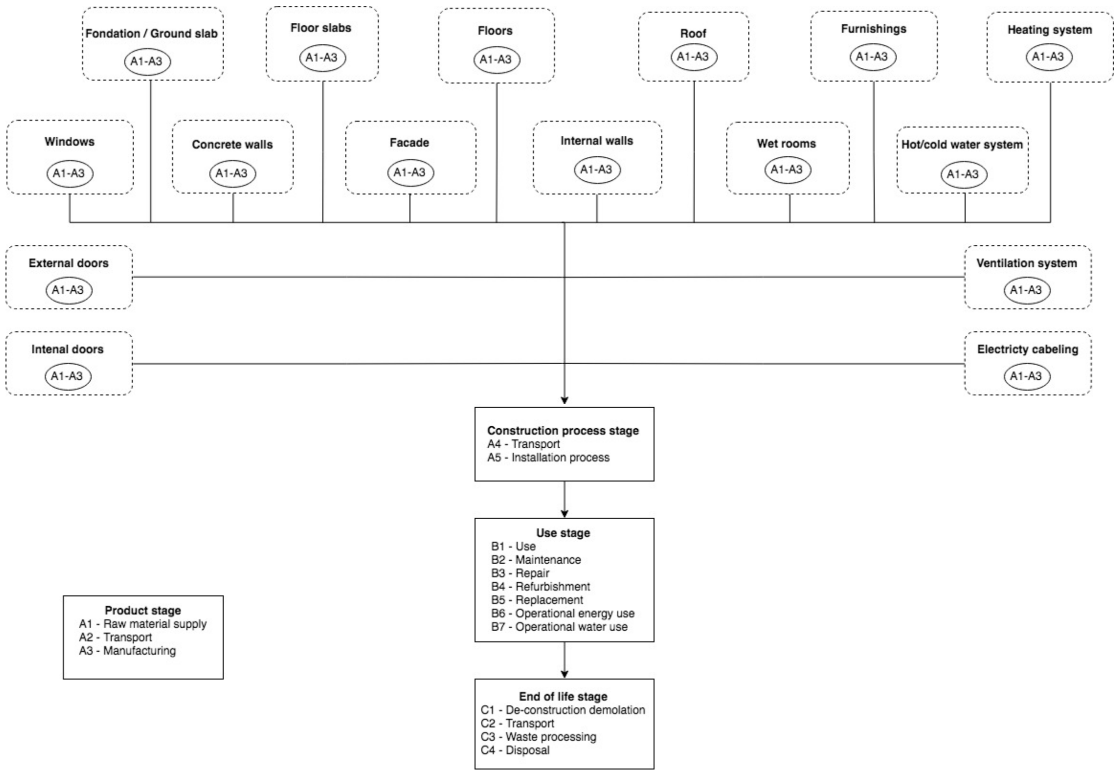

Figure 8. Flowchart for the dwellings.

7.3.2 Inventory results

For the inventory results, see Appendix C and D.

7.4 Impact assessment

In this section the emissions are quantified and presented for the impact categories: Global warming, Acidification, Eutrophication, Ozone depletion potential, Formation of tropospheric ozone and Primary energy. In the end of the section there is a compilation for all impact categories.

7.4.1 Global warming

Figure 9 shows that Quattro's Global warming potential emissions is 46,69 ton carbon dioxide equivalent per resident while the emissions from Folkboende is 37,99 ton carbon dioxide equivalent per resident. The Global warming potential emissions per resident from Quattro is 23 percent higher compared to Folkboende.

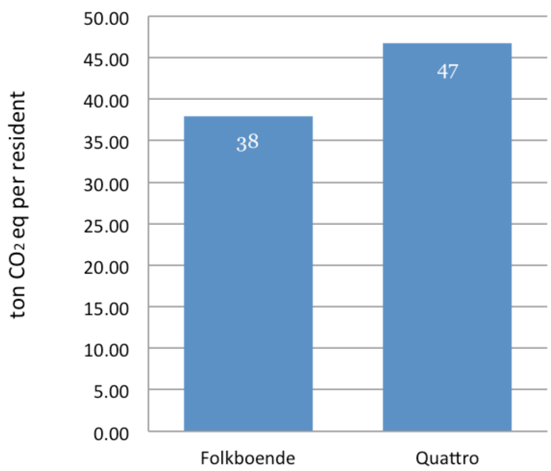

Figure 9. Emissions of carbon dioxide equivalents per resident from Folkboende and Quattro.

As presented in Figure 10 below, the stages with biggest impact on Global warming is A1-A3, B1-B5 and B6 for both Quattro and Folkboende. The emissions derived from the different stages have a similar allocation for both the dwellings.

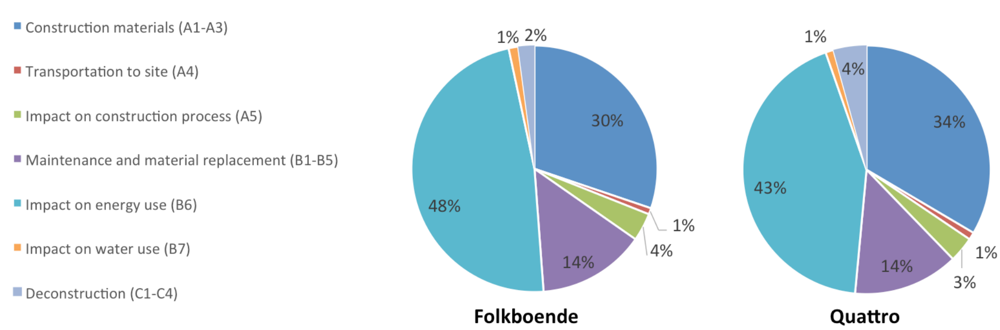

Figure 10. Share of total emissions of carbon dioxide equivalents for respective phase for Folkboende and Quattro.

7.4.2 Acidification

Figure 11 shows that Quattro's Acidification potential emissions is 383 kg sulfur dioxide equivalent per resident and 212 kg sulfur dioxide equivalent per resident for

Folkboende. The Acidification potential emissions per resident from Quattro are 81 percent higher than for Folkboende.

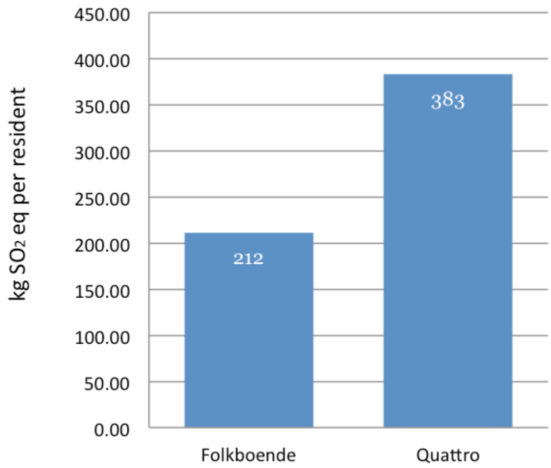

Figure 11. Emissions of sulfur dioxide equivalents per resident from Folkboende and Quattro.

As presented in Figure 12 below the biggest impacts comes from stages A1-A3, B1-B5 and B6. For Quattro stage A1-A3 stands for the highest Acidification potential emissions per resident with a share of 51 percent, the share for Folkboende in this stage is 23. For Folkboende, stage B6 has the highest Acidification potential emissions per resident with a share of 61 percent. The emissions from stage B6 stands for 37 percent of Quattro's Acidification potential emissions.

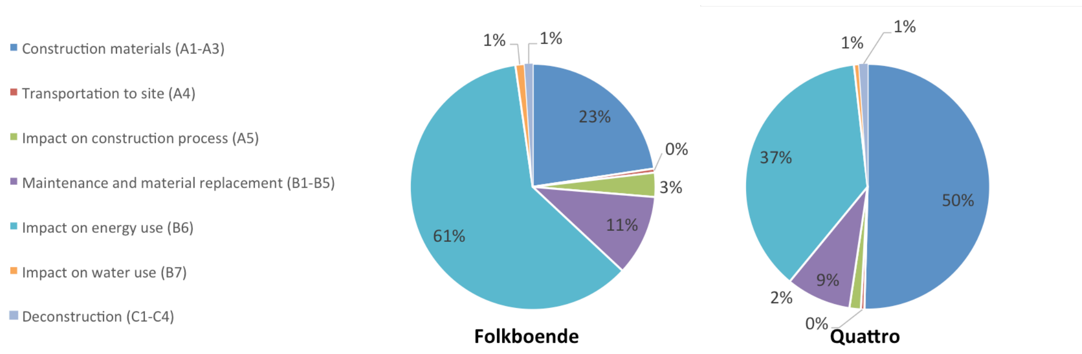

Figure 12. Share of total emissions of sulfur dioxide equivalents for respective phase for Folkboende and Quattro.

7.4.3 Eutrophication

Figure 13 shows that Quattro's Eutrophication potential emissions is 104 kg phosphate equivalent per resident and 73 kg phosphate equivalent per resident for Folkboende. The emissions per resident from Quattro are 43 percent higher compared to Folkboende.

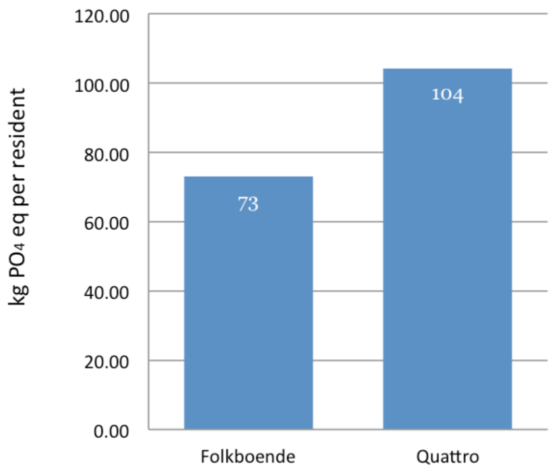

Figure 13. Emissions of phosphate equivalents per resident from Folkboende and Quattro.

As presented in Figure 14 A1-A3, B1-B5 and B6 is the stages with highest Eutrophication potential emissions. For both dwellings, B6 is the stage where the Eutrophication potential emissions are highest. In this stage, 45 percent for Quattro and 58 percent for Folkboende of the total Eutrophication emissions is derived.

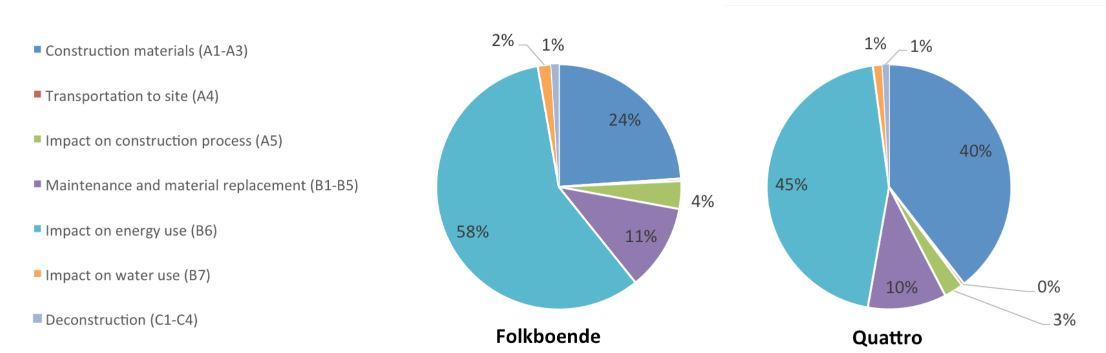

Figure 14. Share of total emissions of phosphate equivalents for respective phase for Folkboende and Quattro.

7.4.4 Ozone depletion

Figure 15 shows that Quattro's depletion potential emissions are 12,2 g CFC11 equivalent per resident and 10,8 g CFC11 equivalent per resident for Folkboende. The emissions per resident from Quattro are 13 percent higher than for Folkboende.

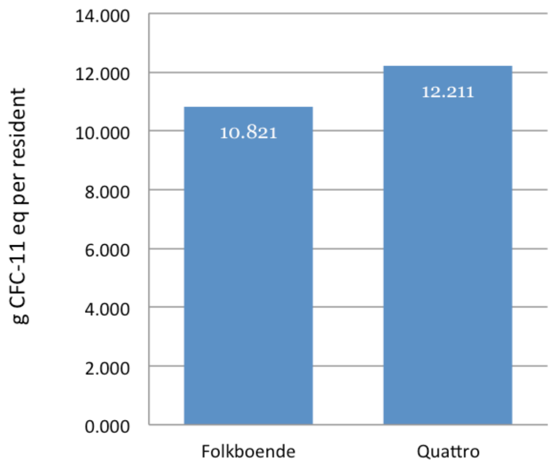

Figure 15. *Emissions of CFC11 equivalents per resident from Folkboende and Quattro.*

As presented in Figure 16 below, stage B6 is where the majority of the Ozone depletion potential emissions are derived. For Quattro, 83 percent of the Ozone depletion potential emissions come from this stage and 86 percent for Folkboende. From stage A1-A3, 10 percent of the Ozone depletion potential emissions for Quattro and 7 percent for Folkboende are derived.

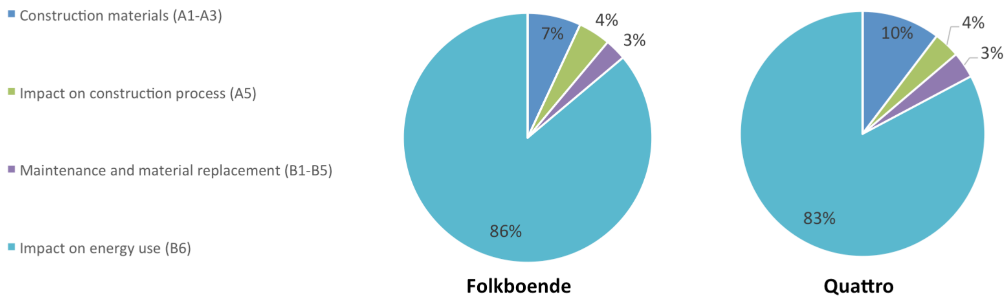

Figure 15. *Emissions of CFC11 equivalents per resident from Folkboende and Quattro.*

7.4.5 Formation of tropospheric ozone

Figure 17 shows the total Formation of tropospheric ozone potential emissions in kg ethylene equivalents. As presented in Figure 17, Quattro's emissions are 22 ton ethylene equivalents per resident and Folkboende's emissions is 11 ton ethylene equivalent per resident. The emissions of ethylene are 2,09 times higher for Quattro than for Folkboende.

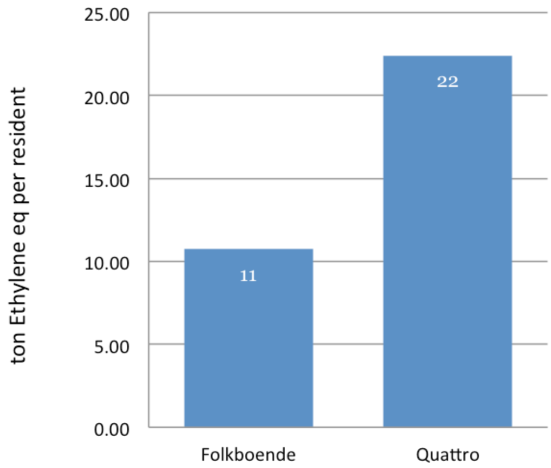

Figure 17. Emissions of ethylene equivalents per resident from Folkboende and Quattro.

As presented in Figure 18 below, the emissions of ethylene equivalents comes from the stages A1-A3 and B1-B5, which stands for 50 percent each of the total emissions of ethylene for both Quattro and Folkboende. The emissions from the other stages are so small that they are insignificant.

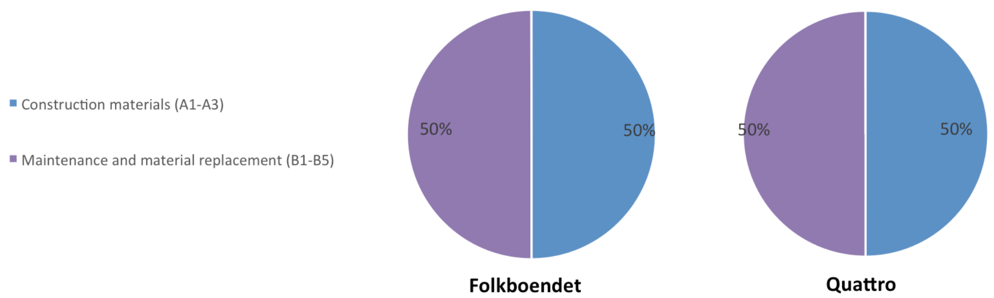

Figure 18. Share of total emissions of ethylene equivalents for respective phase for Folkboende and Quattro.

7.4.6 Primary energy

Figure 19 shows the total Primary energy in TJ for Quattro and Folkboende. As presented in Figure 19 Quattro use 1,28 TJ Primary energy per resident while Folkboende use 1,14 TJ. Quattro use 12 percent more Primary energy per resident than Folkboende do.

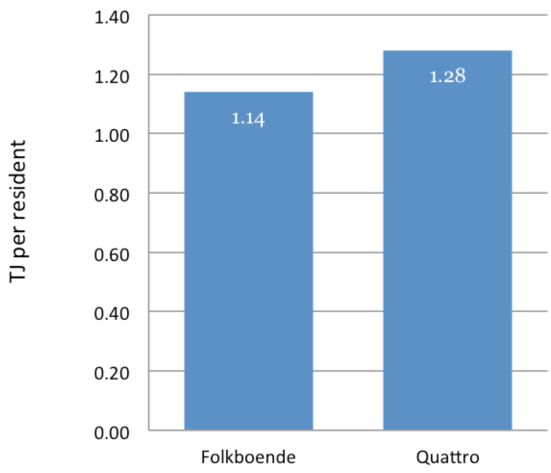

Figure 19. Primary energy use, in TJ, for Folkboende and Quattro.

As presented in Figure 20 below the stage where most Primary energy is used is stage B6. This stage stands for 72 percent of the total Primary energy use for Folkboende and 70 percent for Quattro. The second stage that uses most of the Primary energy is A1-A3, in this stage the total share of Primary energy use is 15 percent for Folkboende and 17 percent for Quattro.

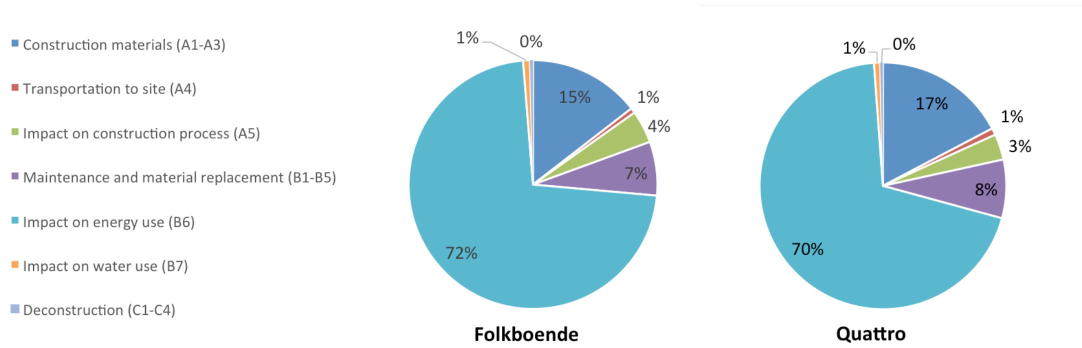

Figure 20. Share of total primary energy use for respective phase for Folkboende and Quattro.

7.4.7 Compilation of impact categories

Table 18 is a compilation of the total emissions per resident from all impact categories for Quattro and Folkboende. The table also presents the difference in emissions between the dwellings. For all impact categories, Quattro's emissions per resident are higher than Folkboende's.

As presented in Table 18 the biggest difference is for the impact category Formation of tropospheric ozone where the emissions of ethylene equivalents per resident is 108,6 percent higher from Quattro compared to Folkboende. The second biggest difference is for the impact category Acidification where the emissions is 80,7 percent higher from Quattro compared to Folkboende.

For the impact category Global warming, the carbon dioxide equivalents emissions per resident are 22,9 percent higher from Quattro than from Folkboende. The impact category with least difference is Primary energy, Quattro use 12,4 percent more Primary energy per resident than Folkboende.

Table 18. Emissions per resident for Quattro and Folkboende for each impact category and difference in emissions between the dwellings, presented as percent higher emissions from Quattro compared to Folkboende.

Impact category	**Quattro**	**Folkboende**	**Diff [%]**
Acidification [kg SO_2 eq]	383	212	+80,7 %
Eutrophication [kg PO_4 eq]	104	73	+42,6 %
Formation of tropospheric ozone [kg ethylene eq]	22386	10730	+ 108,6 %
Global warming [kg CO_2 eq]	46687	37986	+22,9 %
Ozone depletion potential, g CFC 11 eq	12,2	10,8	+ 12,8 %
Primary energy, TJ	1,28	1,14	+ 12,4 %

8 Analysis of life cycle assessment

In this chapter the analysis of the results from the life cycle assessment is carried out. The analysis examines the factors behind the results and outcome from the impact assessment for the dwellings. The first parts analyses differences between the dwellings in terms of energy use and construction compartments. The results for each impact categories are further analyzed. This chapter ends with a comparison to other studies.

8.1 Impact from energy use

In this section the emissions from energy use as well as the differences between Quattro and Folkboende is analyzed.

8.1.1 Energy use per heated area and heated area per resident

The energy use per resident depends on energy use per heated square meter and the amount of heated area per resident. A lower energy use per heated square meter and/or less heated area per resident will lead to a lower energy use per resident.

As presented in Table 19 the energy use per heated square meter and year for Quattro is 66,4 kWh. For Folkboende the energy use per heated square meter and year is 63,5 kWh. This implies that the energy use per heated square meter for Quattro is 4,56 percent higher compared to Folkboende. The table below also show that the heated area per resident is 38,95 square meter for Quattro and 37,24 for Folkboende. This implies that the heated area per resident is 4,6 percent higher in Quattro compared to Folkboende.

Table 19. Energy use per heated area and heated area per resident for Quattro and Folkboende (Johannesson, 2014), (Olsson, 2017).

Dwelling	**Energy use per heated area and year [kWh/m^2,year]**	**Heated area per resident [m^2/resident]**
Quattro	66,4	38,95
Folkboende	63,5	37,24

8.1.2 Energy per resident

As presented in Table 20 below the energy use per resident and year for Quattro is 2585 kWh per resident while for Folkboende the energy use is 2363 kWh per resident and year. This show that Quattro's energy use per resident and year is 9,39 percent higher compared to for Folkboende. The total energy use during the dwellings lifecycle is 155 100 kWh per resident for Quattro and 141 780 kWh per resident for Folkboende. The energy use per resident is higher for Quattro due to the higher energy use per heated area and the higher heated area per resident as presented in the Table 19 above.

Table 20. Energy use per resident for Quattro and Folkboende.

Dwelling	Energy use per resident and year [kWh/resident,year]	Total energy use per resident [kWh/resident]
Quattro	2 585	155 100
Folkboende	2 363	141 780

8.1.3 Share and emissions of district heating and electricity

Quattro have a higher share of district heating. As presented in Table 21, the share of district heating in stage B6 is 90,5 percent in Quattro compared to Folkboende's share of 88,5 percent. Folkboende does further have a higher share of electricity since 11,5 percent of the energy use in B6 derives from electricity compared to Quattro's 9,5 percent.

Table 21. Percentage district heating and electricity of the energy use for Quattro and Folkboende.

Dwelling	**District heating** [%]	**Electricity** [%]
Quattro	90,5	9,5
Folkboende	88,5	11,5

According to Table 22 below, the emissions from district heating is about three times higher compared to the emissions from electricity per kWh for all impact categories except for Ozone depletion potential. For Ozone depletion potential the emissions is 16 percent higher for district heating compared to the electricity. The primary energy use is 66 percent higher for electricity compared to district heating.

Table 22. Emissions per kWh of district heating (Fortum, Stockholm) and electricity (electricity mix Sweden) (Bionova, 2017).

Impact category	District heating [emissions/kWh]	Electricity [emissions/kWh]
Acidification [g SO_2 eq]	0,981	0,334
Eutrophication [g PO_4 eq]	0,323	0,112
Formation of tropospheric ozone [g ethylene eq]	0,015	0,005
Global warming [kg CO_2 eq]	0,1392	0,418
Ozone depletion [mg CFC 11 eq]	0,627	0,540
Primary energy [J]	5,5	9

8.1.4 Emissions from energy use

As presented in Table 23 the emissions emerging from the energy use (B6) per resident is approximately 10,9 percent higher for Quattro compared to Folkboende in all impact categories. The energy use per resident is however 9,39 percent higher for Quattro compared to Folkboende. The higher emissions in Quattro can therefore just partly be explained with the fact that Quattro have a higher energy usage per resident compared to Folkboende. It is also due to the fact that Quattro's energy usage contain a higher share of district heating compared to Folkboende since district heating have up to 3 times higher emissions compared to electricity per kWh.

Table 23. Emissions per resident from energy use for Quattro and Folkboende (Bionova, 2017).

Impact category	**Quattro [emissions/resident]**	**Folkboende [emissions/resident]**
Acidification [kg SO_2 eq]	142,65	128,64
Eutrophication [kg PO_4 eq]	47	42,39
Formation of tropospheric ozone [kg ethylene eq]	2,21	1,99
Global warming [kg CO_2 eq]	20 151	18 158
Ozone depletion [g CFC 11 eq]	10	9,3

8.1.5 Share of emissions derived from energy use

In this section the share of emissions from the stage B6 will be compared between the multi-family dwellings. As presented in Table 24, the share of total emissions derived from stage B6 is quite similar for Quattro and Folkboende within the impact categories Global warming and Ozone depletion. The emissions from energy use for the impact category Formation of tropospheric ozone potential are further insignificant for the total emissions. For the impact categories Acidification and Eutrophication, the share of total emissions derived from B6 differs significantly between the dwellings. This will be further analyzed.

The emissions from stage B6 stands for 60,79 percent of the total Acidification potential emissions for Folkboende and 37,24 percent for Quattro. This even though the Acidification potential emissions per resident from energy use are 10,9 percent higher from Quattro compared to Folkboende. This is due to that Quattro have significant higher Acidification potential emissions originated from construction materials (A1-A3) compared to Folkboende.

Almost 58 percent of Folkboende's Eutrophication potential emissions are derived from stage B6 while the share is 47 percent for Quattro. Also in this case this is due to the Eutrophication potential emissions from construction materials are significant higher from Quattro compared to Folkboende.

Table 24. Share of total emissions derived from stage B6 within each impact category.

Impact category	Quattro [%]	Folkboende [%]
Acidification [kg SO_2 eq]	37,24	60,79
Eutrophication [kg PO_4 eq]	46,98	57,99
Formation of tropospheric ozone [kg ethylene eq]	0,001	0,0022
Global warming [kg CO_2 eq]	43,16	47,80
Ozone depletion [g CFC 11 eq]	89,14	84,98

8.2 Construction materials for Quattro and Folkboende

In this section, construction compartments that differ in type or quantity between Quattro and Folkboende will be described. Further will only compartments with significance for the total emissions in one or more of the impact categories be analyzed.

8.2.1 Insulation material

In this section the different insulation materials and the amount of insulation materials used in Quattro and Folkboende is described and the emissions derived from the materials are analyzed.

8.2.1.1 Amount of insulation materials

The facade in Quattro is insulated with XPS foam and stone wool while Folkboende is insulated with glass wool. Quattro have a thicker layer of insulation in the facade (240 millimeters compared to 225 millimeters for Folkboende). The ground slab in Quattro is insulated with XPS foam while in Folkboende the ground slab is insulated with EPS with a complement of XPS foam. The insulation layer of the ground slab for Quattro is 300 millimeters thick compared to 100 millimeters thick in Folkboende. As presented in Table 25, the total use of insulation materials is 25,61 cubic meters per resident for Quattro and 6,73 cubic meters per resident for Folkboende. This implies that Quattro use 3,8 times more insulation material per resident compared to Folkboende.

Table 25. Amount of insulation materials per resident used Quattro and Folkboende.

Material	**Quattro [m^3]**	**Folkboende [m^3]**
XPS insulation	18,19	0,21
Glass wool insulation	6,33	5,46
Stone wool insulation	1,09	-
EPS insulation	-	1,06
Total insulation	25,61	6,73

The higher amount of insulation material use per resident in Quattro depends partly on thicker insulation material layer in the ground slab and the external wall compared to Folkboende. It is also due to more area per resident in ground slab, facade and roof for Quattro compared to Folkboende. This increases the insulation material use per resident since these areas are insulated. As presented in Table 26 below the ground slab and roof area are 2,28 times bigger per resident and the facade area is 1,40 times bigger per resident for Quattro compared to Folkboende. This implies that more residents per built area resulting in lower use of insulation materials per resident.

Table 26. Ground slab-, facade- and roof area per resident for Quattro and Folkboende.

Compartment	**Quattro [m^2/resident]**	**Folkboende [m^2/resident]**
Ground slab area	12,34	5,41
Facade area	38,11	27,17
Roof area	12,34	5,41

8.2.1.2 Emissions from different insulation material stage A1-A3

As presented in Table 27, the emissions from 1 cubic meter of XPS insulation (used in Quattro) have almost three times as high Global warming potential emissions than the glass wool insulation (used in Folkboende). The XPS have almost twice as much Global warming potential emissions than the EPS (used in Folkboende) per cubic meter. While the stone wool (used in Quattro) have almost six times higher Global warming potential emissions than the EPS.

Stone wool has highest Acidification and Eutrophication potential emissions of the insulation materials. XPS have higher Acidification and Eutrophication potential emissions than both glass wool- and EPS insulation.

Table 27. The emissions per cubic meter of different insulation materials (Bionova, 2017).

Impact category	XPS [emission/m^3]	Glass wool [emission/m^3]	EPS [emission/m^3]	Stone wool [emission/m^3]
Acidification [kg SO_2 eq]	0,27	0,27	0,14	0,77
Eutrophication [kg PO_4 eq]	0,05	0,03	0,01	0,08
Formation of tropospheric ozone [kg ethylene eq]	0,04	0,03	0,34	0,01
Global warming [kg CO_2 eq]	90,3	31	50	174,36
Ozone depletion [kg CFC 11 eq]	0	0	0	0
Primary energy [MJ]	1479,75	674	834	1979

8.2.1.3 Emissions from insulation materials in Quattro and Folkboende

In Table 28 the emissions per resident from insulation materials for Quattro and Folkboende is presented. The emissions per resident from insulation materials is in the range of 2-8 times higher for Quattro compared to Folkboende depending on impact category. The Global warming potential emissions per resident from insulation materials is eight times higher for Quattro compared to Folkboende.

For Quattro, the emissions from insulation materials stand for 4,13 percent of the total Global warming potential emissions, 1,88 percent of the total Acidification potential emissions and 1,05 percent of the total Eutrophication potential emissions. For the other impact categories, the emissions from insulation materials from Quattro are less than 1 percent of the total emissions. While for Folkboende the emissions from insulation material are lower than 1 percent for all impact categories.

Table 28. The emissions per resident from insulation materials for Quattro and Folkboende (Bionova, 2017).

Impact category	Quattro [emissions/resident]	Folkboende [emissions/resident]
Acidification [kg SO_2 eq]	0,102	0,0195
Eutrophication [kg PO_4 eq]	0,018	0,0026
Formation of tropospheric ozone [kg ethylene eq]	0,014	0,0083
Global warming [kg CO_2 eq]	32,11	4,0116
Ozone depletion [kg CFC 11 eq]	0	0
Primary energy [MJ]	536,98	101,85

The higher emissions from insulation materials for Quattro compared to Folkboende is due to use of insulation material with higher emissions in the facade and ground slab and higher insulation material use per resident.

8.2.2 Façade compartments

In this section the different materials used in the facade for Folkboende and Quattro and the emissions derived from the materials is described.

8.2.2.1 Façade in Quattro

In Quattro a plaster facade is used consisting of plaster and reinforced mesh fabric from glass fiber. As presented in Table 29, the emissions from the plaster stand for 1,9 percent of the Ozone depletion potential emissions. The emissions from plaster are lower than 1 percent of the total emissions for the other impact categories.

Table 29. Ozone depletion potential emissions from exterior plaster per resident for Quattro (Bionova, 2017).

Impact category	Emissions from exterior plaster [emission/resident]	Share of total emissions [%]
Ozone depletion potential [g CFC 11 eq]	5,76	1,9 %

As presented in Table 30, the emissions from reinforced mesh fabric from glass fabric stands for 31,9 percent of Quattro's total Acidification potential emissions. For the other impact categories, the emissions from the reinforced mesh fabric are lower than 1 per cent of the total emissions.

Table 30. Acidification potential emissions from glass fabric wire mesh per resident for Quattro (Bionova, 2017).

Impact category	Emissions from glass fabric wire mesh [emission/resident]	Share of total emissions [%]
Acidification [kg SO_2 eq]	2,034	31,9 %

8.2.2.2 Façade in Folkboende

In Folkboende the facade is made of bricks. As presented in Table 31, the emissions from the bricks stands for 1,6 percent of the total Global warming potential emissions and less than 1 per cent of the total emissions in the other impact categories.

Table 31. Global warming potential emissions from bricks per resident for Folkboende (Bionova, 2017).

Impact category	Emissions from bricks [emission/resident]	Share of total emissions [%]
Global warming [kg CO_2 eq]	41 402	1,6 %

8.2.3 Sheet and wooden material

In this section the different amount of sheet and wooden material used in Quattro and Folkboende and the emissions derived from the materials is described.

8.2.3.1 Amount of sheet and wooden material

The dwellings external walls have different construction techniques, which are affecting the materials used in the construction. As presented in Table 32, Quattro use almost six times more sheet material per resident than Folkboende. The table also shows that Folkboende use two times more wooden material than Quattro.

Table 32. Weight of sheet and wooden material per resident for Folkboende and Quattro.

Dwelling	Weight sheet material [kg/resident]	Weight wooden material [kg/resident]
Quattro	192	174,2
Folkboende	33,5	366,4

The higher use of sheet material per resident in Quattro is partly due to different construction technique compared to Folkboende. It can also be explained with the fact that Quattro have a higher total floor area per resident, which increases the material use per resident. This also means that the wooden material used per resident in Folkboende would be even higher compared to Quattro with Folkboende's construction technique if the dwellings would have the same total floor area per resident.

8.2.3.2 Comparison of emissions from sheet and wooden material

As presented in Table 33, the Eutrophication potential emissions is almost 400 times higher per kg sheet material compared to wooden material. For the other impact categories, the emissions from sheet material is between 4-9 times higher than the emissions from wooden material except for ozone depletion where the emissions is zero for both sheet and wooden material. This implies that a higher share of wooden material instead of sheet material for wall construction (as in Folkboende) will lead to lower emissions especially within Eutrophication potential.

Table 33. Emissions from 100 kg of sheet- and wooden material (Bionova, 2017).

Impact category	Sheet material [emission/100kg]	Wooden material [emission/100kg]
Acidification [kg SO_2 eq]	2,46	0,27
Eutrophication [kg PO_4 eq]	11,81	0,03
Formation of tropospheric ozone [kg ethylene eq]	0,11	0,03
Global warming [kg CO_2 eq]	247,36	31
Ozone depletion [kg CFC 11 eq]	0	0
Primary energy [MJ]	6346	995

8.2.3.3 Emissions from sheet and wooden material per resident

As presented in Table 34, the Eutrophication potential emissions from sheet material per resident for Quattro is almost six times higher compared to Folkboende. The Eutrophication potential emissions per resident from sheet material stand for 22 percent of the total Eutrophication potential emissions for Quattro and 5 percent for Folkboende. For all other impact categories, the emissions from sheet materials are less than 1 percent of the total emissions for Quattro and Folkboende.

Table 34. Eutrophication potential emissions from sheet material per resident for Quattro and Folkboende (Bionova, 2017).

Impact category	Quattro [emission/resident]	Folkboende [emission/resident]
Eutrophication [kg PO_4 eq]	0,3783	0,06583

Furthermore, the emissions from wooden materials for Quattro and Folkboende are less than 1 percent of the total emissions for all impact categories.

The higher Eutrophication potential emissions from sheet material for Quattro are due to a higher use of sheet material compared to Folkboende. The higher use of sheet material in Quattro is as described in Section 8.2.3.1 partly due to different construction technique compared to Folkboende, which use a higher share of wooden material instead. It is also due to higher total floor area per resident compared to Folkboende, which increases material use per resident.

8.2.4 Waterproofing material

In this section the different amount of waterproofing material used in Quattro and Folkboende and the emissions derived from the materials is described.

8.2.4.1 Amount of waterproofing material

The roof for both dwellings has a waterproofing layer that consists of carpet made of SBS-modified bitumen. As presented in Table 35, the area covered with waterproofing carpet is 310 square meters for Quattro and 416 square meters for Folkboende. For Quattro, the waterproofing carpet area per resident is 13,05 square meters and in Folkboende the amount is 6,25 square meters. Quattro have 2,09 times as much waterproofing area carpet per resident. This is due to more roof area per resident in Quattro compared to Folkboende.

Table 35. The area of waterproofing carpet used in Quattro and Folkboende.

Dwelling	**Waterproofing carpet area [m^2]**	**Waterproofing carpet area per resident [m^2/resident]**
Quattro	310	13,05
Folkboende	416	6,25

8.2.4.2 Emissions from waterproofing material

As presented in Table 36, the ethylene emissions from the SBS-modified bitumen carpet is 22,38 ton ethylene per resident for Quattro and 10,72 ton ethylene per resident for Folkboende. The emissions from the waterproofing carpet stand for 100 percent of the total emissions of ethylene for both dwellings. The emissions of ethylene per resident from Quattro are 2,09 times higher than the emissions from Folkboende. Since the material used for waterproofing the roof is the same for Quattro and Folkboende. The higher emissions per resident from Quattro are hence only depending on higher use of the material per resident. This implies that the more residents per roof area the lower will the emissions of ethylene per resident be.

For all the other impact categories the emissions from the waterproofing carpet is lower than 1 percent for both the dwellings.

Table 36. Emissions of ethylene per resident from waterproofing carpet for Quattro and Folkboende (Bionova, 2017).

Impact category	Quattro [emission/resident]	Folkboende [emission/resident]
Formation of tropospheric ozone [ton ethylene eq]	22,38	10,72

8.2.5 Concrete

In this section the different type of and amount of concrete used in Quattro and Folkboende is described and the emissions derived from the materials is analyzed.

8.2.5.1 Amount of concrete

In Folkboende all of the concrete consists of ready-mix concrete. In Quattro the major part of the concrete is ready-mix except for a 50 millimeters thick layer in the floor slab and nine of the load bearing walls that is made of precast concrete This leads to that 85 percent of the concrete used in Quattro is ready-mix concrete, 9 percent is precast concrete wall and the remaining 6 percent is precast concrete floor slab.

As presented in Table 37, the total amount of concrete use per resident in Quattro is 20,88 cubic meters per resident. In Folkboende the total amount concrete is 17,23 cubic meters per resident. This means that Quattro have 21 percent higher use of concrete per resident compared to Folkboende.

Table 37. Amount of concrete per resident for Quattro and Folkboende.

Material	Quattro [m^3/resident]	Folkboende [m^3/resident]
Ready-mix concrete	17,71	17,23
Precast concrete wall	1,94	-
Precast concrete floor slab	1,26	-
Total concrete use	20,88	17,23

The higher use of concrete per resident is partly due to that Quattro have 20 percent more total floor area per resident compared to Folkboende. Since the floor consists of concrete the concrete use per resident increase with more floor area per resident. More floor area per resident also leads to more wall area per resident. The load bearing walls is made of concrete and will thereby increase the concrete use per resident. The higher use of concrete per resident is also due to the fact that all of the external walls in Quattro consist of concrete while only half of the external walls in Folkboende consists of concrete.

Higher use of concrete per resident leads to higher use of reinforced steel and buffer blocking (plastic) per resident. Quattro use 4 percent more reinforced steel per resident compared to Folkboende and 5 percent more buffer blocking (plastic).

8.2.5.2 A comparison of emissions from ready- mix precast concrete

In Table 38 the emissions from concrete materials per cubic meters is presented. The emissions from precast concrete wall have the highest emissions per cubic meters for all impact categories except within Global warming and primary energy. Ready-mix concrete has lowest emissions for all impact categories.

Table 38. The emissions per cubic meters for different concrete materials (Bionova, 2017).

Impact category	**Ready-mix concrete [emission/ m^3]**	**Precast floor slab [emission/m^3]**	**Precast concrete wall [emission/ m^3]**
Acidification [kg SO_2 eq]	0,4	1,24	1,57
Eutrophication [kg PO_4 eq]	0,1	0,15	0,18
Formation of tropospheric ozone [kg ethylene eq]	0	0,08	0,09
Global warming [kg CO_2 eq]	189,9	470	453,6
Ozone depletion [kg CFC 11 eq]	0	0	0
Primary energy [MJ]	1674,1	4850	4500

8.2.5.3 Emissions from concrete per resident

As presented in Table 39, the Acidification potential emissions derived from concrete is in Quattro 70 percent higher per resident compared to Folkboende. Within Global warming potential the emissions are 48 percent higher per resident and within eutrophication potential the emissions are 34 percent higher per resident compared to Folkboende.

In Quattro the emissions from concrete stands for 3,04 percent of the total Acidification potential emissions, 2,20 percent of the total Eutrophication potential emissions and 10,30 percent of the total Global warming potential emissions. In Folkboende however, the emissions from concrete stands for 2,98 percent of the total Acidification potential emissions, 2,18 percent of the Eutrophication potential emissions and 10,35 percent of the total Global warming potential emissions. For the other impact categories, the emissions from concrete is less than 1 percent for both dwellings.

Table 39. Total emissions per resident from concrete for Quattro and Folkboende (Bionova, 2017).

Impact category	**Quattro [emission/resident]**	**Folkboende [emission/resident]**
Acidification [kg SO_2 eq]	11,4	6,6
Eutrophication [kg PO_4 eq]	2,28	1,68
Formation of tropospheric ozone [kg ethylene eq]	0,24	0
Global warming [kg CO_2 eq]	4835,4	3271,8
Ozone depletion [kg CFC 11 eq]	0	0
Primary energy [GJ]	44,49	28,84

Quattro have 21 percent higher concrete use per resident and the emissions would be 21 percent higher compared to Folkboende if the same concrete were used in both dwellings. In Quattro however 15 percent of the concrete is precast. Since the the emissions from precast concrete is higher compared to the ready mix the emissions from Quattro is up to 72 percent higher compared to Folkboende.

8.3 Analysis per impact category

In this section the results for each of the impact categories will be analyzed separately.

8.3.1 Global warming

For all stages, Quattro's Global warming potential emissions per resident is higher compared to Folkboende's. This leads to a total of 23 percent higher Global warming potential emissions per resident for Quattro compared to Folkboende.

The Global warming potential emissions per resident from the product stage (A1-A3) is 36 percent higher from Quattro compared to Folkboende. This is as described in Section 8.2.1 and 8.2.5 mainly due to higher emissions from concrete and insulation materials. From energy usage (B6) the Global warming potential emissions is 10,9 percent higher for Quattro compared to Folkboende. This is as described in Section 8.1 due to the higher energy use per resident and higher share of district heating.

For Quattro, the Global warming potential emissions per resident from the end of life stage (C1-C4) is two and a half time higher compared to for Folkboende. This is due to the fact that the Global warming potential emissions per cubic meter from deconstruction of the XPS insulation (used in Quattro) is 15 times higher compared to glass wool insulation (used in Folkboende).

From stage B1-B5 the Global warming potential emissions is 19 percent higher from Quattro compared to Folkboende. The higher Global warming potential emissions from Quattro is mostly derived from building installations systems such as pipe system for hot and cold water and the drainage system. The building installations systems used in this study is supplied by Bionova and calculated per square meter total floor area. Since Quattro has 20 percent higher total floor area per resident compared to Folkboende this will be reflected in the emissions.

8.3.2 Acidification

For all stage except for stage A5, Quattro's Acidification potential emissions per resident are higher compared to Folkboende. In stage A5 however, the Acidification potential emissions from Folkboende is higher compared to Quattro due to higher use of diesel per resident during the construction processes. In total Quattro have 81 percent higher Acidification potential emissions per resident compared than Folkboende.

The Acidification potential emissions per resident from product stage (A1-A3) are four times higher from Quattro compared to Folkboende. This is mainly due to the reinforcement mesh fabric made of glass described in Section 8.2.2. It can also be explained with the fact that Quattro have 20 percent more total floor area per resident compared to Folkboende which leads to higher use of construction materials per resident in Quattro.

The Acidification potential emissions from B6 are 10,9 percent higher for Quattro compared to Folkboende. This is due to the higher energy use per resident and higher share of district heating as described in Section 8.1.

From stage B1-B5 the Acidification potential emissions is 46 percent higher from Quattro compared to Folkboende. The higher Acidification potential emissions from Quattro for this stage are mostly derived from building installations systems such as pipe system for hot and cold water, ventilation and heating systems and the buildings drainage system. The building installations systems used in this study is supplied by Bionova and calculated per square meter total floor area. Since Quattro has 20 percent higher total floor area per resident compared to Folkboende this will be reflected in the emissions. It can however also be explained with the fact that different air handling units are used in the dwellings. Since the system used in Quattro have higher acidification potential emissions per resident compared to the system used in Folkboende.

8.3.3 Eutrophication

For all stages, Quattro's Eutrophication potential emissions per resident are higher compared to Folkboende, except for stage A5 in which the emissions are equally big. In total Quattro have 43 percent higher Eutrophication potential emissions per resident compared to Folkboende.

The Eutrophication potential emissions per resident from the product stage (A1-A3) are 2,3 times higher from Quattro compared to Folkboende. This is as described in Section 8.2.3, partly due to the higher sheet material use per resident in Quattro compared to Folkboende, which lead to higher emissions from sheet materials. The higher emissions from Quattro is also due to the fact that Quattro have less residents per total floor area leading to higher material use per resident compared to Folkboende. This results in higher emissions per resident for Quattro.

The Eutrophication potential emissions from energy use (B6) are 10,9 percent higher for Quattro compared to Folkboende. This is as described in Section 8.1 and is due to the higher energy use per resident and higher share of district heating.

In stage B1-B5 the Eutrophication potential emissions is 30 percent higher from Quattro compared to Folkboende. The higher Eutrophication potential emissions from Quattro are mostly derived from building installations systems such as pipe system for hot and cold water, ventilation and heating systems and the buildings drainage system. The building installations systems used in this study is supplied by Bionova and calculated per square meter total floor area. Since Quattro has 20 percent higher total floor area per resident compared to Folkboende this will be reflected in the emissions. The difference in emissions is also due to difference in type of the air handling unit between the dwellings, where Quattro's air handling unit have higher Eutrophication potential emissions per resident for stage B1-B5.

8.3.4 Ozone depletion

Quattro have 12,8 percent higher Ozone depletion potential emissions per resident compared to Folkboende. Of the total emissions for Folkboende and Quattro, 93 percent of the emissions is derived from stage A1-A3 and B6 in both dwellings.

Most of the construction materials that have significant Ozone depletion potential emissions is made of plastic for example pipe system, buffer blockings and exterior plaster. The use of plastic materials is higher per resident in Quattro compared to Folkboende due to that Quattro have 20 percent higher total floor area per resident. This increases the use of these materials per resident.

The Ozone depletion potential emissions from energy use (B7) are 10,9 percent higher for Quattro compared to Folkboende. This is as described in chapter 8.1 and is due to the higher energy use per resident and higher share of district heating.

8.3.5 Formation of tropospheric ozone

The emissions of ethylene equivalents are 2,09 times higher per resident for Quattro compared to Folkboende. The emissions of ethylene originate from only one material in both dwellings, the SBS-bitumen carpet on the roof, which is replaced after 30 years. Quattro have 2,09 times as much SBS-bitumen area carpet per resident. This is due to more roof area per resident for Quattro compared to Folkboende. This implies that the more residents per roof area the lower will the emissions of ethylene per resident be.

8.3.6 Primary energy

For all stages except for stage A5 the Primary energy use per resident is higher in Quattro compared to Folkboende. The total Primary energy use per resident and year is 12 percent higher for Quattro compared to Folkboende.

In stage A1-A3 the Primary energy use per resident is 34 percent higher for Quattro compared to Folkboende. The higher Primary energy use per resident and year from Quattro is partly due to Quattro's use of XPS insulation material which have 2,1 times higher Primary energy use compared to Folkboende's glass wool. This is also due to the higher material use per resident Quattro have compared to Folkboende which increases the Primary energy use per resident.

The Primary energy use per resident in stage B1-B5 is 23 percent higher for Quattro compared to Folkboende. The higher Primary energy use per resident from Quattro in this stage is mostly derived from building installations such as pipe system for hot and cold water, ventilation and heating systems and the buildings drainage system. This is due to the building installations and the emissions are calculated per square meter total floor area. Quattro has as mentioned in previous chapters 20 percent higher total floor area per resident compared to Folkboende and this is reflected in the emissions.

In stage B6 the Primary energy use per resident and year is 8,2 percent higher for Quattro compared to Folkboende. The energy use per resident is though 9,6 percent higher for Quattro compared to Folkboende. This is due to higher share of electricity for Folkboende. Electricity has a higher primary energy use per kWh compared to district heating.

8.4 In relation to other studies

In this section the life cycle assessment of the dwellings is compared to other studies within the field. This is done to verify the reasonability of the result of this study as well as to se if the same conclusions can be drawn.

8.4.1 Comparison with an other Swedish multi-family dwelling

Blå Jungfrun is a building project in Stockholm constructed by Skanska and finished 2010 (Liljenström, 2015). It consists of 97 apartments with two to five rooms and kitchen, distributed on four buildings (IVA, 2014). The total heated area (A_{temp}) is 11 003 square meters. The building is a low energy-demanding house and fulfills the criteria for a passive house. The lifetime for Blå Jungfrun is expected to be 50 years. As presented in Table 40, the emissions of carbon dioxide equivalents from the building during its lifetime are 886 kg per square meters A_{temp}.

To make Folkboende and Quattro comparable with Blå Jungfrun their lifetime is set to 50 years. In Blå Jungfrun the emissions from earth- and groundwork is included as 150 kg carbon dioxide equivalents per square meter heated area (IVA, 2014). The emissions from earth- and groundwork are therefore assumed to be the same per heated square meter in Folkboende and Quattro in this comparison. The emissions for Folkboende and Quattro are recalculated with their new prerequisites and with the functional unit per square meter heated area. As presented in Table 40, the emissions of carbon dioxide equivalents from Folkboende is 991 kg per square meter A_{temp} and 1141 kg per square meter A_{temp} for Quattro. The global warming potential emissions from Folkboende are 12 percent higher than the emissions from Blå Jungfrun and the emissions from Quattro is 29 percent higher than Blå Jungfruns emissions.

The emissions from construction stage (A1-A5) from Blå Jungfrun are higher than Quattro emissions but similar to Folkboende emissions. The higher emissions per square meter heated area from Quattro in the constructions stage is mainly due to higher use of concrete per heated square meter and higher emissions from insulation materials due to use of XPS instead of EPS (used in Folkboende and Blå Jungfrun).

In Blå Jungfrun the emissions from use stage (B1-B7) is lower than the emissions from both Quattro and Folkboende. This is likely due to that Blå jungfrun have lower energy use per square meter A_{temp} that decrease the emissions from use stage compared to Folkboende and Quattro.

Table 40. Global warming potential emissions per m2 A_{temp} for Folkboende, Quattro and Blå jungfrun (Bionova, 2017; IVA,2014).

GWP emissions [kg CO_2 eq]	**Folkboende [emission/$m^2 A_{temp}$]**	**Quattro [emission/$m^2 A_{temp}$]**	**Blå Jungfrun [emission/$m^2 A_{temp}$]**
Construction stage A1-A5	503	603	501
Use stage B1-B7	466	487	362
Deconstruction stage C1-C4	22	51	23
Total	991	1141	886

8.4.2 Comparison with literature studies

Bastos, Batterman and Freire's study indicates that per heated square meter the Greenhouse gas emissions and Embodied energy are greater for smaller dwellings over the whole lifecycle. On a per resident basis however the emissions are lower for smaller dwellings. This is not the case in this study, where the emissions are higher both per square meter heated area and per resident in Quattro compared to Folkboende, see Table 41. According to Bastos, Batterman and Freire's analysis, in construction stage this was due to larger contribution of wall per square meter for the smaller dwelling. In the user stage this was due to the fact that the larger the area was per resident, the lower the energy consumption was per square meter. Why the trend was not similar in this study can be explained by a higher energy demand per square meter in Quattro compared to Folkboende. Further, Quattro use insulation materials and concrete with higher global warming emissions than the type of materials Folkboende use. These buildings properties makes the emissions from Quattro higher compared to those from Folkboende also on a square meter basis.

Table 41. The emissions per heated square meter and per resident from Quattro divided with the emissions from Folkboende for all impact categories (Bionova, 2017).

Impact category	**Emissions per m^2 A$_{temp}$ [Quattro /Folkboende]**	**Emissions per resident [Quattro /Folkboende]**
Acidification	1,73	1,81
Eutrophication	1,37	1,43
Formation of tropospheric ozone	1,83	2,09
Global warming	1,18	1,23
Ozone depletion	1,08	1,38
Primary energy	0,99	1,12

According to Cuéllar-Franca and Azapagic the same trend could be seen within all the different impact categories except for Ozone depletion. This was due to the fact that these impact categories main influence was the energy usage. Ozone depletion was however mainly influenced by the construction stage. In Cuéllar-Franca and Azapagic study the emissions from Ozone depletion potential was between 50 000 and 100 000 kg CFC11 equivalents over the lifetime with about 85 percent of the emissions derived from the construction stage. The Ozone depletion potential emissions in this study is with more than 80 percent generated by the use stage (B6) and in the magnitude of 0,29-0,73 kg CFC11 equivalents over the lifetime of the dwellings. This is less than 1 permille of the emissions from the study by Cuéllar-Franca and Azapagic. Chlorofluorocarbons (CFCs) in construction industry originate primarily from insulation materials but in Sweden the use of CFCs are banned (Naturvårdsverket, 2009; Miljödepartementet, 2012). The insulation material used in this study does hence not contain CFCs. This makes the difference between the studies reasonable.

The dwellings in this assessment have a lower energy usage compared to the buildings in Cuéllar-Franca and Azapagic study. The product stage (A1-A3) do therefore in general result in a higher share of the total emissions for Quattro and Folkboende. Quattro use some construction materials that generate greater emissions than those used in Folkboende. This might be the reason why the impact per square meter are not significantly lower in Quattro compared to Folkboende but in fact higher.

8.5 Conclusion

For all impact categories in the life cycle assessment the majority of the emissions comes from stage B6 (Operational energy use) and A1-A3 (Construction materials) except for the impact category Formation of tropospheric ozone where the emissions are derived from stage A1-A3 and stage B1-B5 (Maintenance and material replacement) instead.

The emissions per resident are higher from Quattro compared to Folkboende for all impact categories in the life cycle assessment. One reason is that Quattro have higher energy use per resident compared to Folkboende. This is due to the fact that Quattro have higher energy use per heated square meter and more heated square meters per resident. Another reason is that there live 20 percent more residents per total floor area in Folkboende. This implies that Quattro use more construction materials per resident. The higher emissions from Quattro is also due to the fact that the material type differs in some compartments between the dwellings and parts of these materials used in Quattro have higher emissions than the materials used in Folkboende.

Conclusion from this study is that space efficient dwellings (more residents per total floor area) have lower emissions per resident than average size dwellings. This is due to the more residents per heated area, the lower will the emissions from energy use be per resident. And the fact that more residents per total floor area leads to lower emissions per resident from construction materials due to lower material use per resident.

With the relation of this study to the study of the dwelling Blå Jungfrun, the result from this study seems credible. It is reasonable that the emissions per heated area from the dwellings from this study is higher than the emissions from Blå Jungfrun due to the low energy use in that building.

In the study by Bastos, Batterman and Freire dwellings with more residents per square meter have higher emissions per heated square meter than dwellings with less residents per square meter. In this study however Quattro have higher emissions per heated square meter than Folkboende. This is due to that Quattro have higher energy use per heated square meter and have some construction materials with higher emissions than corresponding materials used in Folkboende. Quattro and Folkboende have higher share of the total emissions derived from stage A1-A3 compared to the dwellings in Cuéllar-Franca and Azapagic. This is due to lower energy use in Quattro and Folkboende compared to the dwellings in the study by Cuéllar-Franca and Azapagic.

9 Sweden’s climate target

In this chapter Sweden’s climate target to the years 2020 and 2050 is calculated as a climate budget. The emissions from housing with the new dwellings needed until the year 2025 is calculated and the emissions are related to the climate target.

9.1 Climate target

Sweden's climate target is to decrease the emissions of greenhouse gases with 40 percent until the year 2020, calculated from the emissions in 1990 (Regeringen, 2015). The emissions the year 1990 were about 72 million tons of carbon dioxide equivalents. The goal is hence that the emission of greenhouse gases should be 42 million tons of carbon dioxide equivalents or lower the year 2020. Sweden further has a goal to be fossil free and to have 85 percent lower emissions compared to 1990 by the year 2050. This means that the emissions shall be 10,8 millions of ton carbon dioxide equivalents or lower to the year 2050 (Fossilfritt2050, 2017)

If the target to reduce the emissions between the years 2020 to 2050 in Sweden is assumed to be linear it is possible to calculate a greenhouse gas budget. The greenhouse gas budget represents all the carbon dioxide equivalents emissions that can be let out under a certain time period if Sweden shall still stay within the climate target. The greenhouse gas budget for the year 2016 to the year 2025 for Sweden's climate target is 460 million ton carbon dioxide equivalents. Between the year 2016 to the year 2050 it is 1110,7 million ton carbon dioxide equivalents. This can be compared with the total amount of carbon dioxide equivalent that the atmosphere can take care of if the global warming shall be limited to two degrees Celsius. According to the Intergovernmental Panel on Climate Change (IPCC) the carbon dioxide equivalent emissions must be limited to 10000 billion tons in total on earth if the two degrees goal should be reach with a likelihood of 66 percent (IPCC, 2013). If using a model where all inhabitants on earth can emit an equal amount of greenhouse gas emissions, Sweden will stand for about one per mille of the total global budget. This means that Sweden can emit at most 500 million ton carbon dioxide equivalent emissions between the years 2012 and 2100 (Greenpeace, 2016).

9.2 Accommodations needed to 2025

The 710 000 dwellings needed until the year 2025 is estimated by Boverket. The estimation is done by using the expected population changes, the number of demolish households, the number of free apartments and the need for reserve housing within each region of Sweden as well as taking into consideration the household quota for each age group (Eriksson, 2015b). The housing reserve needed is estimated by Boverket to be 1 percentage of the housing stock. It is important to have a certain proportion of vacant apartments if the housing market shall function properly. This is due to the need of extra dwellings if movements between different regions shall take place in a smooth matter.

A household quota is defined as the number of households divided by the number of individuals and differs depending on the age group (Eriksson, 2015b). If disregarding the possibility that three or more adults share a household, the household quota will range from 0.5 to 1.0. A low value means a high rate of household sharing. A household ratio of 0.5 hence means no single household. A high household ratio means a high rate of single household. A household ratio of 1.0 therefore means that all individuals in that age group live in private households.

In Table 42, the amount of new household needed to year 2025 is recalculated as the number of new accommodations needed to 2025.

Table 42. The amount of new accommodations needed to 2025.

Age group	**Proportion of households in 2025 [%]**	**Dwelling needs [pcs]**	**Household quota [-]**	**Number of accommodations needed to 2025 [pcs]**
15-19	0,49	3479	0,03	115967
20-24	5,41	38411	0,43	89328
25-34	15,22	108062	0,62	174294
35-44	16,4	116440	0,63	184825
45-54	16,25	115375	0,67	172201
55-64	16,3	115730	0,66	175348
65-69	6,64	47144	0,62	76039
70-74	6,4	45440	0,65	69908
75-79	6,77	48067	0,71	67700
80+	10,12	71852	0,77	93314
Tot	100	710000		1218924

The accommodations needed are calculated with equation (1).

$$Accommodation\ needed = \frac{Housing\ needs}{Housing\ quota} \tag{1}$$

The proportion of household used in the calculations is an estimation that Boverket developed and forecast a case for the year 2025 while the household quota is for the year 2011. The calculation shows that 1 218 924 new accommodations are needed until the year 2025. One accommodation is equal to housing for one resident.

9.3 Emissions from the new dwellings needed until the year 2025

If using the construction Folkboende the need of new accommodations to 2025 is equivalent to 18 319 buildings or 677 180 apartments. I instead using the construction Quattro the need of new accommodations is equivalent to 51 323 buildings or 615 619 apartments. This implies that the distribution of apartments of different types in this study is not the same as the one Boverket forecast is needed. It might further not be desired to meet the need of new accommodations with only multi- family dwellings but other kinds of housing might be required like townhouse or villas. In this study the emissions from the new dwellings is calculated based on the need of accommodations in Section 9.2.

If the amount of accommodations needed until the year 2025 is provided by the multi-family dwellings Folkboende and Quattro the total emissions would be as presented in Figure 21. If all the accommodations would be provided by Folkboende the total Global warming potential emissions would be 46,3 millions ton and if using Quattro the emissions would instead be 56,9 millions ton. This means that if choosing to build Folkboende instead of Quattro to meet the need of housing to 2025, the emissions would be 18,6 percent lower. This means that 10,6 million tons of Carbon dioxide equivalent less will be emitted during the dwellings lifecycle.

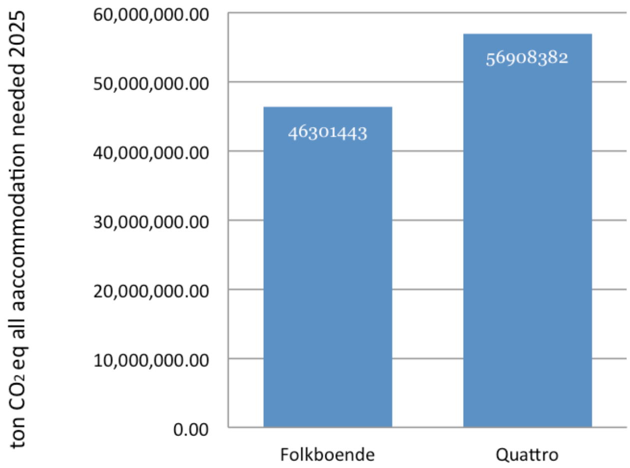

Figure 21. *The total greenhouse gas emissions during the lifetime for the new accommodations needed to year 2025 built as Folkboende and Quattro.*

9.4 Emissions from new dwellings in relation to Climate budget

In this section the emissions from accommodation needed to be built to 2025 is related to Sweden's climate budget to the years 2025 and 2050.

9.4.1 Housings share of the GHG budget for the new dwellings

To relate the emissions for all new accommodations built with the construction Folkboende or Quattro to the Sweden's climate budget the total emissions from the dwellings are calculated. In this study the emissions that occurs until year 2025 and year 2050 is calculated for the stages A1-B7. Stage C1-C4 is excluded due to the fact that the emissions from the deconstruction will take place after the year 2050 for the dwellings. The average household electricity per resident in a household with two residents is 1440 kWh per year (Energirådgivaren, 2011). This generates 60 kg of carbon dioxide equivalents per person and year with the Swedish electricity mix (One Click). If this is added to the result from the LCA all the emissions that occur until the year 2025 and 2050 from housing in Folkboende and Quattro can be calculated. Further are the 1 218 924 new accommodations assumed to be built between 2016 and 2025 with equally many dwellings built each year in the calculation.

To the year 2025 the Global warming potential emissions would be 18,86 million tons carbon dioxide equivalents if using the construction Folkboende to fulfill the demand of housing. If instead using the construction Quattro the emissions would be 24,59 million tons carbon dioxide equivalents. To the year 2050 the Global warming potential emissions would be 33,73 million tons carbon dioxide equivalents if using Folkboende and if building Quattro instead the emissions would be 42,76 million tons carbon dioxide equivalents.

The 1 218 924 new accommodations needed until the year 2025 will lead to an increase in the existing building stock in Sweden. As presented in Table 43, the emissions from this increase of the building stock built as Folkboende will to year 2025 stand for 4,10 percent of Sweden's budget of global warming emissions and 5,35 percent if built with Quattro instead. To year 2050 the emissions from Folkboende would stand for 3,03 percent of budget and if using Quattro, the emissions would stand for 3,85 percent of the budget.

Table 43. Share of Sweden's greenhouse gas budget year 2016 to 2025 and 2016 to 2050 derived from stage A1-B7 (to year 2050) and household electricity for the 1 218 924 new accommodations needed to 2025 built as Folkboende and Quattro.

	Folkboende [%]	**Quattro [%]**
Share of GHG budget 2016-2025	4,10	5,35
Share of GHG budget 2016-2050	3,03	3,85

9.4.2 Housings share of the GHG budget for both new and existing dwellings

The emissions from the existing building stock are not included in the calculation in Section 9.4.1. The year 2014, the emissions from housing in Sweden were 1,46 ton carbon dioxide equivalents per person and year (Naturvårdsverket, 2016). The population the year 2014 was 9 747 355 persons (SCB, 2015b). From these total emissions from housing of 14,23 million tons carbon dioxide equivalents can be derived. In this value home appliances and furniture's are included and contributing with about 3,9 ton carbon dioxide equivalents per year (Hunhammar, 2008). This is excluded in this study. Further are the emissions from construction process that year included. The emissions from construction processes in Sweden year 2014 was estimated to be 1,8 million tons carbon dioxide equivalents (IVA, 2014). If excluding the emissions from construction processes the total emissions from housing the year 2014 are 8,54 million tons carbon dioxide equivalents.

If the emissions from housing from the existing building stock continues at the same level in the future and if adding the emissions from construction and housing (stage A1-B7 + household electricity) for the new accommodations it is possible to calculate the total emissions from housing. If the new accommodations are provided by Folkboende the emissions would be 104,25 million ton carbon dioxide equivalents from 2016 to 2025 and 332,8 million ton from the years 2016 to 2050. If the new accommodations instead would be provided by Quattro the emissions from housing from the years 2016 to 2025 would be 109,98 million tons and 341,61 million tons from the years 2016 to 2050.

The emissions from housing for the existing building stock and the new accommodations needed to the year 2025 are presented in Table 44. If the new accommodations are constructed with Folkboende, housing will stand for 22,66 percent of Sweden's budget of global warming emissions to 2025 and 29,94 percent of the budget to the year 2050. If the new accommodations were constructed with Quattro instead the emissions from housing would stand for 23,90 percent of budget to the year 2025 and for the year 2050 the emissions would stand for 30,76 percent of the budget.

Table 44. Share of Sweden's greenhouse gas budget derived from stage A1-B7 and household electricity for the 710 000 new accommodations needed to 2025 built as Folkboende and Quattro and the emissions from housing for the existing building stock.

	Folkboende plus existing stock [%]	**Quattro plus existing stock [%]**
Share of GHG budget 2016-2025	22,66	23,90
Share of GHG budget 2016-2050	29,94	30,76

If adding the emissions from the dwellings needed to be built between 2025 and 2050 the emissions from housing would most likely be higher and so would also the share of the climate budget.

9.4.3 Share of Climate target 2050 per capita

The climate target for 2050 implies that each person in Sweden can emit 0,87 ton carbon dioxide equivalents per year. This is calculated from an expected population of 12 394 893 people the year 2050 (SCB, 2017).

The results from the LCA showed that the emissions from use stage (B1-B7) for Folkboende is 0,40 ton carbon dioxide equivalents per resident and year while Quattro's emissions is 0,45 ton carbon dioxide equivalents per resident and year. If adding the emissions from household electricity mentioned in Section 9.4.1, the emissions from housing per person can be calculated (Energirådgivaren, 2011). The emission from housing per person living in Folkboende results in 0,46 ton carbon dioxide equivalents per year and 0,51 ton in Quattro.

As presented in Table 45 below, the emissions from housing would for the residents in Folkboende stand for 52,87 percent of the carbon dioxide equivalents budget per capita the year 2050. The emissions from housing for the residents in Quattro would stand for 58,62 percent of the carbon dioxide equivalents budget. However, if the emissions per capita from housing would continue at the same level in the future as the year 2014, the emissions would stand for 100,69 percent of each person's carbon budget year 2050. This implies that the emissions from housing per capita must decrease to be able to reach Sweden's climate target 2050, since it would stand for more than the whole carbon budget if it continues at the same level as in the year 2014.

As mentioned in Section 9.4.2 the total emissions from housing in Sweden the year 2014 was 8,54 million ton carbon dioxide equivalents. The total greenhouse gas emissions from Sweden the year 2014, were 53,83 million ton carbon dioxide equivalents (Naturvårdsverket, 2017). This implies that the emissions from housing stood for 15,9 percent of Sweden's total greenhouse gas emissions year 2014. This can be compared with the share of emissions in the future scenarios.

Since the emissions from housing with Folkboende is lower compared to those from Quattro this implies that space efficient dwellings can be one part of the solution to lower the greenhouse gas emissions from housing. The emissions from space efficient housing will however also be a large share of almost 53 percent of the greenhouse gas budget year 2050. This is much higher than the share from housing the year 2014. This implies that more actions than only space efficient dwellings are needed to lower the emissions from housing in the future.

Table 45. Housing's share of the green house gas budget per capita year 2050 for residents in Folkboende, Quattro and housing level 2014 (Naturvårdsverket, 2016).

	Folkboende [%]	**Quattro [%]**	**Housing 2014 [%]**
Share of GHG budget per capita Year 2050	52,87	58,62	100,69

10 Discussion

The discussion is divided in three sections, space efficiency, LCA and climate target. In each section the results and findings from this study is discussed.

10.1 Space efficiency

In this study, space efficiency is measured with the total floor area (BTA) per resident. For multi-family dwellings a floor area lower than 41,5 square meters per resident is defined to be space efficient, even though it is possible to design dwellings that are significantly smaller than this with the same functions. Regardless of what seems to be believed by construction industry, there are no rules that hinder dwellings to be constructed space efficient. If studying the history, comfort and higher living standard led to bigger living areas during 20th century. At present however a big living area does not per se mean a high living standard. A person with small living area might be able to share some functions with other people in the dwelling or in the city. This could for example be a common space in the dwelling for washing instead of washing machines in every apartment. In the future it might also be more common to use different technical and design solutions that make it possible to create apartments with the same standard but with less living area.

The way people live and the way dwellings are constructed has changed over time. So has also the view of the optimal design and where geographically people want to live. Today Sweden has a huge housing shortage and the trend is that many want to live in larger cities or cities with universities. To make this possible, these cities in Sweden must be densified. According to construction- and real estate companies, the market demands for space efficient apartments is increasing. The customers ask to fit more in less area. This trend in Sweden has led to that the average size of an apartment has decreased the last ten years. Despite this Sweden still has one of the biggest living areas per person in Europe.

The definition of space efficient dwellings, total floor areas lower than 41,5 square meters per resident, covers almost all of the multi-family dwellings marketed as space efficient in this study. This implies that the definition is adapted to what today is seen as space efficient and is set without considering the future trends. If the trend with smaller living area continues, the definition of space efficiency needs to be adjusted to the present conditions. The result from this analysis showed that designing more space efficient apartment could decrease the climate impact from new multi-family dwellings with 18,3 percent. This indicates that if the average living area per person continues to decrease this will decrease the environmental impact from the whole dwellings stock if calculated per person.

It is important to understand the concept of "BTA per resident". When investigating the amount of residents a building can house, this is the most accurate term to use. It does however relate to the functions of the building rather than the functions of an apartment. It might therefore not be a good measure for brokers or real estate companies, which are more interested in rentable area. It is rather a measure for those designing or constructing multi-family dwellings that are interested in designing a more resident densified dwelling. For residents, "functions per square meter" could be a more interesting measure since it reflects how well the apartment can serve a certain purpose.

10.2 LCA

In this section the discussion of the LCA is divided in five subsections: materials, technical development, energy, system in the buildings and distribution of apartments.

10.2.1 Materials

One click's database only consists of materials where an environmental product declaration has been performed. This means that materials that do not have an environmental product declaration cannot be chosen in the software. When a product or a material used in Quattro or Folkboende did not existed in One clicks database, another similar product was chosen. This might have affected the result of the study mainly do to the fact that materials manufactured in Sweden might not have the same emissions as materials manufactured in other countries in Europe. This is true since products manufactured in Sweden in general have lower emissions due to higher share of renewable energy compared to the rest of the Europe (Haglund, 2014). Also the technology used in the production might be different both between countries and within Sweden. The emissions from the dwellings might therefore be higher in this study compared to the actual case. The comparison between the dwellings should however not be particularly affected since the same materials in dwellings often were exchanged and the same exchanged product were chosen.

During the lifetime of Quattro and Folkboende there are several materials that are expected to be replaced. Within the environmental product declaration the product's lifetime is listed and this lifetime is used in One click. If a material with a shorter lifetime than the building is used, the material is replaced with the same material. Since a similar material sometimes have to be chosen, it is possible that the chosen material do not have the same expected lifetime as the actual material has. The emissions in reality might therefore differ to the actual emissions. Nevertheless, since the majority of the materials is the same in both buildings, this will most likely affect both dwellings equally. Further do the replacement stage only stand for 10 percent or less of the total emissions in all impact categories. This should therefore only have a limited effect on the result and the comparison between the dwellings.

10.2.2 Technical development

As mentioned above a material with shorter lifetime than the building is replaced with the same material and is set to have the same emissions when it is replaced (stage B1-B5) as when its was first produced (stage A1-A3). This implies that the software does not take into account technical development. The product in the future might be produced with a cleaner energy and with a better technology that lower the emission from the manufacturing of the product. The emissions according to One click could hence be higher than the actual case since the production of materials in future might emit less. Further do the materials get replaced with the same product. This might not be the case. The windows in the software are for example set to be replaced after 40 years with the same type of window. This could represent the actual outcome but it is also possible that the window would be replaces with a totally different type of window. The windows might for instance be replaced with photovoltaic windows that produce electricity. The differences in the production of the window as well as the fact that is could provide electricity would most likely change the emissions from the present case and thereby affect the total emissions from the dwellings. It is impossible to predict what the future will bring but all possible changes would most likely affect both buildings relatively similar.

In One click the expected annual use of district heating and electricity is stated to show the total emissions during the building's lifetime from energy use. However, for the district heating used in the dwellings data is taken from Fortums district heating plant the year 2016. For the electricity, data from Sweden's electricity mix 2016 is used for calculation of the emissions. This means that One click calculates the emissions from energy use in the future with data from 2016. One click is by this not considering the fact that the emissions from district heating and the electricity might change over time. Considering today's political goals, it seems likely that the amount of renewable energy and greener technologies should rather increase than decrease. This implies that the emissions from energy use (B6) in this study might be higher than what could be the case. This can significantly affect the result since the emissions from energy use stand for the highest emissions within all impact categories except for Formation of tropospheric ozone. This would most likely affect the dwellings equally as well.

10.2.3 Energy

From the study made by Cuéllar-Franca and Azapagic, the use of energy depends both on the type of house, the size of the house and the household size (Cuéllar-Franca, 2012). The lighting and space heating was said to differ with size since a greater space entails more lighting and space to heat which is leading to a higher energy use per resident with fewer residents per area. Cooking, use of domestic appliances and heating of water differs with the amount of residents since more residents per square meter leads to a higher energy use per square meter from those activities. In this study the lighting and the household energy is excluded in Chapter 7 and 8. Also the energy use from tap water is estimated per square meter floor area. In Folkboende there live more residents per square meter than in an average multifamily dwelling. This would probably lead to a higher energy use from the tap water per square meter than what is used for Folkboende at present and thereby increase the energy use per square meter. Since the heating of water, the cooking and the use of domestic appliances stand for more significant energy usage than lighting the difference in energy use per square meter between Folkboende and Quattro should probably be smaller than in the result (Energirådgivaren, 2011).

10.2.4 Systems in the building

In One click the emissions from the drainage system, pipe system (hot and cold water supply), electricity cabling, heating system (steel pipes and heat distribution center) and ventilation system is calculated from the total floor area in building. The emissions derived from buildings installation systems is based on One click's own study of how much each system generally emits per square meter floor area and are probably based on an average buildings built today. This might give more reasonable results for Quattro, which is more of an average building regarding residents per square meter than what Folkboende is. For a more precise and accurate simulation of emissions this would need to be further investigated to ensure that the data of emissions per square meter for building installation systems is valid for buildings with more residents per area than general.

10.3 Climate target

As presented in Section 9.4.1 the emissions from Folkboende and Quattro is only representing a small part of the greenhouse gas budget. If looking at the emissions from the total building stock however a significant part of the emissions in the budget originates from housing. Even though the amount of new dwellings needed until the year 2025 only stand for about 13 percent of the building stock 2025 it is important that they are constructed with as little impact as possible. If choosing to build space efficient multi-family dwellings, the greenhouse gas emissions can be reduced by 18,3 percent. In the long run this could highly influence the emissions from housing since what is build today will be tomorrow's building stock.

In Section 9.4.3, the comparison shows that almost 53 percent respectively 59 percent of the climate budget per person will be derived from housing if living in Folkboende or Quattro, if each person were responsible for their own emissions. If only looking at the emissions from those living in the existing building stock (year 2014) more than 100 percent of their budget year 2050 will come from housing if each person were responsible for their own emissions. This means that the emissions from housing per resident the year 2014, is higher than the climate budget per person year 2050. This can be compared to the share of emissions from housing year 2014. The year 2014 only 15,9 percent of Sweden’s total greenhouse gas emissions originated from housing. If housing would have the same share of total emissions in the climate budget 2050 as today, the emissions from housing year 2050 would be 1,71 million ton carbon dioxide equivalent emissions. With an expected population of 12 394 893 persons year 2050, the emissions would be 0,138 ton carbon dioxide per person (SCB, 2017). This can be compared with the emissions from housing 2014, which is 0,87 ton carbon dioxide per person. This means that the reduction of the emissions from housing needs to be 85 percent lower between the years 2014 to 2050 if having the same share of total emissions the year 2050 as Sweden did the year 2014.

However, if looking at use stage (B1-B7) of the building stock it is clear that buildings constructed before 1990 have significantly higher energy consumption per heated area (Mangold, 2015). In Gothenburg in Sweden more than 85 percent of the heated floor area in multi-family building are constructed before the year 1990. If the same is assumed to be true for the rest of Sweden it will take time to reduce the impact from the use stage with just the construction of new dwellings. The emissions per capita from housing have been decreasing the last years. In the year 2003 the emissions from housing where 2,5 ton per capita and in year 2014 the emissions from housing is 1,46 ton per capita (Naturvårdsverket, 2016). The decrease of the emissions is partly due to a significant increase of district heating and a decrease of heating oil but also due to the refurbishment of existing housing stock with focus on lowering the energy use. This trend must continue if the emissions target shall be met.

It is furthermore important to point out that the Swedish target could be seen as unambitious and not related to the amount of carbon dioxide equivalents that the earth can take care of. It is often argued that the change in temperature on earth must be kept within two degrees. If this condition is met and if all inhabitants on earth where allowed to emit the same amount of greenhouse gas, the carbon dioxide budget for

Sweden would have to be significantly lower than present. It would then be even harder for Sweden to reach the target with the emissions from housing stock of today. It is therefore very urgent to manage the question of reducing the emissions from housing.

Nevertheless, building space efficient buildings can help in the aim to reduce the environmental impact from housing but if the share of the carbon dioxide budget originated from housing shall be kept at present level more must be done. One important part is to lower the energy use from the existing building stock and to reduce the emissions from energy use, for example with renewable energy solutions. For the future housing stock it is important that all new dwellings during their lifetime emit as little green house gas emissions as possible. Here space efficient dwellings have an important role to play in lowering the emissions.

11 Conclusion

Space efficiency for dwellings can be measured in total floor area per resident. The recommendation is that space efficient dwellings have a total floor area lower than 41,5 square meters per resident.

The average size dwelling had 23-109 percent higher emissions compared to a space efficient dwelling depending on impact category. The greenhouse gas emissions per resident is 18,3 percent lower for a space efficient dwelling compared to a average size dwelling. This implies that space efficient dwellings can be one part of the solution to lower the greenhouse gas emissions in the aim to reach Sweden's climate goal.

For further research we recommend a detailed study of the social- and economical consequences for space efficient multi-family dwellings.

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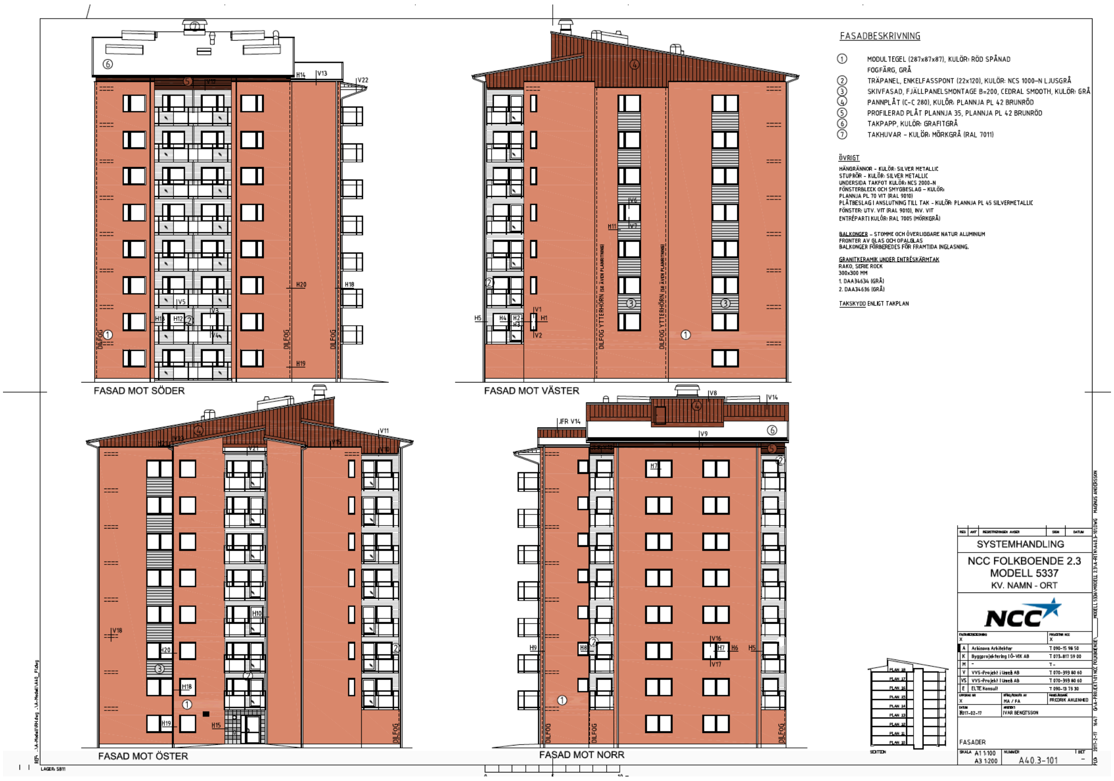
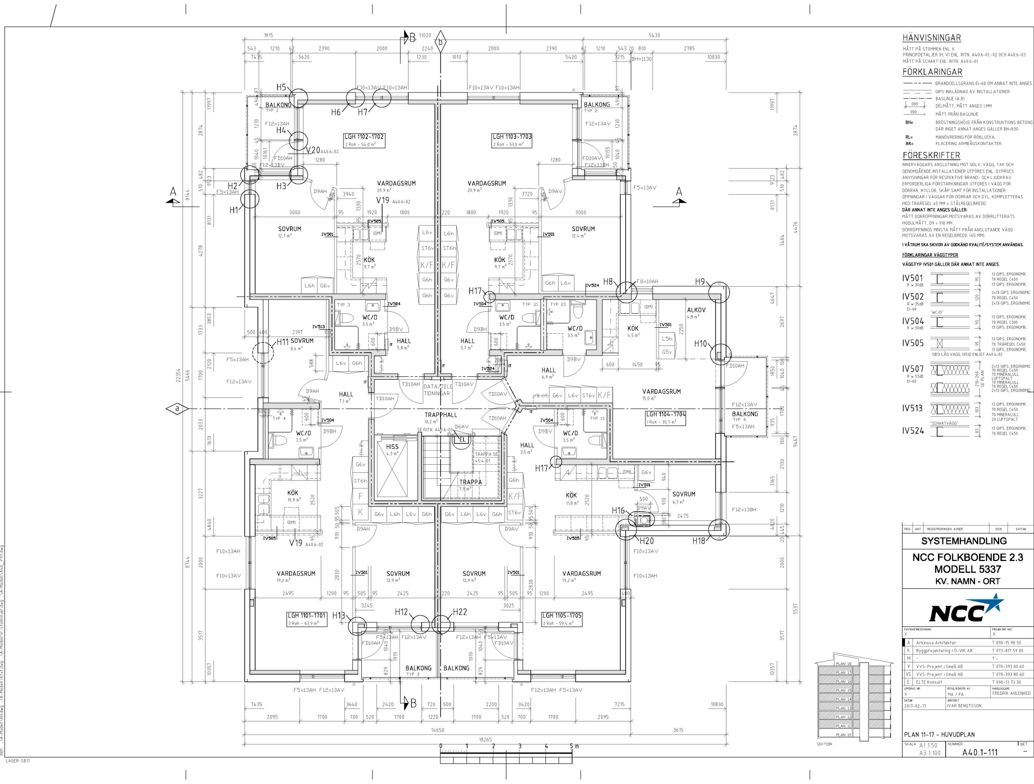
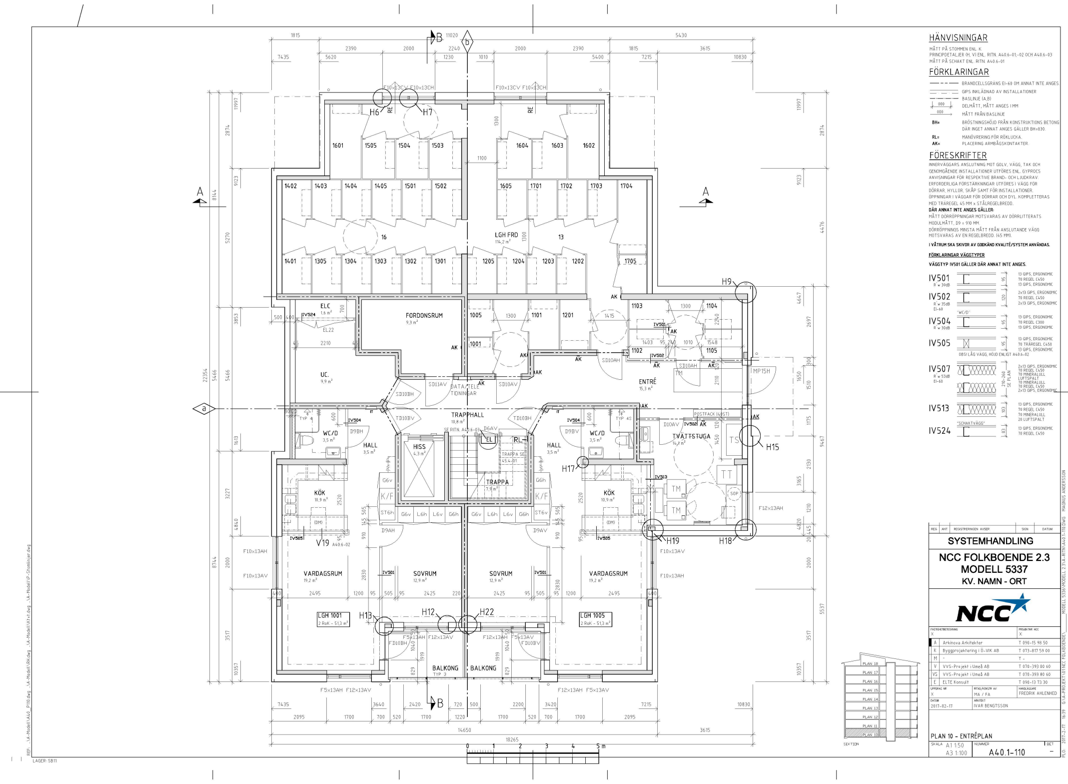
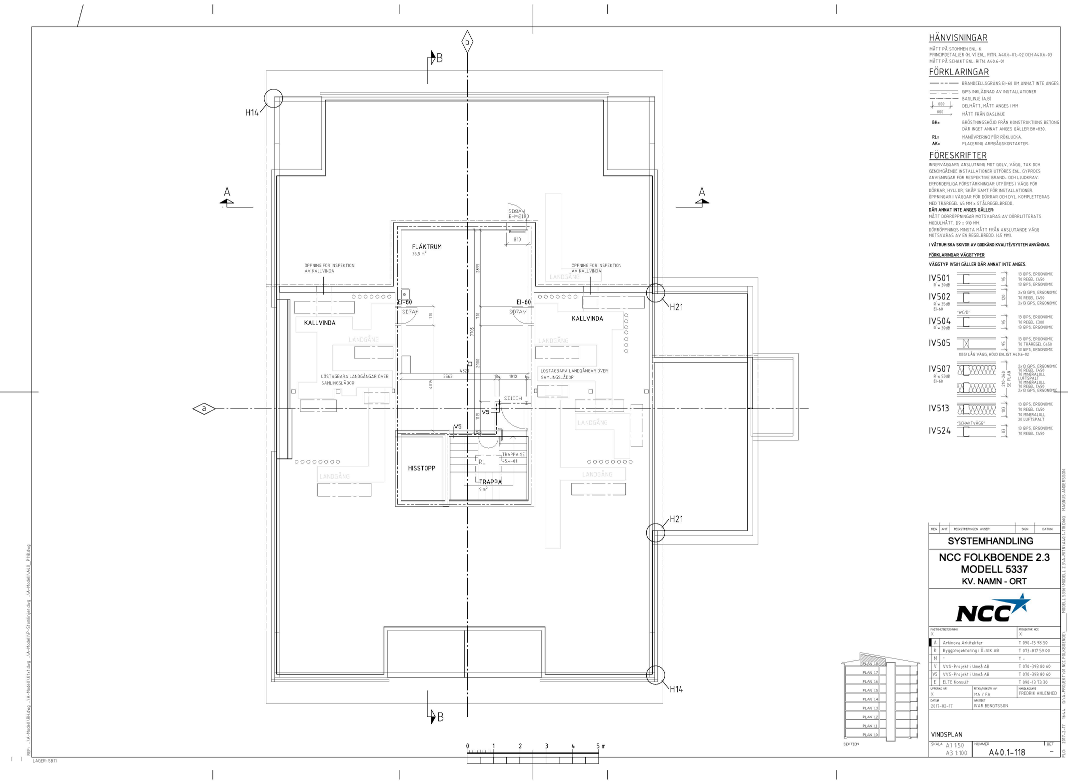
Appendix A – Façade and floor plan for Folkboende



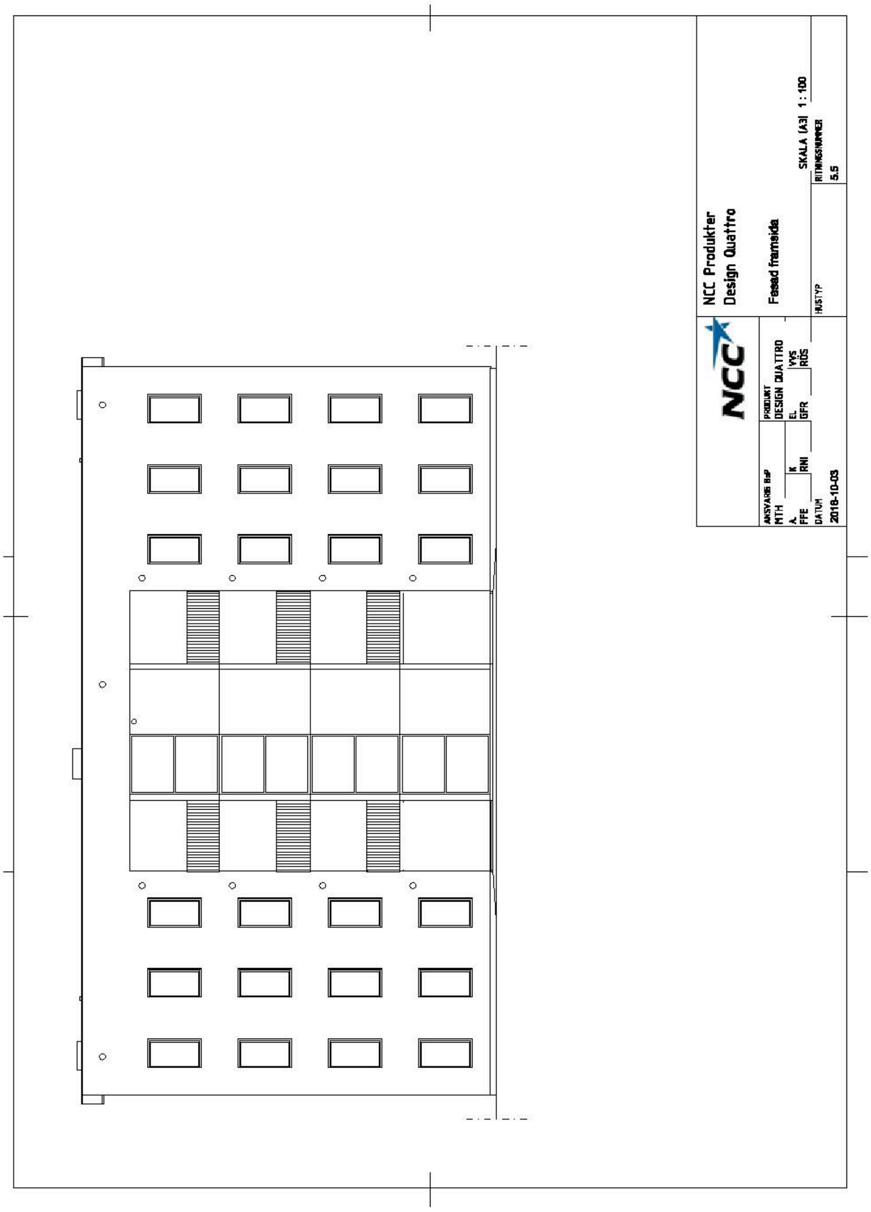






Appendix B – Façade and floor plan for Quattro

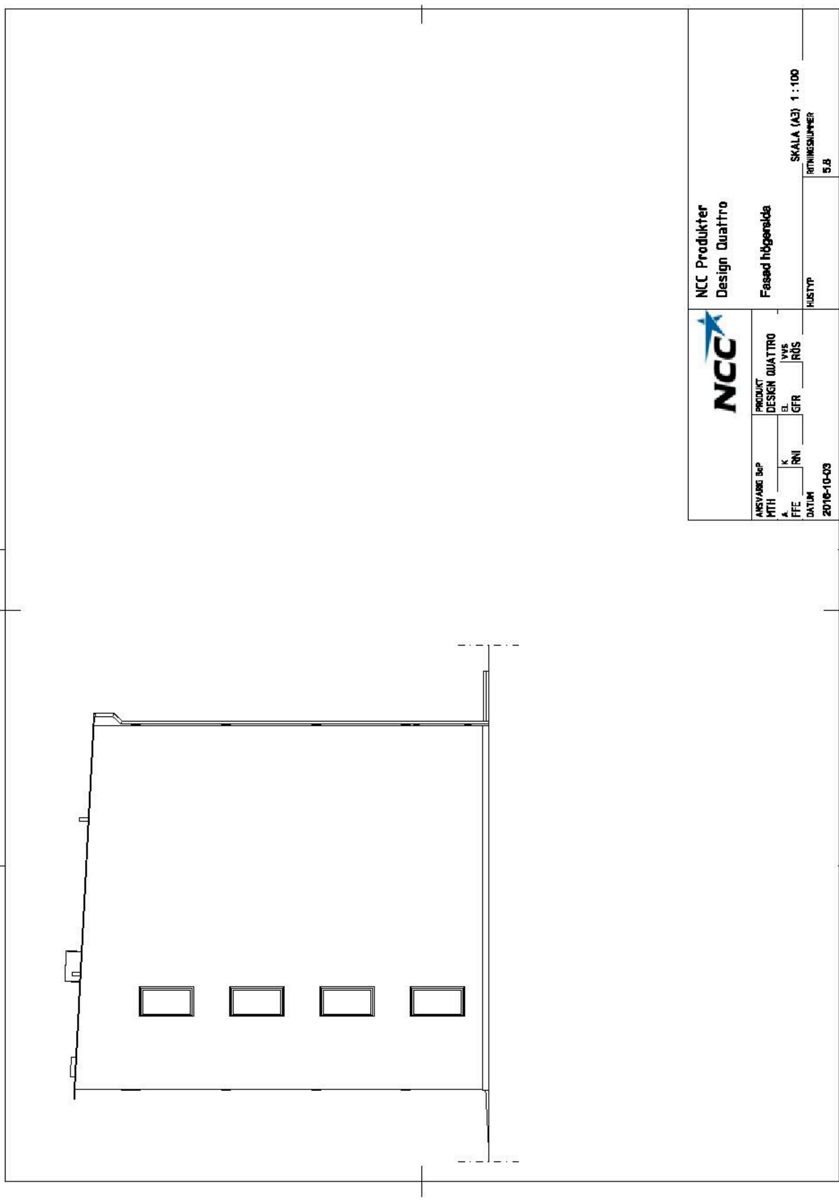
5.5 FASAD FRAMSIDA



2016-10-03 med reservation för ev. tryckfel och ändringar såsom pris, material, färger etc. För aktuella uppgifter är du välkommen att kontakta NCC.

24 (41)

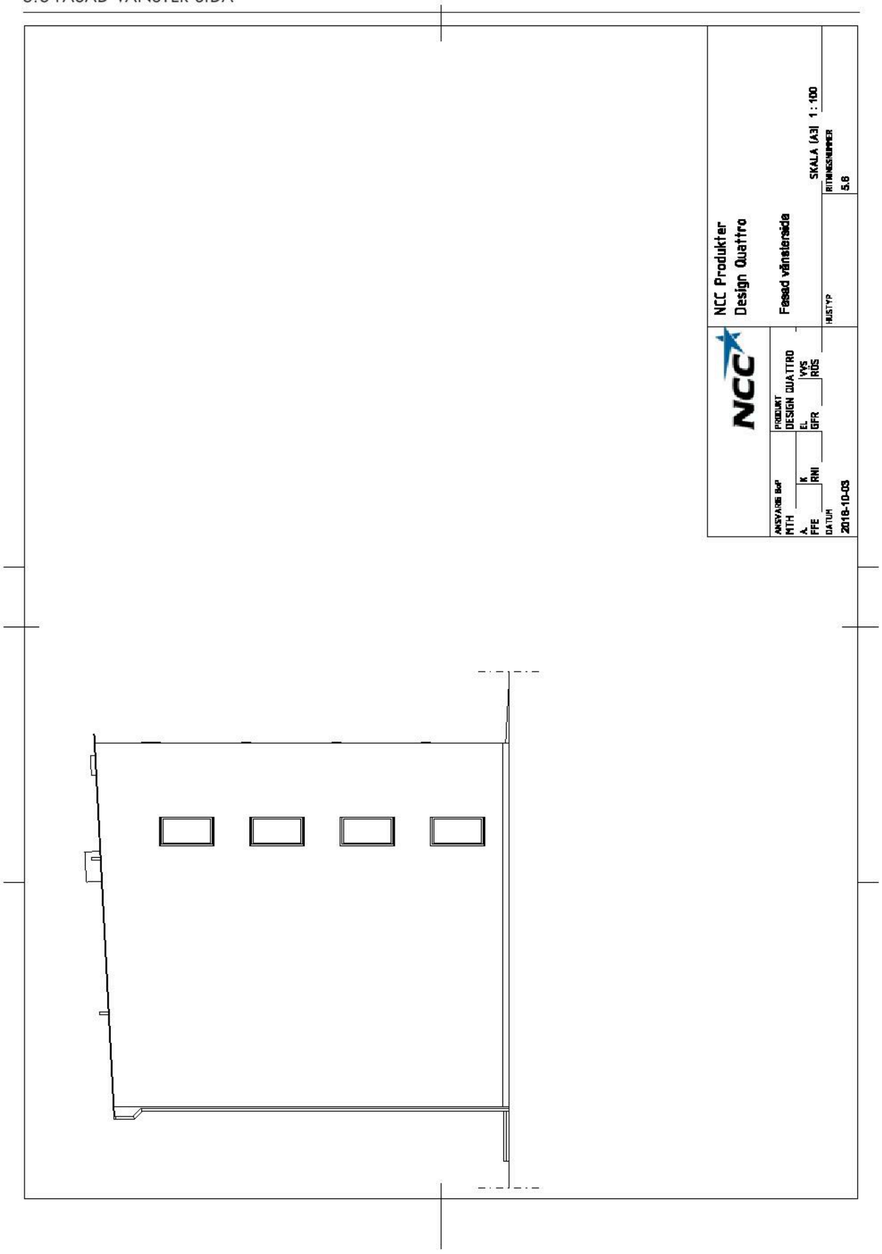
5.8 FASAD HÖGER SIDA



2016-10-03 med reservation för ev. tryckfel och ändringar såsom pris, material, färger etc. För aktuella uppgifter är du välkommen att kontakta NCC.

27 (41)

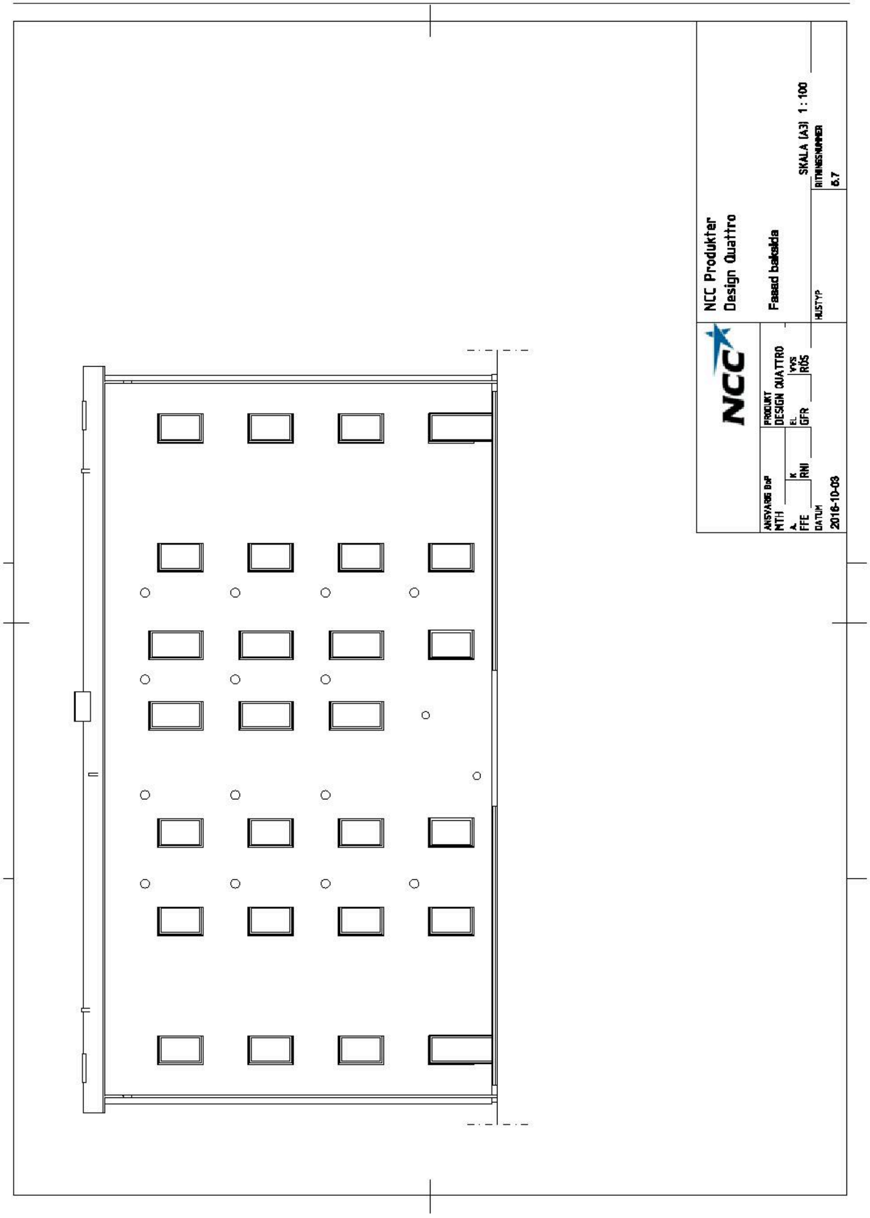
5.6 FASAD VÄNSTER SIDA



2016-10-03 med reservation för ev. tryckfel och ändringar såsom pris, material, färger etc. För aktuella uppgifter är du välkommen att kontakta NCC.

25 (41)

5.7 FASAD BAKSIDA



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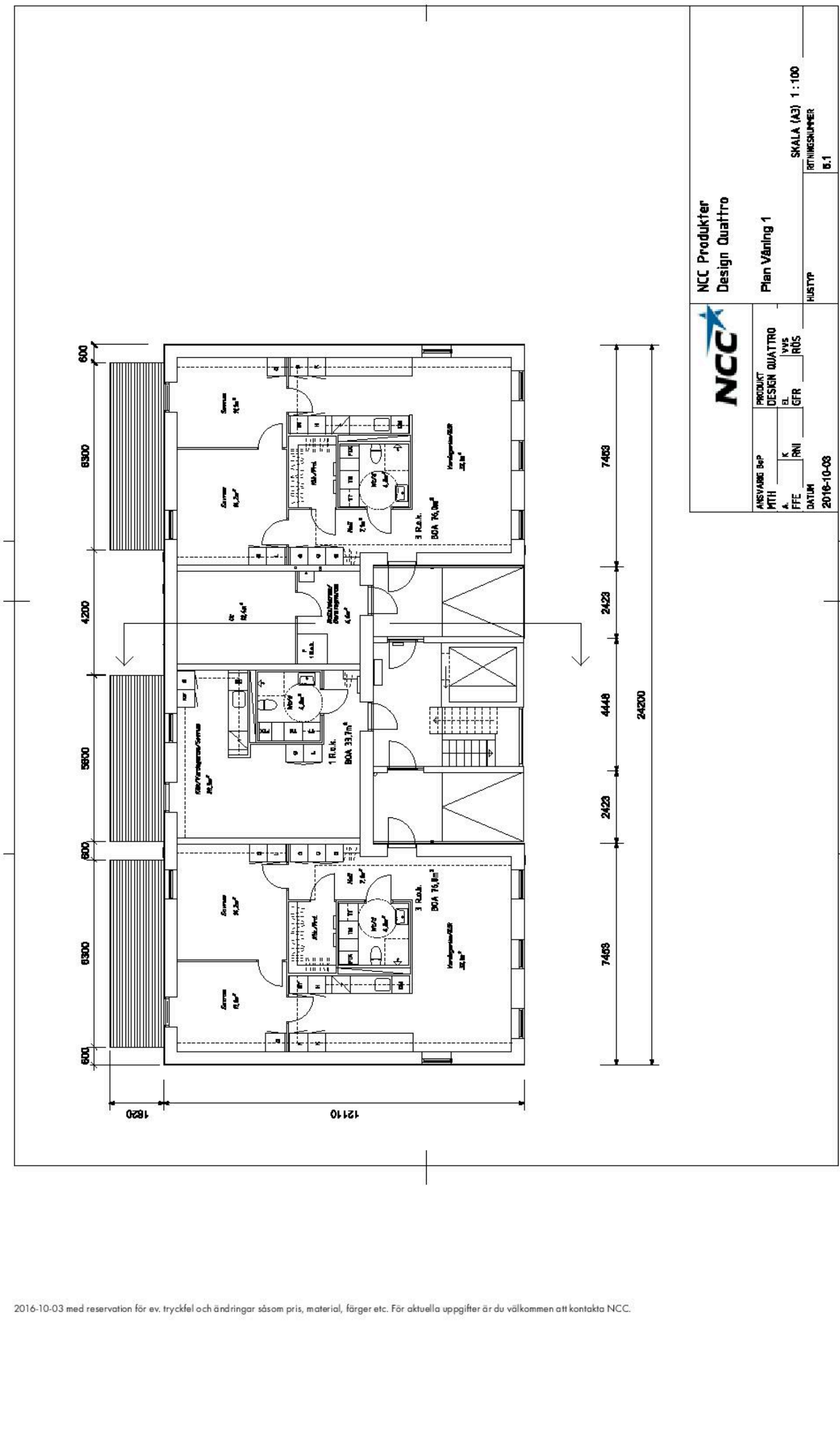
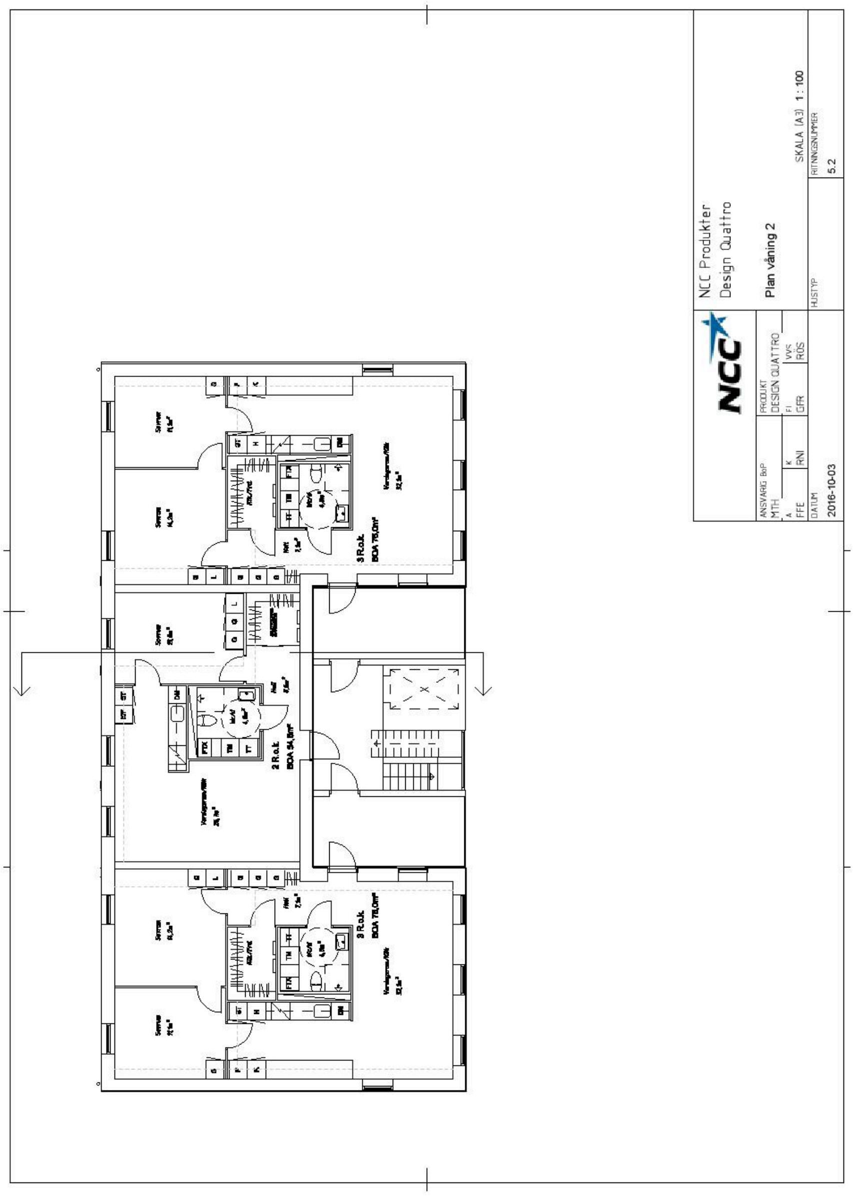
26 (41)



2016-10-03 med reservation för ev. tryckfel och ändringar såsom pris, material, färger etc. För aktuella uppgifter är du välkommen att kontakta NCC.

20 (41)

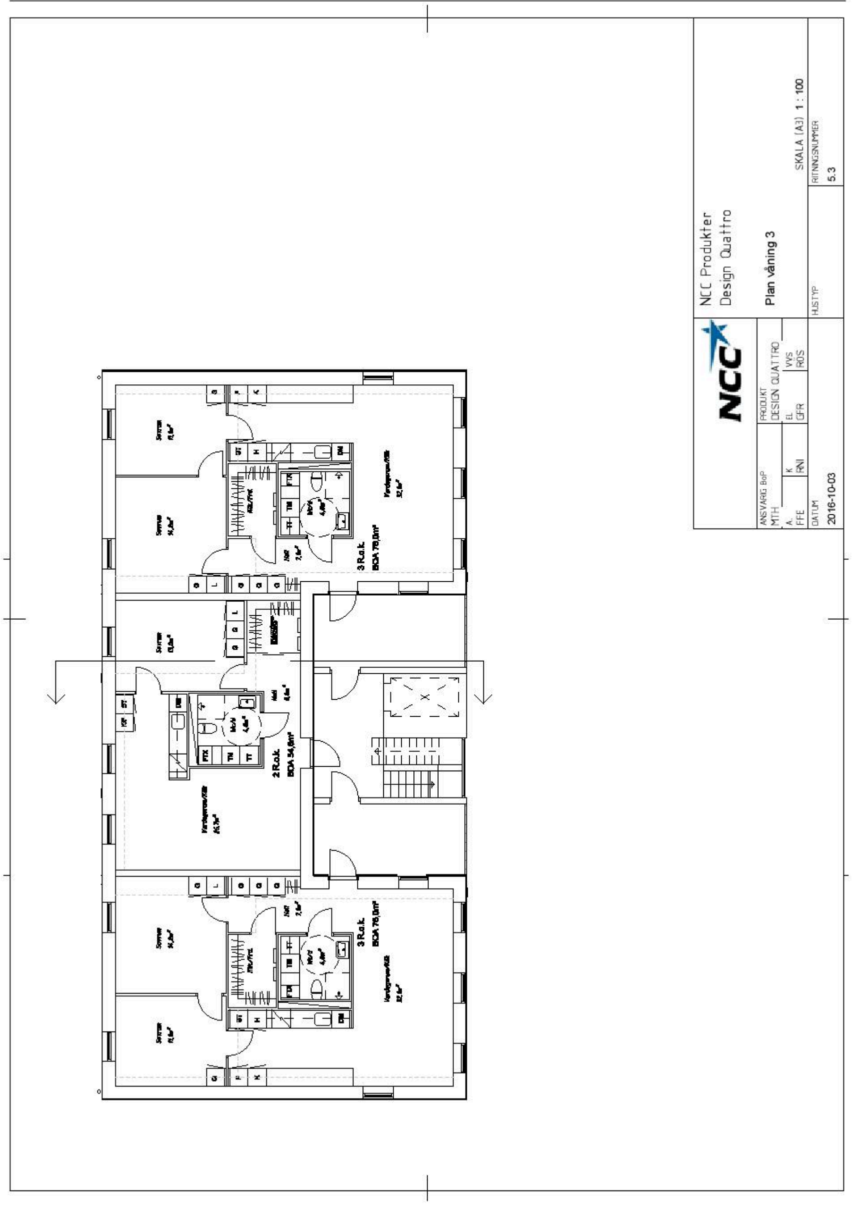
5.2 PLAN VÅNING 2



2016-10-03 med reservation för ev. tryckfel och ändringar såsom pris, material, färger etc. För aktuella uppgifter är du välkommen att kontakta NCC.

21 (41)

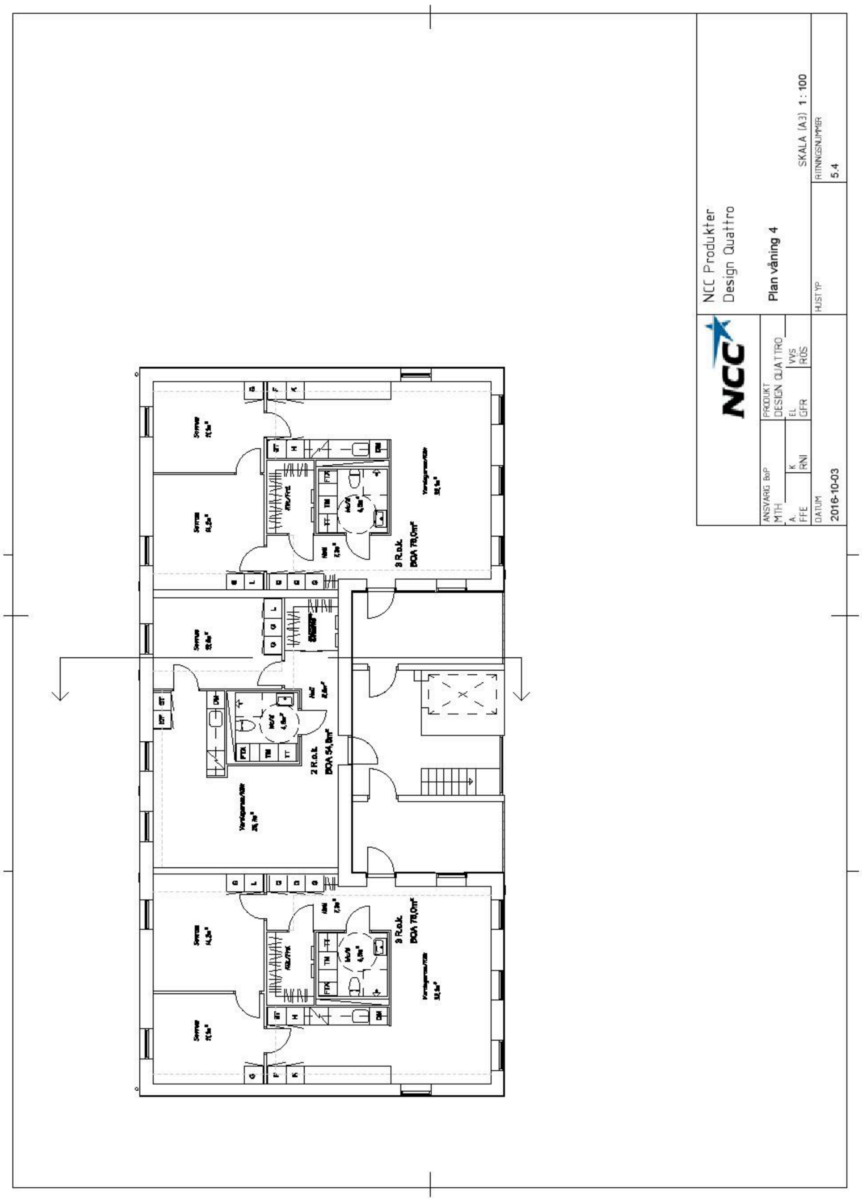
5.3 PLAN VÅNING 3



2016-10-03 med reservation för ev. tryckfel och ändringar såsom pris, material, färger etc. För aktuella uppgifter är du välkommen att kontakta NCC.

22 (41)

5.4 PLAN VÅNING 4



2016-10-03 med reservation för ev. tryckfel och ändringar såsom pris, material, färger etc. För aktuella uppgifter är du välkommen att kontakta NCC.

23 (41)

Appendix C – Inventory analysis Folkboende

Life-cycle assessment, EN-15978: Construction Materials

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)	800							
Electricity, Sweden	209 200							Elförbrukning produktion
District Heat, Sweden	228 000							Fjärrvärme produktion
Liquified petroleum gas	47,5							Gasol produktion
Diesel	5 716							Diselanv. prodution
Petrol 95E10	363							Bensinanv. produktion
Tap water, clean	500							Vattenförbrukning produktion
Biowaste	2 600							Komposterbart avfall
Brick waste	1 950							Tegelavfall (30 % av fyllnadsmassor)
Cardboard waste	650							Emballageavfall
Concrete waste to recycling	2 600							Betongavfall (40% av fyllnadsmassor)
Gypsum waste	6 500							Gipsavfall
Mixed waste	3 900							Osorterat avfall
Plastic waste	1 300							Plastavfall
Soil waste	1 950							Schaktavfall (30 % av fyllnadsmassor)
Wood waste	17 550							Träavfall
Bitumen-polymer membrane, groundings	276,6 kg	0,76	0,11	0,17	188,5	0	3 442,65	Base slab insulation papp
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	177 m3	70,8	17,7	0	33 612,3	0	296 315,7	Concrete base slab
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	7 318,74 kg	10,98	1,61	0,73	3 293,43	0	46 737,47	Reinforcement base slab
EPS insulation, 0.035 W/mK, 20 kg/m3 (EUMEPS)	70,72 m3	9,9	0,85	24,04	3 536	0	58 980,48	Base slab insulation
Insulation, XPS, 40-50 kg/m3	14 m3	9,38	1,01	6,42	4 760,16	0	23 872,93	Base slab insulation
Plastic, HDPE	4	19,2	4,8	2,52	7,2	0	129,2	Buffer blocking
Plastic profile, EPDM	0,45 m3	2,73	0,32	0,41	1 954,14	0	35 601,64	Sill plate insulation
Steel, stainless, hot rolled (Outokumpu)	0,05 m3	8,77	0,39	0,73	1 086,25	0	16 226,6	Mounting hardware
Steel, stainless, hot rolled (Outokumpu)	635 kg	14,1	0,63	1,17	1 746,25	0	26 085,8	Rebend
Steel, stainless, cold rolled (Outokumpu)	416 kg	10,11	0,5	0,85	1 476,8	0	23 961,6	Mountingplate
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	4 379 kg	1,08	0,57	4,42	1 449,45	0	38 578,99	Reinforcement base slab
Laminated plywood, waterproof, 10.2 mm	3,2 m3	20,26	3,92	2,4	931,53	0	130 791,07	Concrete mould
Brick facade, common brick, 1395 kg/m3, 130 mm (Wienerberger...	149 142 kg	92,69	11,96	16,99	41 401,82	0	683 965,21	Brick facade
Ready-mix concrete exluding rebar, C32/40, B35 M45 < 200 mm,...	5,5 m3	1,03	0,3	2,96	1 335,14	0	8 067,11	Concrete foundation
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	0,53 m3	0,7	0,11	0,07	307,3	0	5 628,48	Fiber cement board
Cement, CEM I	720 kg	1,53	0,23	0,37	694,08	0	4 858,56	Cement mortar

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Insulation, glass wool, water repellent, kraft paper lining,...	66,65 m3	24,99	3,08	1,25	2 166,12	0	43 739,06	Facade insulation
Glass fibers, glass yarn, 146g/m2 (Vitrulan)	2,11	0,05	0	0	9,34	0	174,58	Insect screen
Gypsum board, storm sheathing, 9.5 mm, Glasroc H Storm (Gypr...	687,5 m2	12,93	0,67	0,83	1 815	0	27 046,25	Plasterboard storm sheating
Insulation, glass wool/mineral wool, 80 kg/m3, KL (Isover)	85 m3	22,95	2,55	2,89	2 635	0	57 290	Facade insulation
Lightweight concrete block, 500 kg/m3, 0.12-0.13 W/mK, Ytong...	900 kg	0,44	0,06	0	443,53	0	3 814,18	Lightweight concrete block
Aluminium curtain walling, 2700 kg/m3 (GAA)	0,01 m3	2,33	0,13	0,14	452,88	0	8 241,6	Curtain walling
Facade plastering, plaster (weber)	5 724 kg	15,51	2	2,29	8 368,49	0	174 793,79	Facade plastering
Screws/fixings, galvanized	224 kg	2,49	0,23	0,32	804,59	0	10 323,93	Screw/ fixings facade
Sealing tapes, PE/PP foil	31,39 kg	0,14	0,01	0,03	79,29	0	1 150,1	Sealing tape
Steel, stainless, hot rolled (Outokumpu)	0,2 m3	35,08	1,56	2,92	4 345	0	64 906,4	Mounting hardware, valve
Steel, stainless, hot rolled (Outokumpu)	453 kg	10,06	0,45	0,84	1 245,75	0	18 609,24	Reinforcement, brick
Steel, stainless, cold rolled (Outokumpu)	0,01 m3	1,32	0,07	0,11	192,34	0	3 120,77	Air gap wire mesh
Stoneware tiles, unglazed	6 m2	0,07	0,01	0	42,17	0	710,88	Granite ceramics wall covering
Plastic vapour control layer, 0.2 mm (Tommen Gram)	84,45 kg	0,74	0,06	0,04	194,02	0	1 767,16	Plastic vapour control
Plastic vapour control layer, 0.2 mm (Tommen Gram)	1 146 m2	1,87	0,14	0,1	487,05	0	4 436,17	Plastic vapour control
Dry mortar, M5, Murmortel M5 (weber)	51 865 kg	7,81	2,35	10,65	7 747,18	0	50 513,94	Dry mortar
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	56,52 m3	18,65	4,41	2,26	3 391,2	0	130 674,24	Construction timber
Planed timber, conifer	9,92 m3	4,07	0,89	0,26	525,64	0	38 005,01	Planed timber
Wooden façade external facing, thermo tree, pine	3,16 m2	0,15	0,14	0,01	38,44	0	760,93	Wooden facade panels
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	481,8 m3	192,72	48,18	0	91 493,82	0	806 581,38	Concrete walls
Ready mix concrete, excluding rebar, C32/40 (B35 M45)	5,3 m3	0,98	0,2	2,82	1 205,15	0	6 874,17	Concrete walls
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	14 637 kg	11,42	2,49	0,92	5 415,69	0	87 046,24	Reinforcement (load bearing walls)
Plastic, HDPE	10	48	12	6,3	18	0,01	323	Buffer blocking
Steel, hot-dip zinc coating	554,84 kg	21,46	6,83	1,18	1 455,29	0	0	Rebend
Steel, stainless, hot rolled (Outokumpu)	0,25 m3	43,84	1,96	3,65	5 431,25	0	81 133	Mounting hardware, walls
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	8 758 kg	2,15	1,15	8,85	2 898,9	0	77 157,98	Reinforcement wire mesh (load bearing walls)
Planed timber, conifer	13 m3	5,33	1,17	0,34	689	0	49 816	Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	0,04 m3	7,13	0,78	0,45	1 069,2	0	17 852,4	Reinforcement wire
Glass wool/mineral wool insulation, acoustic partition roll,...	7,32 m3	0,96	0,11	0,12	121,92	0	2 267,65	Acoustic insulation panel
Non-Alloy Structural Steel (Direct Reduced Iron production r...	349 kg	4,99	0,54	0,37	1 026,06	0	15 090,76	Screws/fixings non galvaniz

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Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Ceramic tiles, 15.1 kg/m2 (IKFP)	333 m2	6,7	0,64	0,54	3 230,1	0	58 294,84	Ceramic tiles public spaces
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	0,03 m3	0,02	0,01	0	15,46	0	131,49	Adhesive cementitious for tiles
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	3 m2	0,05	0	0	9,6	0	188,7	Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Pla...	2 922 m2	22,94	2,09	2,06	6 720,6	0	107 704,92	Plasterboard, Standard
Gypsum plasterboard, wetroom, 12.5x900 mm, 10 kg/m2, Glasroc...	86,3 m2	1,29	0,09	0,15	250,27	0	6 757,29	Plasterboard wetroom
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	95,1 m2	1,91	0,18	0,15	922,47	0	16 648,16	Ceramic tiles kitchen
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	333 m2	6,7	0,64	0,54	3 230,1	0	58 294,84	Ceramic tiles WC/shower
Plastic carpet, wet area, 2.25 mm, 2.9 kg/m2 (ERFMI)	1 m2	0,04	0,01	0	2,58	0	129,1	Plastic carpet
Screws/fixings, galvanized	879 kg	9,77	0,89	1,26	3 157,29	0	40 512,21	Screws/fixings galvanized
Steel profile with PE lining (Norgips)	85,7	1,02	4,98	0,04	96,69	0	2 544,26	Steel rail SK 70 polyeten
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	41,5 kg	1,02	4,9	0,04	102,65	0	2 633,66	Corner profile
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	119,6 kg	2,94	14,12	0,13	295,84	0	7 590,02	Corner protection HS29
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	426 kg	10,49	50,31	0,46	1 053,76	0	27 034,7	T-nogging
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	637 kg	15,68	75,23	0,69	1 575,69	0	40 425,13	Steel rail SK 70
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	1 003 kg	24,69	118,45	1,09	2 481,03	0	63 652,12	Steel joist R70
Silicon waterproofing compound	0,07 m3	0	0	0	0,69	0	13,05	Silicion selant
Wood board, particleboard	3,3 m3	3,21	0,59	0,15	646,8	0	12 606	OSB plywood
Plywood, spruce, uncoated	40,61 m3	36,91	7,8	2,25	4 913,81	0	259 904	Plywood
Timber lining (interior), conifer	9 m3	3,69	0,81	0,24	501,43	0	34 457,14	Floor beading
Planed timber, conifer	9,92 m3	4,07	0,89	0,26	525,76	0	38 013,44	Planed timber
MDF, 7-30 mm, Fibrapan (Finsa)	1,85 m3	8,81	0,78	1,17	714,08	0	31 095,02	MDF-board
Ceramic tiles, 15.1 kg/m2 (IKFP)	11,55 m2	0,23	0,02	0,02	112,04	0	2 021,94	Foundation ceramic tiles
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	438,1 m3	175,24	43,81	0	83 195,19	0	733 423,21	Concrete floor slab
Ready mix concrete, excluding rebar, C30/37 (B30 M60) D22 Sy...	45,4 m3	7,03	1,39	19,71	8 523,08	0	49 227,73	Concrete, elevator and balconies
Mineral wool insulation with recycled briquette content, 0.0...	211,64 m3	7,62	6,77	126,98	19 894,16	0	279 153,16	Roof insulation UNI-board
Ceramic floor tiles (Kutahya Seramik)	134,3 m2	4,2	1,44	0,22	1 340,31	0	21 225,98	Ceramic floor tiles
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	0,18 m3	0,24	0,03	0,01	64,75	0	657,67	Screed flooring fan room
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	9,15 m3	11,9	1,42	0,5	3 204,25	0	32 546,02	Screed flooring
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	14 637 kg	21,96	3,22	1,46	6 586,65	0	93 471,88	Reinforc[illegible] teel (floor sla[illegible]

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Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	416 m2	0,26	3,67	356 512	719,68	0	28 213,12	Waterproofing roof carpet
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	133,2 m2	2,68	0,25	0,21	1 292,04	0	23 317,93	Ceramic tile, floor we troom
Plastic flooring, thick (SNMI)	39,5 m2	0,35	6,32	0	67,54	0	2 544,59	Plastic flooring fan room
Insulation panel, 120 mm, Thane Sarking (KNAUF)	672 m2	76,61	11,22	5,73	12 297,6	0	322 828,8	Sarking
Acoustic flooring, 10 mm, VIBRASTO 10 (TEXAA)	0,13 m3	0,22	0,03	0,04	47,45	0	1 388,94	Acoustic carpet
Acoustic ceiling tiles, 91 - 131 kg/m3, 1.7 - 9.3 kg/m2, 300...	72 m2	0,24	0,17	1,78	239,41	0	5 178,02	Ceiling indoor
Primer, protective, for walls and floors, Gisogrund (PCI)	0,23 m3	5,42	0,16	0,38	515,25	0	10 478,25	Primer for floors
Plastic, HDPE	10	48	12	6,3	18	0,01	323	Buffer blocking
Sealing tapes, PE/PP foil	2,61 kg	0,01	0	0	6,59	0	95,63	Sealing tape
Luxury vinyl floor tile, Luxury Vinyl Tile (LVT) (Karndean)	1 857 m2	24,88	6,08	18,2	17 641,5	0	362 115	Vinyl flooring Tarkett nordic stabil
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	0,01 m3	0,12	0,02	0,02	40	0	623,02	Flooring adhesive
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	0,04 m3	0,81	0,15	0,14	263,31	0	4 101,07	Flooring adhesive
Steel, hot-dip zinc coating	12,8 kg	0,5	0,16	0,03	33,57	0	0	Eye bolt
Steel, hot-dip zinc coating	132,83 kg	5,14	1,64	0,28	348,4	0	0	Brackets
Steel, hot-dip zinc coating	832,26 kg	32,19	10,25	1,77	2 182,93	0	0	Rebend
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	8 758 kg	2,15	1,15	8,85	2 898,9	0	77 157,98	Reinforcement wire mesh (floor slab)
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	2 796,8 kg	3,29	0,26	0,21	707,43	0	8 571,37	Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	43 579,8 kg	51,27	3,97	3,2	11 023,13	0	133 559,27	Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 2-30mm/4-50mm...	41 342,4 kg	58,37	4,5	3,65	10 457,2	0	171 449,36	Multipurpose floor screed
Natural stone tiles, hard, exterior	5,12 m2	0,07	0,01	0,01	29,86	0	431,79	Natural stone, floor public area
Plastic vapour control layer, 0.15 mm (Tommen Gram)	0,19 kg	0	0	0	0,43	0	8,05	Plastic vapour control layer
Dry mortar, B30, B30 (weber)	2 195 kg	0,28	0,11	0,66	388,52	0	2 725,96	Dry mortar
Laminated plywood, waterproof, 10.2 mm	10,94 m3	69,3	13,41	8,22	3 186,02	0	447 329,97	Concrete mould
Dried timber, conifer	22 m3	7,46	1,65	0,45	946	0	65 010	Tounge and grove
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,03 m3	0,01	0	0	1,92	0	73,98	Fink truss 13
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,07 m3	0,02	0,01	0	4,2	0	161,84	Fink truss 4
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,09 m3	0,03	0,01	0	5,34	0	205,77	Fink truss 3A
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,12 m3	0,04	0,01	0,01	7,5	0	289	Fink truss 6
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,17 m3	0,06	0,01	0,01	10,2	0	393,04	Fink tru[illegible]

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,29 m3	0,09	0,02	0,01	17,22	0	663,54	Fink truss 1
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,39 m3	0,13	0,03	0,02	23,4	0	901,68	Fink truss 8
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,5 m3	0,17	0,04	0,02	30	0	1 156	Fink truss 12
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,59 m3	0,2	0,05	0,02	35,5	0	1 368,01	Fink truss 10
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,71 m3	0,23	0,06	0,03	42,72	0	1 646,14	Fink truss 7
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	1,07 m3	0,35	0,08	0,04	64,08	0	2 469,22	Fink truss 3
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	1,32 m3	0,44	0,1	0,05	79,2	0	3 051,84	Fink truss 11
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	2,31 m3	0,76	0,18	0,09	138,6	0	5 340,72	Fink truss 2
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	2,72 m3	0,9	0,21	0,11	163,38	0	6 295,58	Fink truss 9
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	0,11 m3	0,08	0,02	0,01	12,7	0	518,24	Laminated wood beam 13
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	0,13 m3	0,09	0,02	0,01	14,22	0	580,39	Laminated wood beam 14
Planed timber, conifer	16,25 m3	6,66	1,46	0,43	861,25	0	62 270	Concrete mould
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0 m3	0,05	0	0	8,88	0	157,81	Drying mat, frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,06 m3	7,94	0,44	0,47	1 522,8	0	27 054	Drying mat, alloy
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,11 m3	14,1	0,78	0,83	2 705,78	0	48 070,83	Balcony parapet
Aluminium, blank sheet, 2700 kg/m3 (GAA)	18,5 kg	0,91	0,05	0,05	173,9	0	3 089,5	Magazine rack
Brass building components	42,5 kg	0,38	0,02	0,02	61,82	0	1 127,38	Door nob, brass
Glass, reflective, solar control, CVD coated, clear, 4 mm, L...	0,04 m2	0	0	0	0,53	0	6,99	Mirror, bathrom
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	25 550,5 kg	37,23	6,86	1,75	7 508,09	0	146 331,2	Cabinet interior
Glass façade, laminated safety glass, 600x321 (Pilkington)	0,13 m3	4,91	0,41	0,32	719,73	0	11 534,31	Balcony parapet, Glass
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	37	10,1	1,74	0,67	2 971,1	0	52 828,6	Sink, bathroom
Porcelain WC kit (toilet and tank) (AFISB)	37	21,24	3,16	1,3	3 207,9	0	53 513,1	Toilet
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	142,5 m3	9,16	1,73	0,55	2 137,5	0	70 910,71	Blowing wool
Zinc plates, Naturel (NedZink)	390,5 kg	4,45	0,85	0,05	667,75	0	8 188,78	Bathroom cabinet
Skylight, smoke lift, F100 (Lamilux)	1	0,36	0,04	0,06	67	0	3 096	Smoke lift
Plastic, LDPE	0,74	3,23	0,93	0,96	1,38	0	25,97	Hook, clothing shelf
Natural stone quartzite schist, even thickness, with sawn ed...	1 780 kg	1,89	0,57	0,07	315,06	0	7 629,08	Window ledge
Steel, hot-dip zinc coating	0,01 m3	0,32	0,03	0,03	130,17	0	1 068,84	Wall fittings
Steel, hot-dip zinc coating	0,56 kg	0	0	0	1,53	0	12,53	Mirror clamp
Steel, hot-dip zinc coating	2,4 kg	0,02	0	0	6,6	0	54,19	Shower
Steel, hot-dip zinc coating	20,68 kg	0,14	0,01	0,01	56,87	0	466,95	Hooks
Steel, hot-dip zinc coating	24,54 kg	0,16	0,02	0,02	67,48	0	554,11	Shower
Steel, hot-dip zinc coating	155,2 kg	1,04	0,11	0,1	426,8	0	3 504,42	Postbox

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, hot-dip zinc coating	0,01 kg	0	0	0	0,02	0	0	Clothing shelf
Steel, hot-dip zinc coating	0,05 m3	14,17	4,51	0,78	960,69	0	0	Handrail
Steel, hot-dip zinc coating	0,39 m3	116,91	37,22	6,44	7 928,54	0	0	Balcony parapet
Steel, hot-dip zinc coating	1,36 kg	0,05	0,02	0	3,57	0	0	Pull handles
Steel, hot-dip zinc coating	12,21 kg	0,47	0,15	0,03	32,03	0	0	Toilet paper holder
Steel, hot-dip zinc coating	19,61 kg	0,76	0,24	0,04	51,44	0	0	Kitchen faucet
Steel, hot-dip zinc coating	26,86 kg	1,04	0,33	0,06	70,44	0	0	Door nob, steel
Steel, hot-dip zinc coating	27,75 kg	1,07	0,34	0,06	72,79	0	0	Shower rail
Steel, hot-dip zinc coating	65,23 kg	2,52	0,8	0,14	171,09	0	0	Hinge, cabinet interior
Steel, hot-dip zinc coating	197,62 kg	7,64	2,43	0,42	518,35	0	0	Banister
Steel, hot-dip zinc coating	547,54 kg	21,18	6,74	1,17	1 436,14	0	0	Sink, kitchen
Steel, color coated (EAPP)	0,64 kg	0,01	0	0	1,53	0	19,29	Cloth rail
Steel, color coated (EAPP)	140,94 kg	1,2	0,11	0,16	337,84	0	4 248,93	Wire basket
Natural rubber sealing compound	0,14 m3	0,76	0,09	0,16	518,21	0	9 161,3	Drying mat, rubber
Laminated plywood, waterproof, 10.2 mm	1,82 m3	11,49	2,22	1,36	528,36	0	74 183,67	Countertop
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	0,03 m3	0,3	0,02	0	6,64	0	450,26	Clothing shelf, console
Balcony glass door, wood-alu frame, U-value 0.84	37	54,39	18,24	2,8	7 694,52	0	171 792,48	Balcony door
Insulation, polyethylene foam	0,25 m3	1,4	0,19	0,24	874,81	0	13 353,39	Backing rod
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	6,43 m2	0,98	0,31	0,05	66,25	0	0	Cover plate
Door, steel, 1,23 x2,18 m (Novoferm)	5	6,15	0,59	0,74	1 740	0	24 935	Steel doors
Window, triple glazed, wood-alu frame, fixed, 1.23x1.48 mx10...	255,72	117,58	35,54	5,44	16 450,98	0	390 570,02	Windows
Wooden inner door, painted	359,94	53,47	4,28	26,69	12 776,21	0	257 697,59	Tree doors
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0 m3	0,08	0	0	14,97	0	266,03	Fittings, floor beading
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	235 m2	0,34	0,14	0,06	71,48	0	1 077,93	Paint wood panel
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	2 550 m2	3,68	1,56	0,61	775,66	0	11 696,7	Paint plasterboard
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	400 m2	0,79	0,51	0,14	158,84	0	2 250,21	Paint banister
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	5 450 m2	10,71	7	1,89	2 164,17	0	30 659,05	Paint concrete
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	0 m3	0,15	0,05	0,01	10,5	0	0	Metal fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	0,12 m2	0,02	0,01	0	1,24	0	0	Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	3,92 m2	0,6	0,19	0,03	40,36	0	0	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	20,7 m2	3,14	1	0,17	213,1	0	0	Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	20,88 m2	3,17	1,01	0,17	214,91	0	0	gable plate

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	21,4 m2	3,25	1,03	0,18	220,31	0	0	Covering of steel sheeting
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	23,89 m2	3,63	1,15	0,2	245,94	0	0	Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	29,37 m2	4,46	1,42	0,25	302,36	0	0	Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	37,82 m2	5,74	1,83	0,32	389,35	0	0	Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	54,16 m2	8,22	2,62	0,45	557,57	0	0	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	55,49 kg	2,15	0,68	0,12	145,53	0	0	Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	65 m2	9,87	3,14	0,54	669,17	0	0	Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	116,8 m2	17,73	5,65	0,98	1 202,44	0	0	Plate on wall
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	325 kg	12,57	4	0,69	852,44	0	0	Roof hood
Ventilation system with steel pipes, room area m2	2 703	48,45	2,32	4,56	11 217,45	0	186 777,25	Ventilation system
Air exchanger+heat recovery, 190 liters / s	1	5,3	1,19	0,31	391	0	6 980,8	Exhaust fan garbage room
Air exchanger+heat recovery, 190 liters / s	1	5,3	1,19	0,31	391	0	6 980,8	Duct fan washroom
Drainage system, PP, room area m2	2 000	251	61	15	72 139	0	847 024,15	Drainage system
Electricity cabling, room area m2	2 703	24,97	2,59	2,21	8 479,31	0	139 513,98	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	2 703	34,78	1,18	3,17	7 730,58	0	138 232,04	Heating system
Elevator components (per storey)	8	34,85	2,52	3,64	7 612,17	0	89 832,18	Elevator components
Locking system for doors, TS 93 EN 2-5 (Dorma)	38	3,36	0,2	0,21	676,4	0	11 597,6	Locking system
Ventilator, central, 10.000 m3/h with heat recovery	5	54,51	4,24	5,52	13 519,47	0	196 702,57	FTX
Ventilator, decentral (wall and ceiling), 60 m3/h	37	0,48	0,05	0,05	159,01	0	3 228,67	Cooker hood
Pipesystem, hot and cold water supply, PEX, room area m2	2 703	532,49	360,85	43,25	92 668,3	0,01	981 088,85	Pipesystem, hot and cold water
Electricity, Sweden	17 940							Elförbrukning
Fortum Värme, s m Stockholms stad, Stockholm	139 275							Fjärrvärme
Tap water, clean	1 759							Vattenförbrukning
	Total	3 181,83	1 162,7	356 986,44	762 050,18	0,05	11 002 204,19	

Life-cycle assessment, EN-15978: Transportation to site

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)		800							
Electricity, Sweden		209 200							Elförbrukning produktion
District Heat, Sweden		228 000							Fjärrvärme produktion
Liquified petroleum gas		47,5							Gasol produktion
Diesel		5 716							Diselanv. prodution
Petrol 95E10		363							Bensinanv. produktion
Tap water, clean		500							Vattenförbrukning produktion
Biowaste		2 600							Komposterbart avfall
Brick waste		1 950							Tegelavfall (30 % av fyllnadsmassor)
Cardboard waste		650							Emballageavfall
Concrete waste to recycling		2 600							Betongavfall (40% av fyllnadsmassor)
Gypsum waste		6 500							Gipsavfall
Mixed waste		3 900							Osorterat avfall
Plastic waste		1 300							Plastavfall
Soil waste		1 950							Schaktavfall (30 % av fyllnadsmassor)
Wood waste		17 550							Träavfall
Bitumen-polymer membrane, groundings	Trailer combination, 40 ton capacity, 50% fill rate	276,6 kg	0,08	0,02	0	16,1	0	460,01	Base slab insulation papp
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Concrete mixer truck, appr. 8 m3, 100% fill rate	177 m3	1,61	0,33	0,17	1 104,48	0	16 822,08	Concrete base slab
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	7 318,74 kg	0,21	0,04	0	44,37	0	1 270,94	Reinforcement base slab
EPS insulation, 0.035 W/mK, 20 kg/m3 (EUMEPS)	Trailer combination, 40 ton capacity, 50% fill rate	70,72 m3	0,06	0,01	0	13,72	0	392,04	Base slab insulation
Insulation, XPS, 40-50 kg/m3	Trailer combination, 40 ton capacity, 50% fill rate	14 m3	0,03	0,01	0	6,11	0	174,62	Base slab insulation
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	4	0	0	0	0,23	0	6,65	Buffer blocking
Plastic profile, EPDM	Trailer combination, 40 ton capacity, 50% fill rate	0,45 m3	0,12	0,03	0	26,2	0	748,39	Sill plate insulation
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	0,05 m3	0,11	0,02	0	23	0	656,92	Mounting hardware
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	635 kg	0,17	0,04	0	36,97	0	1 056,06	Rebend
Steel, stainless, cold rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	416 kg	0,11	0,02	0	24,22	0	691,84	Mountingplate

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Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	4 379 kg	0,12	0,03	0	26,55	0	760,44	Reinforcement base slab
Laminated plywood, waterproof, 10.2 mm	Trailer combination, 40 ton capacity, 50% fill rate	3,2 m3	0,17	0,04	0	36,8	0	1 051,07	Concrete mould
Brick facade, common brick, 1395 kg/m3, 130 mm (Wienerberger...	Trailer combination, 40 ton capacity, 100% fill rate	149 142 kg	2,63	0,56	0,06	565,06	0	16 187,13	Brick facade
Ready-mix concrete exluding rebar, C32/40, B35 M45 < 200 mm,...	Concrete mixer truck, appr. 8 m3, 100% fill rate	5,5 m3	0,05	0,01	0,01	34,32	0	522,72	Concrete foundation
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Trailer combination, 40 ton capacity, 50% fill rate	0,53 m3	0,08	0,02	0	17,93	0	512,23	Fiber cement board
Cement, CEM I	Trailer combination, 40 ton capacity, 50% fill rate	720 kg	0,05	0,01	0	10,48	0	299,35	Cement mortar
Insulation, glass wool, water repellent, kraft paper lining,...	Trailer combination, 40 ton capacity, 50% fill rate	66,65 m3	0,04	0,01	0	7,76	0	221,69	Facade insulation
Glass fibers, glass yarn, 146g/m2 (Vitrulan)	Trailer combination, 40 ton capacity, 50% fill rate	2,11	0	0	0	0,12	0	3,51	Insect screen
Gypsum board, storm sheathing, 9.5 mm, Glasroc H Storm (Gypr...	Trailer combination, 40 ton capacity, 50% fill rate	687,5 m2	0,36	0,08	0,01	76,05	0	2 172,4	Plasterboard storm sheating
Insulation, glass wool/mineral wool, 80 kg/m3, KL (Isover)	Trailer combination, 40 ton capacity, 50% fill rate	85 m3	0,08	0,02	0	17,32	0	494,77	Facade insulation
Lightweight concrete block, 500 kg/m3, 0.12-0.13 W/mK, Ytong...	Trailer combination, 40 ton capacity, 50% fill rate	900 kg	0,14	0,03	0	30,57	0	873,12	Lightweight concrete block
Aluminium curtain walling, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0,01	0	0	2,38	0	67,85	Curtain walling
Facade plastering, plaster (weber)	Trailer combination, 40 ton capacity, 50% fill rate	5 724 kg	0,39	0,08	0,01	83,32	0	2 379,87	Facade plastering
Screws/fixings, galvanized	Trailer combination, 40 ton capacity, 50% fill rate	224 kg	0,06	0,01	0	13,04	0	372,53	Screw/ fixings facade
Sealing tapes, PE/PP foil	Trailer combination, 40 ton capacity, 50% fill rate	31,39 kg	0,01	0	0	1,83	0	52,2	Sealing tape
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	0,2 m3	0,43	0,09	0,01	91,99	0	2 627,67	Mounting hardware, valve
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	453 kg	0,12	0,03	0	26,37	0	753,38	Reinforcement, brick
Steel, stainless, cold rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0,01	0	0	3,15	0	90,11	Air gap wire mesh
Stoneware tiles, unglazed	Trailer combination, 40 ton capacity, 50% fill rate	6 m2	0,03	0,01	0	6,99	0	199,57	Granite ceramics wall covering
Plastic vapour control layer, 0.2 mm (Tommen Gram)	Trailer combination, 40 ton capacity, 50% fill rate	84,45 kg	0,02	0	0	4,92	0	140,46	Plastic vapour control
Plastic vapour control layer, 0.2 mm (Tommen Gram)	Trailer combination, 40 ton capacity, 50% fill rate	1 146 m2	0,06	0,01	0	12,34	0	352,59	Plastic vapour control
Dry mortar, M5, Murmortel M5 (weber)	Trailer combination, 40 ton capacity, 50% fill rate	51 865 kg	3,55	0,76	0,08	754,92	0	21 563,91	Dry mortar
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	56,52 m3	1,66	0,35	0,04	353,75	0	10 104,71	Construction timber
Planed timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	9,92 m3	0,26	0,06	0,01	55,58	0	1 587,56	Planed timber
Wooden façade external facing, thermo tree, pine	Trailer combination, 40 ton capacity, 50% fill rate	3,16 m2	0	0	0	0,48	0	13,61	Wooden facade panels
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Concrete mixer truck, appr. 8 m3, 100% fill rate	481,8 m3	4,39	0,9	0,45	3 006,43	0	45 790,27	Concrete walls

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Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Ready mix concrete, excluding rebar, C32/40 (B35 M45)	Concrete mixer truck, appr. 8 m3, 100% fill rate	5,3 m3	0,04	0,01	0	29,6	0	450,82	Concrete walls
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	14 637 kg	0,41	0,09	0,01	88,73	0	2 541,8	Reinforcement (load bearing walls)
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	10	0	0	0	0,58	0	16,63	Buffer blocking
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	554,84 kg	0,15	0,03	0	32,3	0	922,74	Rebend
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	0,25 m3	0,54	0,12	0,01	114,99	0	3 284,58	Mounting hardware, walls
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	8 758 kg	0,25	0,05	0,01	53,09	0	1 520,88	Reinforcement wire mesh (load bearing walls)
Planed timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	13 m3	0,34	0,07	0,01	72,85	0	2 080,93	Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	Trailer combination, 40 ton capacity, 50% fill rate	0,04 m3	0,09	0,02	0	18,86	0	538,84	Reinforcement wire
Glass wool/mineral wool insulation, acoustic partition roll,...	Trailer combination, 40 ton capacity, 50% fill rate	7,32 m3	0,01	0	0	1,7	0	48,66	Acoustic insulation panel
Non-Alloy Structural Steel (Direct Reduced Iron production r...	Trailer combination, 40 ton capacity, 50% fill rate	349 kg	0,1	0,02	0	20,32	0	580,41	Screws/fixings non galvanized
Ceramic tiles, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	333 m2	0,34	0,07	0,01	73,19	0	2 090,62	Ceramic tiles public spaces
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	Trailer combination, 40 ton capacity, 50% fill rate	0,03 m3	0	0	0	0,48	0	13,62	Adhesive cementitious for tiles
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	Trailer combination, 40 ton capacity, 50% fill rate	3 m2	0	0	0	0,55	0	15,84	Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Pla...	Trailer combination, 40 ton capacity, 50% fill rate	2 922 m2	1,8	0,38	0,04	382,78	0	10 933,92	Plasterboard, Standard
Gypsum plasterboard, wetroom, 12.5x900 mm, 10 kg/m2, Glasroc...	Trailer combination, 40 ton capacity, 50% fill rate	86,3 m2	0,06	0,01	0	12,56	0	358,81	Plasterboard wetroom
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	95,1 m2	0,1	0,02	0	20,9	0	597,05	Ceramic tiles kitchen
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	333 m2	0,34	0,07	0,01	73,19	0	2 090,62	Ceramic tiles WC/shower
Plastic carpet, wet area, 2.25 mm, 2.9 kg/m2 (ERFMI)	Trailer combination, 40 ton capacity, 50% fill rate	1 m2	0	0	0	0,17	0	4,79	Plastic carpet
Screws/fixings, galvanized	Trailer combination, 40 ton capacity, 50% fill rate	879 kg	0,24	0,05	0,01	51,18	0	1 461,85	Screws/fixings galvanized
Steel profile with PE lining (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	85,7	0,02	0	0	3,29	0	94,07	Steel rail SK 70 polyeten
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	41,5 kg	0,01	0	0	1,47	0	42,1	Corner profile
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	119,6 kg	0,02	0	0	4,25	0	121,33	Corner protection HS29
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	426 kg	0,07	0,02	0	15,13	0	432,17	T-nogging
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	637 kg	0,11	0,02	0	22,62	0	646,22	Steel rail SK 70
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	1 003 kg	0,17	0,04	0	35,62	0	1 017,52	Steel joist R70
Silicon waterproofing compound	Trailer combination, 40 ton capacity, 50% fill rate	0,07 m3	0	0	0	0,01	0	0,15	Silicio

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Wood board, particleboard	Trailer combination, 40 ton capacity, 50% fill rate	3,3 m3	0,15	0,03	0	31,94	0	912,41	OSB plywood
Plywood, spruce, uncoated	Trailer combination, 40 ton capacity, 50% fill rate	40,61 m3	1,28	0,27	0,03	271,9	0	7 766,83	Plywood
Timber lining (interior), conifer	Trailer combination, 40 ton capacity, 50% fill rate	9 m3	0,24	0,05	0,01	50,43	0	1 440,64	Floor beading
Planed timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	9,92 m3	0,26	0,06	0,01	55,59	0	1 587,91	Planed timber
MDF, 7-30 mm, Fibrapan (Finsa)	Trailer combination, 40 ton capacity, 50% fill rate	1,85 m3	0,09	0,02	0	19,72	0	563,42	MDF-board
Ceramic tiles, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	11,55 m2	0,01	0	0	2,54	0	72,51	Foundation ceramic tiles
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Concrete mixer truck, appr. 8 m3, 100% fill rate	438,1 m3	4	0,82	0,41	2 733,74	0	41 637,02	Concrete floor slab
Ready mix concrete, excluding rebar, C30/37 (B30 M60) D22 Sy...	Concrete mixer truck, appr. 8 m3, 100% fill rate	45,4 m3	0,41	0,08	0,04	283,3	0	4 314,82	Concrete, elevator and balconies
Mineral wool insulation with recycled briquette content, 0.0...	Trailer combination, 40 ton capacity, 50% fill rate	211,64 m3	0,39	0,08	0,01	82,15	0	2 346,5	Roof insulation UNI-board
Ceramic floor tiles (Kutahya Seramik)	Trailer combination, 40 ton capacity, 50% fill rate	134,3 m2	0,01	0	0	1,95	0	55,84	Ceramic floor tiles
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	Trailer combination, 40 ton capacity, 50% fill rate	0,18 m3	0,02	0	0	4,58	0	130,76	Screed flooring fan room
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	Trailer combination, 40 ton capacity, 50% fill rate	9,15 m3	1,06	0,23	0,02	226,53	0	6 470,84	Screed flooring
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	14 637 kg	0,41	0,09	0,01	88,73	0	2 541,8	Reinforcement steel (floor slab)
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	Trailer combination, 40 ton capacity, 50% fill rate	416 m2	0,38	0,08	0,01	81,45	0	2 326,66	Waterproofing roof carpet
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	133,2 m2	0,14	0,03	0	29,28	0	836,25	Ceramic tile, floor we troom
Plastic flooring, thick (SNMI)	Trailer combination, 40 ton capacity, 50% fill rate	39,5 m2	0,03	0,01	0	5,75	0	164,23	Plastic flooring fan room
Insulation panel, 120 mm, Thane Sarking (KNAUF)	Trailer combination, 40 ton capacity, 50% fill rate	672 m2	0,12	0,03	0	25,82	0	737,61	Sarking
Acoustic flooring, 10 mm, VIBRASTO 10 (TEXAA)	Trailer combination, 40 ton capacity, 50% fill rate	0,13 m3	0	0	0	0,56	0	16,03	Acoustic carpet
Acoustic ceiling tiles, 91 - 131 kg/m3, 1.7 - 9.3 kg/m2, 300...	Trailer combination, 40 ton capacity, 50% fill rate	72 m2	0,01	0	0	1,33	0	37,92	Ceiling indoor
Primer, protective, for walls and floors, Gisogrund (PCI)	Trailer combination, 40 ton capacity, 50% fill rate	0,23 m3	0,06	0,01	0	13,1	0	374,19	Primer for floors
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	10	0	0	0	0,58	0	16,63	Buffer blocking
Sealing tapes, PE/PP foil	Trailer combination, 40 ton capacity, 50% fill rate	2,61 kg	0	0	0	0,15	0	4,34	Sealing tape
Luxury vinyl floor tile, Luxury Vinyl Tile (LVT) (Karndean)	Trailer combination, 40 ton capacity, 50% fill rate	1 857 m2	2,8	0,6	0,06	595,73	0	17 016,75	Vinyl flooring Tarkett nordic stabil
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0	0	0	0,5	0	14,28	Flooring adhesive
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	Trailer combination, 40 ton capacity, 50% fill rate	0,04 m3	0,02	0	0	3,29	0	93,97	Flooring adhesive
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	12,8 kg	0	0	0	0,75	0	21,29	Eye b[illegible]

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	132,83 kg	0,04	0,01	0	7,73	0	220,91	Brackets
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	832,26 kg	0,23	0,05	0	48,46	0	1 384,11	Rebend
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	8 758 kg	0,25	0,05	0,01	53,09	0	1 520,88	Reinforcement wire mesh (floor slab)
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	Trailer combination, 40 ton capacity, 50% fill rate	2 796,8 kg	0,19	0,04	0	40,71	0	1 162,83	Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	Trailer combination, 40 ton capacity, 50% fill rate	43 579,8 kg	2,98	0,64	0,06	634,32	0	18 119,17	Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 2-30mm/4-50mm...	Trailer combination, 40 ton capacity, 50% fill rate	41 342,4 kg	2,83	0,6	0,06	601,76	0	17 188,93	Multipurpose floor screed
Natural stone tiles, hard, exterior	Trailer combination, 40 ton capacity, 50% fill rate	5,12 m2	0,17	0,04	0	36,17	0	1 033,15	Natural stone, floor public area
Plastic vapour control layer, 0.15 mm (Tommen Gram)	Trailer combination, 40 ton capacity, 50% fill rate	0,19 kg	0	0	0	0,01	0	0,32	Plastic vapour control layer
Dry mortar, B30, B30 (weber)	Trailer combination, 40 ton capacity, 50% fill rate	2 195 kg	0,15	0,03	0	31,95	0	912,62	Dry mortar
Laminated plywood, waterproof, 10.2 mm	Trailer combination, 40 ton capacity, 50% fill rate	10,94 m3	0,59	0,13	0,01	125,85	0	3 594,84	Concrete mould
Dried timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	22 m3	0,58	0,12	0,01	123,28	0	3 521,57	Tounge and grove
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,03 m3	0	0	0	0,2	0	5,72	Fink truss 13
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,07 m3	0	0	0	0,44	0	12,51	Fink truss 4
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,09 m3	0	0	0	0,56	0	15,91	Fink truss 3A
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,12 m3	0	0	0	0,78	0	22,35	Fink truss 6
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,17 m3	0,01	0	0	1,06	0	30,39	Fink truss 5
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,29 m3	0,01	0	0	1,8	0	51,31	Fink truss 1
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,39 m3	0,01	0	0	2,44	0	69,72	Fink truss 8
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,5 m3	0,01	0	0	3,13	0	89,39	Fink truss 12
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,59 m3	0,02	0	0	3,7	0	105,78	Fink truss 10
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,71 m3	0,02	0	0	4,46	0	127,29	Fink truss 7
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	1,07 m3	0,03	0,01	0	6,68	0	190,94	Fink truss 3
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	1,32 m3	0,04	0,01	0	8,26	0	235,99	Fink truss 11
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	2,31 m3	0,07	0,01	0	14,46	0	412,98	Fink truss 2
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	2,72 m3	0,08	0,02	0	17,04	0	486,82	Fink truss 9
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	Trailer combination, 40 ton capacity, 50% fill rate	0,11 m3	0	0	0	0,78	0	22,16	Laminated wood beam 13
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	Trailer combination, 40 ton capacity, 50% fill rate	0,13 m3	0	0	0	0,87	0	24,82	Lamir[illegible]od beam 14

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Planed timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	16,25 m3	0,43	0,09	0,01	91,06	0	2 601,16	Concrete mould
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0,06	0	1,57	Drying mat, frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0,06 m3	0,04	0,01	0	9,43	0	269,42	Drying mat, alloy
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0,11 m3	0,08	0,02	0	16,76	0	478,72	Balcony parapet
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	18,5 kg	0,01	0	0	1,08	0	30,77	Magazine rack
Brass building components	Trailer combination, 40 ton capacity, 50% fill rate	42,5 kg	0,01	0	0	2,47	0	70,68	Door nob, brass
Glass, reflective, solar control, CVD coated, clear, 4 mm, L...	Trailer combination, 40 ton capacity, 50% fill rate	0,04 m2	0	0	0	0,02	0	0,66	Mirror, bathrom
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	Trailer combination, 40 ton capacity, 50% fill rate	25 550,5 kg	1,75	0,37	0,04	371,9	0	10 623,13	Cabinet interior
Glass façade, laminated safety glass, 600x321 (Pilkington)	Trailer combination, 40 ton capacity, 50% fill rate	0,13 m3	0,09	0,02	0	19,33	0	552,11	Balcony parapet, Glass
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	Trailer combination, 40 ton capacity, 50% fill rate	37	0,15	0,03	0	32,31	0	923,01	Sink, bathroom
Porcelain WC kit (toilet and tank) (AFISB)	Trailer combination, 40 ton capacity, 50% fill rate	37	0,36	0,08	0,01	76,69	0	2 190,61	Toilet
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	Trailer combination, 40 ton capacity, 50% fill rate	142,5 m3	0,1	0,02	0	20,74	0	592,47	Blowing wool
Zinc plates, Naturel (NedZink)	Trailer combination, 40 ton capacity, 50% fill rate	390,5 kg	0,11	0,02	0	22,74	0	649,43	Bathroom cabinet
Skylight, smoke lift, F100 (Lamilux)	Trailer combination, 40 ton capacity, 50% fill rate	1	0	0	0	0,98	0	28,04	Smoke lift
Plastic, LDPE	Trailer combination, 40 ton capacity, 50% fill rate	0,74	0	0	0	0,04	0	1,23	Hook, clothing shelf
Natural stone quartzite schist, even thickness, with sawn ed...	Trailer combination, 40 ton capacity, 50% fill rate	1 780 kg	0,28	0,06	0,01	60,45	0	1 726,83	Window ledge
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0,01	0	0	2,76	0	78,72	Wall fittings
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0,56 kg	0	0	0	0,03	0	0,92	Mirror clamp
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	2,4 kg	0	0	0	0,14	0	3,99	Shower
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	20,68 kg	0,01	0	0	1,2	0	34,39	Hooks
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	24,54 kg	0,01	0	0	1,43	0	40,81	Shower mixer
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	155,2 kg	0,04	0,01	0	9,04	0	258,11	Postbox
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0,01 kg	0	0	0	0	0	0,01	Clothing shelf
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0,05 m3	0,1	0,02	0	21,32	0	609,14	Handrail
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0,39 m3	0,83	0,18	0,02	175,99	0	5 027,18	Balcony parapet
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	1,36 kg	0	0	0	0,08	0	2,26	Pull handles
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	12,21 kg	0	0	0	0,71	0	20,31	Toilet holde

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	19,61 kg	0,01	0	0	1,14	0	32,61	Kitchen faucet
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	26,86 kg	0,01	0	0	1,56	0	44,66	Door nob, steel
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	27,75 kg	0,01	0	0	1,62	0	46,15	Shower rail
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	65,23 kg	0,02	0	0	3,8	0	108,48	Hinge, cabinet interior
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	197,62 kg	0,05	0,01	0	11,51	0	328,67	Banister
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	547,54 kg	0,15	0,03	0	31,88	0	910,6	Sink, kitchen
Steel, color coated (EAPP)	Trailer combination, 40 ton capacity, 50% fill rate	0,64 kg	0	0	0	0,04	0	1,06	Cloth rail
Steel, color coated (EAPP)	Trailer combination, 40 ton capacity, 50% fill rate	140,94 kg	0,04	0,01	0	8,21	0	234,39	Wire basket
Natural rubber sealing compound	Trailer combination, 40 ton capacity, 50% fill rate	0,14 m3	0,04	0,01	0	7,52	0	214,89	Drying mat, rubber
Laminated plywood, waterproof, 10.2 mm	Trailer combination, 40 ton capacity, 50% fill rate	1,82 m3	0,1	0,02	0	20,87	0	596,16	Countertop
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	Trailer combination, 40 ton capacity, 50% fill rate	0,03 m3	0	0	0	0,32	0	9,19	Clothing shelf, console
Balcony glass door, wood-alu frame, U-value 0.84	Trailer combination, 40 ton capacity, 50% fill rate	37	0,45	0,1	0,01	95,86	0	2 738,26	Balcony door
Insulation, polyethylene foam	Trailer combination, 40 ton capacity, 50% fill rate	0,25 m3	0,01	0	0	2,35	0	67,22	Backing rod
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	6,43 m2	0,01	0	0	1,47	0	42,01	Cover plate
Door, steel, 1,23 x2,18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	5	0,08	0,02	0	17,1	0	488,53	Steel doors
Window, triple glazed, wood-alu frame, fixed, 1.23x1.48 mx10...	Trailer combination, 40 ton capacity, 50% fill rate	255,72	1,01	0,22	0,02	215,34	0	6 151,03	Windows
Wooden inner door, painted	Trailer combination, 40 ton capacity, 50% fill rate	359,94	1,28	0,27	0,03	271,38	0	7 751,99	Tree doors
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0,09	0	2,65	Fittings, floor beading
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	Trailer combination, 40 ton capacity, 50% fill rate	235 m2	0,01	0	0	1,42	0	40,69	Paint wood panel
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	Trailer combination, 40 ton capacity, 50% fill rate	2 550 m2	0,07	0,02	0	15,46	0	441,58	Paint plasterboard
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Trailer combination, 40 ton capacity, 50% fill rate	400 m2	0,01	0	0	2,75	0	78,43	Paint banister
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Trailer combination, 40 ton capacity, 50% fill rate	5 450 m2	0,18	0,04	0	37,41	0	1 068,62	Paint concrete
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0,23	0	6,66	Metal fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	0,12 m2	0	0	0	0,03	0	0,78	Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	3,92 m2	0	0	0	0,9	0	25,59	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	20,7 m2	0,02	0	0	4,73	0	135,12	Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	20,88 m2	0,02	0	0	4,77	0	136,26	gable [illegible]

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	21,4 m2	0,02	0	0	4,89	0	139,69	Covering of steel sheeting
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	23,89 m2	0,03	0,01	0	5,46	0	155,94	Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	29,37 m2	0,03	0,01	0	6,71	0	191,72	Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	37,82 m2	0,04	0,01	0	8,64	0	246,87	Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	54,16 m2	0,06	0,01	0	12,38	0	353,53	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	55,49 kg	0,02	0	0	3,23	0	92,28	Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	65 m2	0,07	0,01	0	14,85	0	424,29	Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	116,8 m2	0,13	0,03	0	26,69	0	762,42	Plate on wall
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	325 kg	0,09	0,02	0	18,92	0	540,5	Roof hood
Ventilation system with steel pipes, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	2 703	2,84	0,6	0,06	603,37	0	17 235	Ventilation system
Air exchanger+heat recovery, 190 liters / s	Trailer combination, 40 ton capacity, 50% fill rate	1	0,03	0,01	0	6,33	0	180,78	Exhaust fan garbage room
Air exchanger+heat recovery, 190 liters / s	Trailer combination, 40 ton capacity, 50% fill rate	1	0,03	0,01	0	6,33	0	180,78	Duct fan washroom
Drainage system, PP, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	2 000	7,22	1,54	0,15	1 535,55	0	43 862,4	Drainage system
Electricity cabling, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	2 703	1,67	0,36	0,04	355,66	0	10 159,39	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	Trailer combination, 40 ton capacity, 50% fill rate	2 703	2,03	0,43	0,04	432,78	0	12 362,09	Heating system
Elevator components (per storey)	Trailer combination, 40 ton capacity, 50% fill rate	8	0,72	0,15	0,02	153,71	0	4 390,53	Elevator components
Locking system for doors, TS 93 EN 2-5 (Dorma)	Trailer combination, 40 ton capacity, 50% fill rate	38	0,02	0	0	4,14	0	118,23	Locking system
Ventilator, central, 10.000 m3/h with heat recovery	Trailer combination, 40 ton capacity, 50% fill rate	5	0,96	0,21	0,02	204,94	0	5 854,04	FTX
Ventilator, decentral (wall and ceiling), 60 m3/h	Trailer combination, 40 ton capacity, 50% fill rate	37	0,01	0	0	1,94	0	55,38	Cooker hood
Pipesystem, hot and cold water supply, PEX, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	2 703	7,65	1,63	0,16	1 627,24	0	46 481,46	Pipesystem, hot and cold water
Electricity, Sweden		17 940							Elförbrukning
Fortum Värme, s m Stockholms stad, Stockholm		139 275							Fjärrvärme
Tap water, clean		1 759							Vattenförbrukning
		Total	74,33	15,75	2,43	20 779,95	0	497 751,43	

Life-cycle assessment, EN-15978: Construction/installation process

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)	800	87,81	53,22	2,97	24 274,78	0	453 457,99	
Electricity, Sweden	209 200	69,84	23,5	1,09	8 742,22	0,01	1 883 410,35	Elförbrukning produktion
District Heat, Sweden	228 000	247,08	78,55	3,5	34 678,8	0,01	571 463,76	Fjärrvärme produktion
Liquified petroleum gas	47,5	0,28	0,03	0,02	151,41	0	2 570,21	Gasol produktion
Diesel	5 716	27,15	5,54	2,79	18 519,84	0	282 656,2	Diselanv. prodution
Petrol 95E10	363	2,16	0,36	0,11	1 016,4	0	16 418,49	Bensinanv. produktion
Tap water, clean	500	0,81	0,41	0,04	150	0	3 171,24	Vattenförbrukning produktion
Biowaste	2 600	2,73	0,75	0,02	522,6	0	891,8	Komposterbart avfall
Brick waste	1 950	0,07	0,02	0	21,63	0	529,71	Tegelavfall (30 % av fyllnadsmassor)
Cardboard waste	650	0,02	0	0	5,04	0	143,21	Emballageavfall
Concrete waste to recycling	2 600	0,01	0	0	2,42	0	128,57	Betongavfall (40% av fyllnadsmassor)
Gypsum waste	6 500	0,34	0,07	0,01	46,36	0	1 291,67	Gipsavfall
Mixed waste	3 900	0,55	10,18	0,17	1 427,4	0	2 199,21	Osorterat avfall
Plastic waste	1 300	5,2	0,36	0,01	3 094	0	602,29	Plastavfall
Soil waste	1 950	0,06	0,01	0	15,13	0	450,39	Schaktavfall (30 % av fyllnadsmassor)
Wood waste	17 550	3,86	5,09	0,05	158,65	0	1 834,85	Träavfall
Bitumen-polymer membrane, groundings	276,6 kg							Base slab insulation papp
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	177 m3							Concrete base slab
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	7 318,74 kg							Reinforcement base slab
EPS insulation, 0.035 W/mK, 20 kg/m3 (EUMEPS)	70,72 m3							Base slab insulation
Insulation, XPS, 40-50 kg/m3	14 m3							Base slab insulation
Plastic, HDPE	4							Buffer blocking
Plastic profile, EPDM	0,45 m3							Sill plate insulation
Steel, stainless, hot rolled (Outokumpu)	0,05 m3							Mounting hardware
Steel, stainless, hot rolled (Outokumpu)	635 kg							Rebend
Steel, stainless, cold rolled (Outokumpu)	416 kg							Mountingplate
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	4 379 kg							Reinforcement base slab
Laminated plywood, waterproof, 10.2 mm	3,2 m3							Concrete mould
Brick facade, common brick, 1395 kg/m3, 130 mm (Wienerberger...	149 142 kg							Brick facade
Ready-mix concrete exluding rebar, C32/40, B35 M45 < 200 mm,...	5,5 m3							Concrete foundation
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	0,53 m3							Fiber cement board
Cement, CEM I	720 kg							Cement mortar
Insulation, glass wool, water repellent, kraft paper lining,...	66,65 m3							Facade in

Life-cycle assessment, EN-15978: Maintenance and material replacement

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)	800							
Electricity, Sweden	209 200							Elförbrukning produktion
District Heat, Sweden	228 000							Fjärrvärme produktion
Liquified petroleum gas	47,5							Gasol produktion
Diesel	5 716							Diselanv. prodution
Petrol 95E10	363							Bensinanv. produktion
Tap water, clean	500							Vattenförbrukning produktion
Biowaste	2 600							Komposterbart avfall
Brick waste	1 950							Tegelavfall (30 % av fyllnadsmassor)
Cardboard waste	650							Emballageavfall
Concrete waste to recycling	2 600							Betongavfall (40% av fyllnadsmassor)
Gypsum waste	6 500							Gipsavfall
Mixed waste	3 900							Osorterat avfall
Plastic waste	1 300							Plastavfall
Soil waste	1 950							Schaktavfall (30 % av fyllnadsmassor)
Wood waste	17 550							Träavfall
Bitumen-polymer membrane, groundings	276,6 kg							Base slab insulation papp
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	177 m3							Concrete base slab
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	7 318,74 kg							Reinforcement base slab
EPS insulation, 0.035 W/mK, 20 kg/m3 (EUMEPS)	70,72 m3							Base slab insulation
Insulation, XPS, 40-50 kg/m3	14 m3							Base slab insulation
Plastic, HDPE	4							Buffer blocking
Plastic profile, EPDM	0,45 m3							Sill plate insulation
Steel, stainless, hot rolled (Outokumpu)	0,05 m3							Mounting hardware
Steel, stainless, hot rolled (Outokumpu)	635 kg							Rebend
Steel, stainless, cold rolled (Outokumpu)	416 kg							Mountingplate
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	4 379 kg							Reinforcement base slab
Laminated plywood, waterproof, 10.2 mm	3,2 m3							Concrete mould
Brick facade, common brick, 1395 kg/m3, 130 mm (Wienerberger...	149 142 kg							Brick facade
Ready-mix concrete exluding rebar, C32/40, B35 M45 < 200 mm,...	5,5 m3							Concrete foundation
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	0,53 m3	0,7	0,11	0,07	307,3	0	5 628,48	Fiber cement board
Cement, CEM I	720 kg							Cement mortar
Insulation, glass wool, water repellent, kraft paper lining,...	66,65 m3							Facade ins

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Glass fibers, glass yarn, 146g/m2 (Vitrulan)	2,11							Insect screen
Gypsum board, storm sheathing, 9.5 mm, Glasroc H Storm (Gypr...	687,5 m2							Plasterboard storm sheating
Insulation, glass wool/mineral wool, 80 kg/m3, KL (Isover)	85 m3							Facade insulation
Lightweight concrete block, 500 kg/m3, 0.12-0.13 W/mK, Ytong...	900 kg							Lightweight concrete block
Aluminium curtain walling, 2700 kg/m3 (GAA)	0,01 m3							Curtain walling
Facade plastering, plaster (weber)	5 724 kg	15,51	2	2,29	8 368,49	0	174 793,79	Facade plastering
Screws/fixings, galvanized	224 kg							Screw/ fixings facade
Sealing tapes, PE/PP foil	31,39 kg							Sealing tape
Steel, stainless, hot rolled (Outokumpu)	0,2 m3							Mounting hardware, valve
Steel, stainless, hot rolled (Outokumpu)	453 kg							Reinforcement, brick
Steel, stainless, cold rolled (Outokumpu)	0,01 m3							Air gap wire mesh
Stoneware tiles, unglazed	6 m2	0,07	0,01	0	42,17	0	710,88	Granite ceramics wall covering
Plastic vapour control layer, 0.2 mm (Tommen Gram)	84,45 kg							Plastic vapour control
Plastic vapour control layer, 0.2 mm (Tommen Gram)	1 146 m2							Plastic vapour control
Dry mortar, M5, Murmortel M5 (weber)	51 865 kg							Dry mortar
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	56,52 m3							Construction timber
Planed timber, conifer	9,92 m3							Planed timber
Wooden façade external facing, thermo tree, pine	3,16 m2							Wooden facade panels
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	481,8 m3							Concrete walls
Ready mix concrete, excluding rebar, C32/40 (B35 M45)	5,3 m3							Concrete walls
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	14 637 kg							Reinforcement (load bearing walls)
Plastic, HDPE	10							Buffer blocking
Steel, hot-dip zinc coating	554,84 kg							Rebend
Steel, stainless, hot rolled (Outokumpu)	0,25 m3							Mounting hardware, walls
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	8 758 kg							Reinforcement wire mesh (load bearing walls)
Planed timber, conifer	13 m3							Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	0,04 m3							Reinforcement wire
Glass wool/mineral wool insulation, acoustic partition roll,...	7,32 m3							Acoustic insulation panel
Non-Alloy Structural Steel (Direct Reduced Iron production r...	349 kg							Screws/fixings non galvanized
Ceramic tiles, 15.1 kg/m2 (IKFP)	333 m2	6,7	0,64	0,54	3 230,1	0	58 294,84	Ceramic tiles public spaces
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	0,03 m3							Adhesive c[illegible]ous for tiles

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	3 m2							Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Pla...	2 922 m2							Plasterboard, Standard
Gypsum plasterboard, wetroom, 12.5x900 mm, 10 kg/m2, Glasroc...	86,3 m2							Plasterboard wetroom
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	95,1 m2	1,91	0,18	0,15	922,47	0	16 648,16	Ceramic tiles kitchen
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	333 m2	6,7	0,64	0,54	3 230,1	0	58 294,84	Ceramic tiles WC/shower
Plastic carpet, wet area, 2.25 mm, 2.9 kg/m2 (ERFMI)	1 m2	0,08	0,02	0	5,16	0	258,21	Plastic carpet
Screws/fixings, galvanized	879 kg							Screws/fixings galvanized
Steel profile with PE lining (Norgips)	85,7							Steel rail SK 70 polyeten
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	41,5 kg							Corner profile
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	119,6 kg							Corner protection HS29
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	426 kg							T-nogging
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	637 kg							Steel rail SK 70
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	1 003 kg							Steel joist R70
Silicon waterproofing compound	0,07 m3	0	0	0	1,38	0	26,1	Silicion selant
Wood board, particleboard	3,3 m3							OSB plywood
Plywood, spruce, uncoated	40,61 m3							Plywood
Timber lining (interior), conifer	9 m3							Floor beading
Planed timber, conifer	9,92 m3							Planed timber
MDF, 7-30 mm, Fibrapan (Finsa)	1,85 m3							MDF-board
Ceramic tiles, 15.1 kg/m2 (IKFP)	11,55 m2	0,23	0,02	0,02	112,04	0	2 021,94	Foundation ceramic tiles
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	438,1 m3							Concrete floor slab
Ready mix concrete, excluding rebar, C30/37 (B30 M60) D22 Sy...	45,4 m3							Concrete, elevator and balconies
Mineral wool insulation with recycled briquette content, 0.0...	211,64 m3	7,62	6,77	126,98	19 894,16	0	279 153,16	Roof insulation UNI-board
Ceramic floor tiles (Kutahya Seramik)	134,3 m2							Ceramic floor tiles
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	0,18 m3							Screed flooring fan room
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	9,15 m3							Screed flooring
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	14 637 kg							Reinforcement steel (floor slab)
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	416 m2	0,26	3,67	356 512	719,68	0	28 213,12	Waterproofing roof carpet
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	133,2 m2	2,68	0,25	0,21	1 292,04	0	23 317,93	Ceramic tile, floor we troom

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Plastic flooring, thick (SNMI)	39,5 m2	0,35	6,32	0	67,54	0	2 544,59	Plastic flooring fan room
Insulation panel, 120 mm, Thane Sarking (KNAUF)	672 m2	76,61	11,22	5,73	12 297,6	0	322 828,8	Sarking
Acoustic flooring, 10 mm, VIBRASTO 10 (TEXAA)	0,13 m3	0,22	0,03	0,04	47,45	0	1 388,94	Acoustic carpet
Acoustic ceiling tiles, 91 - 131 kg/m3, 1.7 - 9.3 kg/m2, 300...	72 m2	0,24	0,17	1,78	239,41	0	5 178,02	Ceiling indoor
Primer, protective, for walls and floors, Gisogrund (PCI)	0,23 m3	5,42	0,16	0,38	515,25	0	10 478,25	Primer for floors
Plastic, HDPE	10							Buffer blocking
Sealing tapes, PE/PP foil	2,61 kg							Sealing tape
Luxury vinyl floor tile, Luxury Vinyl Tile (LVT) (Karndean)	1 857 m2	24,88	6,08	18,2	17 641,5	0	362 115	Vinyl flooring Tarkett nordic stabil
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	0,01 m3	0,98	0,18	0,17	320,01	0	4 984,16	Flooring adhesive
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	0,04 m3	6,46	1,21	1,13	2 106,47	0	32 808,57	Flooring adhesive
Steel, hot-dip zinc coating	12,8 kg							Eye bolt
Steel, hot-dip zinc coating	132,83 kg							Brackets
Steel, hot-dip zinc coating	832,26 kg							Rebend
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	8 758 kg							Reinforcement wire mesh (floor slab)
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	2 796,8 kg							Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	43 579,8 kg							Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 2-30mm/4-50mm...	41 342,4 kg							Multipurpose floor screed
Natural stone tiles, hard, exterior	5,12 m2	0,07	0,01	0,01	29,86	0	431,79	Natural stone, floor public area
Plastic vapour control layer, 0.15 mm (Tommen Gram)	0,19 kg							Plastic vapour control layer
Dry mortar, B30, B30 (weber)	2 195 kg							Dry mortar
Laminated plywood, waterproof, 10.2 mm	10,94 m3							Concrete mould
Dried timber, conifer	22 m3							Tounge and grove
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,03 m3							Fink truss 13
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,07 m3							Fink truss 4
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,09 m3							Fink truss 3A
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,12 m3							Fink truss 6
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,17 m3							Fink truss 5
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,29 m3							Fink truss 1
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,39 m3							Fink truss [illegible]

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,5 m3							Fink truss 12
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,59 m3							Fink truss 10
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,71 m3							Fink truss 7
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	1,07 m3							Fink truss 3
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	1,32 m3							Fink truss 11
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	2,31 m3							Fink truss 2
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	2,72 m3							Fink truss 9
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	0,11 m3							Laminated wood beam 13
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	0,13 m3							Laminated wood beam 14
Planed timber, conifer	16,25 m3							Concrete mould
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0 m3							Drying mat, frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,06 m3							Drying mat, alloy
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,11 m3							Balcony parapet
Aluminium, blank sheet, 2700 kg/m3 (GAA)	18,5 kg							Magazine rack
Brass building components	42,5 kg	0,38	0,02	0,02	61,82	0	1 127,38	Door nob, brass
Glass, reflective, solar control, CVD coated, clear, 4 mm, L...	0,04 m2							Mirror, bathrom
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	25 550,5 kg							Cabinet interior
Glass façade, laminated safety glass, 600x321 (Pilkington)	0,13 m3	4,91	0,41	0,32	719,73	0	11 534,31	Balcony parapet, Glass
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	37	20,2	3,49	1,35	5 942,2	0	105 657,2	Sink, bathroom
Porcelain WC kit (toilet and tank) (AFISB)	37	42,48	6,33	2,6	6 415,8	0	107 026,2	Toilet
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	142,5 m3							Blowing wool
Zinc plates, Naturel (NedZink)	390,5 kg							Bathroom cabinet
Skylight, smoke lift, F100 (Lamilux)	1	0,72	0,08	0,12	134	0	6 192	Smoke lift
Plastic, LDPE	0,74							Hook, clothing shelf
Natural stone quartzite schist, even thickness, with sawn ed...	1 780 kg							Window ledge
Steel, hot-dip zinc coating	0,01 m3							Wall fittings
Steel, hot-dip zinc coating	0,56 kg							Mirror clamp
Steel, hot-dip zinc coating	2,4 kg							Shower
Steel, hot-dip zinc coating	20,68 kg							Hooks
Steel, hot-dip zinc coating	24,54 kg							Shower mixer
Steel, hot-dip zinc coating	155,2 kg							Postbox
Steel, hot-dip zinc coating	0,01 kg							Clothing shelf
Steel, hot-dip zinc coating	0,05 m3							Handrail
Steel, hot-dip zinc coating	0,39 m3							Balcony parapet

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, hot-dip zinc coating	1,36 kg							Pull handles
Steel, hot-dip zinc coating	12,21 kg							Toilet paper holder
Steel, hot-dip zinc coating	19,61 kg							Kitchen faucet
Steel, hot-dip zinc coating	26,86 kg							Door nob, steel
Steel, hot-dip zinc coating	27,75 kg							Shower rail
Steel, hot-dip zinc coating	65,23 kg							Hinge, cabinet interior
Steel, hot-dip zinc coating	197,62 kg							Banister
Steel, hot-dip zinc coating	547,54 kg							Sink, kitchen
Steel, color coated (EAPP)	0,64 kg							Cloth rail
Steel, color coated (EAPP)	140,94 kg							Wire basket
Natural rubber sealing compound	0,14 m3	1,52	0,19	0,33	1 036,42	0	18 322,61	Drying mat, rubber
Laminated plywood, waterproof, 10.2 mm	1,82 m3	22,98	4,45	2,73	1 056,72	0	148 367,33	Countertop
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	0,03 m3	0,3	0,02	0	6,64	0	450,26	Clothing shelf, console
Balcony glass door, wood-alu frame, U-value 0.84	37							Balcony door
Insulation, polyethylene foam	0,25 m3	1,4	0,19	0,24	874,81	0	13 353,39	Backing rod
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	6,43 m2							Cover plate
Door, steel, 1,23 x2,18 m (Novoferm)	5							Steel doors
Window, triple glazed, wood-alu frame, fixed, 1.23x1.48 mx10...	255,72							Windows
Wooden inner door, painted	359,94	53,47	4,28	26,69	12 776,21	0	257 697,59	Tree doors
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0 m3							Fittings, floor beading
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	235 m2	1,69	0,72	0,28	357,41	0	5 389,66	Paint wood panel
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	2 550 m2	18,38	7,81	3,03	3 878,31	0	58 483,51	Paint plasterboard
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	400 m2	3,93	2,57	0,69	794,19	0	11 251,03	Paint banister
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	5 450 m2	53,56	35	9,47	10 820,84	0	153 295,26	Paint concrete
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	0 m3							Metal fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	0,12 m2							Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	3,92 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	20,7 m2							Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	20,88 m2							gable plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	21,4 m2							Covering of steel sheeting
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	23,89 m2							Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	29,37 m2							Socket fitti

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	37,82 m2							Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	54,16 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	55,49 kg							Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	65 m2							Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	116,8 m2							Plate on wall
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	325 kg							Roof hood
Ventilation system with steel pipes, room area m2	2 703	96,89	4,64	9,11	22 434,9	0	373 554,5	Ventilation system
Air exchanger+heat recovery, 190 liters / s	1	10,59	2,38	0,62	782	0	13 961,6	Exhaust fan garbage room
Air exchanger+heat recovery, 190 liters / s	1	10,59	2,38	0,62	782	0	13 961,6	Duct fan washroom
Drainage system, PP, room area m2	2 000	251	61	15	72 139	0	847 024,15	Drainage system
Electricity cabling, room area m2	2 703	24,97	2,59	2,21	8 479,31	0	139 513,98	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	2 703	34,78	1,18	3,17	7 730,58	0	138 232,04	Heating system
Elevator components (per storey)	8	34,85	2,52	3,64	7 612,17	0	89 832,18	Elevator components
Locking system for doors, TS 93 EN 2-5 (Dorma)	38	3,36	0,2	0,21	676,4	0	11 597,6	Locking system
Ventilator, central, 10.000 m3/h with heat recovery	5	109,01	8,49	11,05	27 038,95	0	393 405,14	FTX
Ventilator, decentral (wall and ceiling), 60 m3/h	37	1,93	0,2	0,22	636,06	0	12 914,66	Cooker hood
Pipesystem, hot and cold water supply, PEX, room area m2	2 703	532,49	360,85	43,25	92 668,3	0,01	981 088,85	Pipesystem, hot and cold water
Electricity, Sweden	17 940							Elförbrukning
Fortum Värme, s m Stockholms stad, Stockholm	139 275							Fjärrvärme
Tap water, clean	1 759							Vattenförbrukning
	Total	1 494,09	551,69	356 807,19	357 244,96	0,02	5 303 353,6	

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	3,92 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	20,7 m2							Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	20,88 m2							gable plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	21,4 m2							Covering of steel sheeting
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	23,89 m2							Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	29,37 m2							Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	37,82 m2							Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	54,16 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	55,49 kg							Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	65 m2							Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	116,8 m2							Plate on wall
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	325 kg							Roof hood
Ventilation system with steel pipes, room area m2	2 703							Ventilation system
Air exchanger+heat recovery, 190 liters / s	1							Exhaust fan garbage room
Air exchanger+heat recovery, 190 liters / s	1							Duct fan washroom
Drainage system, PP, room area m2	2 000							Drainage system
Electricity cabling, room area m2	2 703							Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	2 703							Heating system
Elevator components (per storey)	8							Elevator components
Locking system for doors, TS 93 EN 2-5 (Dorma)	38							Locking system
Ventilator, central, 10.000 m3/h with heat recovery	5							FTX
Ventilator, decentral (wall and ceiling), 60 m3/h	37							Cooker hood
Pipesystem, hot and cold water supply, PEX, room area m2	2 703							Pipesystem, hot and cold water
Electricity, Sweden	17 940	359,35	120,89	5,59	44 981,47	0,06	9 690 740,46	Elförbrukning
Fortum Värme, s m Stockholms stad, Stockholm	139 275	8 200,89	2 700,05	127,26	1 163 239,38	0,56	45 130 218,87	Fjärrvärme
Tap water, clean	1 759							Vattenförbrukning
	Total	8 560,24	2 820,95	132,85	1 208 220,86	0,62	54 820 959,34	

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	54,16 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	55,49 kg							Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	65 m2							Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	116,8 m2							Plate on wall
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	325 kg							Roof hood
Ventilation system with steel pipes, room area m2	2 703							Ventilation system
Air exchanger+heat recovery, 190 liters / s	1							Exhaust fan garbage room
Air exchanger+heat recovery, 190 liters / s	1							Duct fan washroom
Drainage system, PP, room area m2	2 000							Drainage system
Electricity cabling, room area m2	2 703							Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	2 703							Heating system
Elevator components (per storey)	8							Elevator components
Locking system for doors, TS 93 EN 2-5 (Dorma)	38							Locking system
Ventilator, central, 10.000 m3/h with heat recovery	5							FTX
Ventilator, decentral (wall and ceiling), 60 m3/h	37							Cooker hood
Pipesystem, hot and cold water supply, PEX, room area m2	2 703							Pipesystem, hot and cold water
Electricity, Sweden	17 940							Elförbrukning
Fortum Värme, s m Stockholms stad, Stockholm	139 275							Fjärrvärme
Tap water, clean	1 759	171,44	86,73	7,71	31 662	0	669 385,64	Vattenförbrukning
	Total	171,44	86,73	7,71	31 662	0	669 385,64	

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Life-cycle assessment, EN-15978: Deconstruction

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)		800							
Electricity, Sweden		209 200							Elförbrukning produktion
District Heat, Sweden		228 000							Fjärrvärme produktion
Liquified petroleum gas		47,5							Gasol produktion
Diesel		5 716							Diselanv. prodution
Petrol 95E10		363							Bensinanv. produktion
Tap water, clean		500							Vattenförbrukning produktion
Biowaste		2 600							Komposterbart avfall
Brick waste		1 950							Tegelavfall (30 % av fyllnadsmassor)
Cardboard waste		650							Emballageavfall
Concrete waste to recycling		2 600							Betongavfall (40% av fyllnadsmassor)
Gypsum waste		6 500							Gipsavfall
Mixed waste		3 900							Osorterat avfall
Plastic waste		1 300							Plastavfall
Soil waste		1 950							Schaktavfall (30 % av fyllnadsmassor)
Wood waste		17 550							Träavfall
Bitumen-polymer membrane, groundings	Bitumen waste	276,6 kg	0,14	0,03	0	647,24	0	168,05	Base slab insulation papp
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Preparation of construction waste	177 m3	8,19	2,04	1,17	1 158,91	0	24 108,05	Concrete base slab
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	7 318,74 kg	0,14	0,04	0,02	19,97	0	415,35	Reinforcement base slab
EPS insulation, 0.035 W/mK, 20 kg/m3 (EUMEPS)	Construction waste to landfill	70,72 m3	0,12	0,06	0,02	61,63	0	457,44	Base slab insulation
Insulation, XPS, 40-50 kg/m3	Construction waste to landfill	14 m3	0,05	0,03	0,01	27,45	0	203,75	Base slab insulation
Plastic, HDPE	Plastic waste	4	0,02	0	0	9,52	0	1,85	Buffer blocking
Plastic profile, EPDM	Incineration of plastic (including benefits) C4	0,45 m3	0,27	0,02	0,01	1 136,49	0	602,6	Sill plate insulation
Steel, stainless, hot rolled (Outokumpu)	Steel waste	0,05 m3	0,01	0	0	3,06	0	87,03	Mounting hardware
Steel, stainless, hot rolled (Outokumpu)	Steel waste	635 kg	0,02	0	0	4,92	0	139,91	Rebend
Steel, stainless, cold rolled (Outokumpu)	Steel waste	416 kg	0,01	0	0	3,22	0	91,66	Mountingplate
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	4 379 kg	0,02	0	0	3,53	0	52,72	Reinforcement base slab
Laminated plywood, waterproof, 10.2 mm	Wood waste	3,2 m3	0,56	0,73	0,01	22,85	0	264,3	Concrete mould

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Brick facade, common brick, 1395 kg/m3, 130 mm (Wienerberger...	Brick waste	149 142 kg	5,33	1,28	0,15	1 654,02	0	40 513,66	Brick facade
Ready-mix concrete exluding rebar, C32/40, B35 M45 < 200 mm,...	Preparation of construction waste	5,5 m3	0,25	0,06	0,04	36,01	0	749,12	Concrete foundation
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Disposal of inert material (e.g. Glass) C4	0,53 m3	0,04	0,01	0	7,15	0	106,65	Fiber cement board
Cement, CEM I	Preparation of construction waste	720 kg	0,01	0	0	1,96	0	40,86	Cement mortar
Insulation, glass wool, water repellent, kraft paper lining,...	Preparation of construction waste	66,65 m3	0,02	0	0	2,18	0	45,39	Facade insulation
Glass fibers, glass yarn, 146g/m2 (Vitrulan)	Disposal of inert material (e.g. Glass) C4	2,11	0	0	0	0,03	0	0,43	Insect screen
Gypsum board, storm sheathing, 9.5 mm, Glasroc H Storm (Gypr...	Gypsum waste	687,5 m2	0,28	0,05	0,01	37,27	0	1 038,3	Plasterboard storm sheating
Insulation, glass wool/mineral wool, 80 kg/m3, KL (Isover)	Construction waste to landfill	85 m3	0,15	0,07	0,02	77,78	0	577,3	Facade insulation
Lightweight concrete block, 500 kg/m3, 0.12-0.13 W/mK, Ytong...	Preparation of construction waste	900 kg	0,02	0	0	2,46	0	51,08	Lightweight concrete block
Aluminium curtain walling, 2700 kg/m3 (GAA)	Aluminium waste	0,01 m3	0	0	0	0,32	0	8,99	Curtain walling
Facade plastering, plaster (weber)	Construction waste to landfill	5 724 kg	0,48	0,24	0,07	249,41	0	1 851,23	Facade plastering
Screws/fixings, galvanized	End of life of galvanised steel C4	224 kg	0	0	0	0,18	0	2,7	Screw/ fixings facade
Sealing tapes, PE/PP foil	Incineration of plastic (including benefits) C4	31,39 kg	0,02	0	0	79,28	0	42,03	Sealing tape
Steel, stainless, hot rolled (Outokumpu)	Steel waste	0,2 m3	0,05	0,01	0	12,24	0	348,12	Mounting hardware, valve
Steel, stainless, hot rolled (Outokumpu)	Steel waste	453 kg	0,01	0	0	3,51	0	99,81	Reinforcement, brick
Steel, stainless, cold rolled (Outokumpu)	Steel waste	0,01 m3	0	0	0	0,42	0	11,94	Air gap wire mesh
Stoneware tiles, unglazed	Preparation of construction waste	6 m2	0	0	0	0,33	0	6,81	Granite ceramics wall covering
Plastic vapour control layer, 0.2 mm (Tommen Gram)	Construction waste to landfill	84,45 kg	0,01	0	0	3,68	0	27,31	Plastic vapour control
Plastic vapour control layer, 0.2 mm (Tommen Gram)	Construction waste to landfill	1 146 m2	0,02	0,01	0	9,24	0	68,57	Plastic vapour control
Dry mortar, M5, Murmortel M5 (weber)	Preparation of construction waste	51 865 kg	1	0,25	0,14	141,49	0	2 943,42	Dry mortar
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	56,52 m3	4,25	0,91	0,4	3 050,51	0	10 757,61	Construction timber
Planed timber, conifer	Wood waste	9,92 m3	0,84	1,11	0,01	34,52	0	399,21	Planed timber
Wooden façade external facing, thermo tree, pine	Wood waste	3,16 m2	0,01	0,01	0	0,3	0	3,42	Wooden facade panels
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Preparation of construction waste	481,8 m3	22,3	5,56	3,17	3 154,59	0	65 622,93	Concrete walls
Ready mix concrete, excluding rebar, C32/40 (B35 M45)	Preparation of construction waste	5,3 m3	0,22	0,05	0,03	31,06	0	646,08	Concrete walls
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	14 637 kg	0,28	0,07	0,04	39,93	0	830,67	Reinforcement (load bearing walls)
Plastic, HDPE	Plastic waste	10	0,04	0	0	23,8	0	4,63	Buffe[illegible]g

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, hot-dip zinc coating	Steel waste	554,84 kg	0,02	0	0	4,3	0	122,25	Rebend
Steel, stainless, hot rolled (Outokumpu)	Steel waste	0,25 m3	0,06	0,01	0	15,31	0	435,15	Mounting hardware, walls
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	8 758 kg	0,04	0,01	0	7,06	0	105,44	Reinforcement wire mesh (load bearing walls)
Planed timber, conifer	Wood waste	13 m3	1,1	1,45	0,01	45,25	0	523,27	Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	Metal waste, average	0,04 m3	0,01	0	0	2,51	0	71,39	Reinforcement wire
Glass wool/mineral wool insulation, acoustic partition roll,...	Disposal of inert material (e.g. Glass) C4	7,32 m3	0,01	0	0	2,38	0	35,46	Acoustic insulation panel
Non-Alloy Structural Steel (Direct Reduced Iron production r...	End of life of steel profiles C4	349 kg	0	0	0	0,28	0	4,2	Screws/fixings non galvanized
Ceramic tiles, 15.1 kg/m2 (IKFP)	Ceramic waste	333 m2	0,18	0,04	0,01	55,76	0	1 365,91	Ceramic tiles public spaces
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	Preparation of construction waste	0,03 m3	0	0	0	0,09	0	1,86	Adhesive cementitious for tiles
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	Preparation of construction waste	3 m2	0	0	0	0,1	0	2,16	Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Pla...	Preparation of construction waste	2 922 m2	0,51	0,13	0,07	71,74	0	1 492,45	Plasterboard, Standard
Gypsum plasterboard, wetroom, 12.5x900 mm, 10 kg/m2, Glasroc...	Preparation of construction waste	86,3 m2	0,02	0	0	2,35	0	48,98	Plasterboard wetroom
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Ceramic waste	95,1 m2	0,05	0,01	0	15,93	0	390,09	Ceramic tiles kitchen
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Ceramic waste	333 m2	0,18	0,04	0,01	55,76	0	1 365,91	Ceramic tiles WC/shower
Plastic carpet, wet area, 2.25 mm, 2.9 kg/m2 (ERFMI)	Construction waste to landfill	1 m2	0	0	0	0,13	0	0,93	Plastic carpet
Screws/fixings, galvanized	End of life of galvanised steel C4	879 kg	0	0	0	0,71	0	10,58	Screws/fixings galvanized
Steel profile with PE lining (Norgips)	End of life of stainless steel C4	85,7	0	0	0	0,05	0	0,68	Steel rail SK70 polyeten
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	41,5 kg	0	0	0	0,02	0	0,3	Corner profile
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	119,6 kg	0	0	0	0,06	0	0,88	Corner protection HS29
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	426 kg	0	0	0	0,21	0	3,13	T-nogging
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	637 kg	0	0	0	0,31	0	4,68	Steel rail SK70
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	1 003 kg	0	0	0	0,49	0	7,37	Steel joist R70
Silicon waterproofing compound	Disposal of inert material (e.g. Glass) C4	0,07 m3	0	0	0	0	0	0,02	Silicion selant
Wood board, particleboard	Wood waste	3,3 m3	0,48	0,64	0,01	19,84	0	229,43	OSB plywood
Plywood, spruce, uncoated	Wood waste	40,61 m3	4,11	5,42	0,05	168,87	0	1 953,06	Plywood
Timber lining (interior), conifer	Wood waste	9 m3	0,76	1	0,01	31,32	0	362,27	Floor beading
Planed timber, conifer	Wood waste	9,92 m3	0,84	1,11	0,01	34,53	0	399,3	Plane[illegible]
MDF, 7-30 mm, Fibrapan (Finsa)	Wood waste	1,85 m3	0,3	0,39	0	12,25	0	141,68	MDF-board

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Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Ceramic tiles, 15.1 kg/m2 (IKFP)	Ceramic waste	11,55 m2	0,01	0	0	1,93	0	47,38	Foundation ceramic tiles
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Preparation of construction waste	438,1 m3	20,27	5,06	2,89	2 868,47	0	59 670,83	Concrete floor slab
Ready mix concrete, excluding rebar, C30/37 (B30 M60) D22 Sy...	Preparation of construction waste	45,4 m3	2,1	0,52	0,3	297,26	0	6 183,65	Concrete, elevator and balconies
Mineral wool insulation with recycled briquette content, 0.0...	Disposal of inert material (e.g. Glass) C4	211,64 m3	0,71	0,1	0,07	114,6	0	1 709,95	Roof insulation UNI-board
Ceramic floor tiles (Kutahya Seramik)	Preparation of construction waste	134,3 m2	0	0	0	0,37	0	7,62	Ceramic floor tiles
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	Preparation of construction waste	0,18 m3	0,01	0	0	0,86	0	17,85	Screed flooring fan room
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	Preparation of construction waste	9,15 m3	0,3	0,07	0,04	42,46	0	883,25	Screed flooring
Steel, reinformcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	14 637 kg	0,28	0,07	0,04	39,93	0	830,67	Reinforcement steel (floor slab)
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	Preparation of construction waste	416 m2	0,03	0,01	0	3,82	0	79,4	Waterproofing roof carpet
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Ceramic waste	133,2 m2	0,07	0,02	0	22,31	0	546,37	Ceramic tile, floor we troom
Plastic flooring, thick (SNMI)	Incineration of plastic (including benefits) C4	39,5 m2	0,06	0	0	249,4	0	132,24	Plastic flooring fan room
Insulation panel, 120 mm, Thane Sarking (KNAUF)	Incineration of plastic (including benefits) C4	672 m2	1,6	0,13	0,09	6 720,74	0	3 563,52	Sarking
Acoustic flooring, 10 mm, VIBRASTO 10 (TEXAA)	Incineration of plastic (including benefits) C4	0,13 m3	0,01	0	0	24,35	0	12,91	Acoustic carpet
Acoustic ceiling tiles, 91 - 131 kg/m3, 1.7 - 9.3 kg/m2, 300...	Disposal of inert material (e.g. Glass) C4	72 m2	0,01	0	0	1,85	0	27,63	Ceiling indoor
Primer, protective, for walls and floors, Gisogrund (PCI)	Disposal of inert material (e.g. Glass) C4	0,23 m3	0,02	0	0	3,05	0	45,45	Primer for floors
Plastic, HDPE	Plastic waste	10	0,04	0	0	23,8	0	4,63	Buffer blocking
Sealing tapes, PE/PP foil	Incineration of plastic (including benefits) C4	2,61 kg	0	0	0	6,59	0	3,5	Sealing tape
Luxury vinyl floor tile, Luxury Vinyl Tile (LVT) (Karndean)	Plastic waste	1 857 m2	40,93	2,86	0,09	24 352,33	0	4 740,52	Vinyl flooring Tarkett nordic stabil
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	Disposal of inert material (e.g. Glass) C4	0,01 m3	0	0	0	0,12	0	1,73	Flooring adhesive
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	Disposal of inert material (e.g. Glass) C4	0,04 m3	0	0	0	0,76	0	11,41	Flooring adhesive
Steel, hot-dip zinc coating	Steel waste	12,8 kg	0	0	0	0,1	0	2,82	Eye bolt
Steel, hot-dip zinc coating	Steel waste	132,83 kg	0	0	0	1,03	0	29,27	Brackets
Steel, hot-dip zinc coating	Steel waste	832,26 kg	0,03	0,01	0	6,45	0	183,37	Rebend
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	8 758 kg	0,04	0,01	0	7,06	0	105,44	Reinforcement wire mesh (floor slab)
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	Disposal of inert material (e.g. Glass) C4	2 796,8 kg	0,23	0,03	0,02	37,86	0	564,92	Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	Disposal of inert material (e.g. Glass) C4	43 579,8 kg	3,65	0,53	0,35	589,94	0	8 802,59	Multipurpose floor screed
Multipurpose floor leveling screed, 1700kg/m3, 2-30mm/4-50mm...	Disposal of inert material (e.g. Glass) C4	41 342,4 kg	3,46	0,5	0,34	559,65	0	8 350,66	Multip floor screed

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Natural stone tiles, hard, exterior	Preparation of construction waste	5,12 m2	0,02	0,01	0	2,91	0	60,44	Natural stone, floor public area
Plastic vapour control layer, 0.15 mm (Tommen Gram)	Construction waste to landfill	0,19 kg	0	0	0	0,01	0	0,06	Plastic vapour control layer
Dry mortar, B30, B30 (weber)	Preparation of construction waste	2 195 kg	0,04	0,01	0,01	5,99	0	124,57	Dry mortar
Laminated plywood, waterproof, 10.2 mm	Wood waste	10,94 m3	1,9	2,51	0,03	78,16	0	903,96	Concrete mould
Dried timber, conifer	Wood waste	22 m3	1,86	2,46	0,02	76,57	0	885,54	Tounge and grove
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,03 m3	0	0	0	1,73	0	6,09	Fink truss 13
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,07 m3	0,01	0	0	3,78	0	13,32	Fink truss 4
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,09 m3	0,01	0	0	4,8	0	16,94	Fink truss 3A
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,12 m3	0,01	0	0	6,75	0	23,79	Fink truss 6
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,17 m3	0,01	0	0	9,18	0	32,36	Fink truss 5
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,29 m3	0,02	0	0	15,49	0	54,63	Fink truss 1
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,39 m3	0,03	0,01	0	21,05	0	74,23	Fink truss 8
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,5 m3	0,04	0,01	0	26,99	0	95,17	Fink truss 12
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,59 m3	0,04	0,01	0	31,94	0	112,62	Fink truss 10
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,71 m3	0,05	0,01	0,01	38,43	0	135,52	Fink truss 7
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	1,07 m3	0,08	0,02	0,01	57,64	0	203,28	Fink truss 3
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	1,32 m3	0,1	0,02	0,01	71,24	0	251,24	Fink truss 11
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	2,31 m3	0,17	0,04	0,02	124,68	0	439,67	Fink truss 2
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	2,72 m3	0,2	0,04	0,02	146,97	0	518,28	Fink truss 9
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	Incineration of wood C3 (without biogenic CO2)	0,11 m3	0,01	0	0	6,69	0	23,59	Laminated wood beam 13
Glued and laminated wooden beam, 470 kg/m3, Moisr. 12%, 45 ...	Incineration of wood C3 (without biogenic CO2)	0,13 m3	0,01	0	0	7,49	0	26,42	Laminated wood beam 14
Planed timber, conifer	Wood waste	16,25 m3	1,38	1,81	0,02	56,56	0	654,09	Concrete mould
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0 m3	0	0	0	0,01	0	0,21	Drying mat, frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0,06 m3	0	0	0	1,26	0	35,69	Drying mat, alloy
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0,11 m3	0,01	0	0	2,23	0	63,42	Balcony parapet
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	18,5 kg	0	0	0	0,14	0	4,08	Magazine rack
Brass building components	Preparation of construction waste	42,5 kg	0	0	0	0,12	0	2,41	Door [illegible]ss

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Glass, reflective, solar control, CVD coated, clear, 4 mm, L...	Preparation of construction waste	0,04 m2	0	0	0	0	0	0,02	Mirror, bathrom
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	Disposal of inert material (e.g. Glass) C4	25 550,5 kg	2,14	0,31	0,21	345,88	0	5 160,89	Cabinet interior
Glass façade, laminated safety glass, 600x321 (Pilkington)	Glass waste	0,13 m3	0,02	0,01	0	4,32	0	111,49	Balcony parapet, Glass
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	Preparation of construction waste	37	0,01	0	0	1,51	0	31,5	Sink, bathroom
Porcelain WC kit (toilet and tank) (AFISB)	Preparation of construction waste	37	0,03	0,01	0	3,59	0	74,75	Toilet
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	Disposal of inert material (e.g. Glass) C4	142,5 m3	0,18	0,03	0,02	28,94	0	431,75	Blowing wool
Zinc plates, Naturel (NedZink)	Preparation of construction waste	390,5 kg	0,01	0	0	1,07	0	22,16	Bathroom cabinet
Skylight, smoke lift, F100 (Lamilux)	Disposal of inert material (e.g. Glass) C4	1	0	0	0	0,55	0	8,17	Smoke lift
Plastic, LDPE	Plastic waste	0,74	0	0	0	1,76	0	0,34	Hook, clothing shelf
Natural stone quartzite schist, even thickness, with sawn ed...	Preparation of construction waste	1 780 kg	0,03	0,01	0	4,86	0	101,02	Window ledge
Steel, hot-dip zinc coating	Steel waste	0,01 m3	0	0	0	0,37	0	10,43	Wall fittings
Steel, hot-dip zinc coating	Steel waste	0,56 kg	0	0	0	0	0	0,12	Mirror clamp
Steel, hot-dip zinc coating	Steel waste	2,4 kg	0	0	0	0,02	0	0,53	Shower
Steel, hot-dip zinc coating	Steel waste	20,68 kg	0	0	0	0,16	0	4,56	Hooks
Steel, hot-dip zinc coating	Steel waste	24,54 kg	0	0	0	0,19	0	5,41	Shower mixer
Steel, hot-dip zinc coating	Steel waste	155,2 kg	0	0	0	1,2	0	34,2	Postbox
Steel, hot-dip zinc coating	Steel waste	0,01 kg	0	0	0	0	0	0	Clothing shelf
Steel, hot-dip zinc coating	Steel waste	0,05 m3	0,01	0	0	2,84	0	80,7	Handrail
Steel, hot-dip zinc coating	Steel waste	0,39 m3	0,09	0,02	0	23,43	0	666,02	Balcony parapet
Steel, hot-dip zinc coating	Steel waste	1,36 kg	0	0	0	0,01	0	0,3	Pull handles
Steel, hot-dip zinc coating	Steel waste	12,21 kg	0	0	0	0,09	0	2,69	Toilet paper holder
Steel, hot-dip zinc coating	Steel waste	19,61 kg	0	0	0	0,15	0	4,32	Kitchen faucet
Steel, hot-dip zinc coating	Steel waste	26,86 kg	0	0	0	0,21	0	5,92	Door nob, steel
Steel, hot-dip zinc coating	Steel waste	27,75 kg	0	0	0	0,22	0	6,11	Shower rail
Steel, hot-dip zinc coating	Steel waste	65,23 kg	0	0	0	0,51	0	14,37	Hinge, cabinet interior
Steel, hot-dip zinc coating	Steel waste	197,62 kg	0,01	0	0	1,53	0	43,54	Banister
Steel, hot-dip zinc coating	Steel waste	547,54 kg	0,02	0	0	4,24	0	120,64	Sink, kitchen
Steel, color coated (EAPP)	Steel waste	0,64 kg	0	0	0	0	0	0,14	Cloth rail
Steel, color coated (EAPP)	Steel waste	140,94 kg	0	0	0	1,09	0	31,05	Wire basket
Natural rubber sealing compound	Disposal of inert material (e.g. Glass) C4	0,14 m3	0,01	0	0	1,75	0	26,1	Drying mat, rubber
Laminated plywood, waterproof, 10.2 mm	Wood waste	1,82 m3	0,32	0,42	0	12,96	0	149,91	Countertop
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	Incineration of wood C3 (without biogenic CO2)	0,03 m3	0	0	0	2,77	0	9,78	Cloth[illegible] conso[illegible]

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Balcony glass door, wood-alu frame, U-value 0.84	Construction waste to landfill	37	0,33	0,16	0,05	172,18	0	1 278,01	Balcony door
Insulation, polyethylene foam	Disposal of inert material (e.g. Glass) C4	0,25 m3	0,02	0	0	3,28	0	48,98	Backing rod
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	6,43 m2	0	0	0	0,2	0	5,56	Cover plate
Door, steel, 1,23 x2,18 m (Novoferm)	Steel waste	5	0,02	0	0	5,46	0	155,33	Steel doors
Window, triple glazed, wood-alu frame, fixed, 1.23x1.48 mx10...	Construction waste to landfill	255,72	0,74	0,37	0,1	386,78	0	2 870,83	Windows
Wooden inner door, painted	Wood waste	359,94	2,46	3,24	0,03	101,13	0	1 169,59	Tree doors
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0 m3	0	0	0	0,01	0	0,35	Fittings, floor beading
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	Disposal of inert material (e.g. Glass) C4	235 m2	0	0	0	0,33	0	4,94	Paint wood panel
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	Disposal of inert material (e.g. Glass) C4	2 550 m2	0,02	0	0	3,59	0	53,63	Paint plasterboard
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Disposal of inert material (e.g. Glass) C4	400 m2	0	0	0	0,64	0	9,53	Paint banister
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Disposal of inert material (e.g. Glass) C4	5 450 m2	0,05	0,01	0,01	8,7	0	129,79	Paint concrete
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	0 m3	0	0	0	0,03	0	0,88	Metal fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	0,12 m2	0	0	0	0	0	0,1	Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	3,92 m2	0	0	0	0,12	0	3,39	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	20,7 m2	0	0	0	0,63	0	17,9	Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	20,88 m2	0	0	0	0,63	0	18,05	gable plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	21,4 m2	0	0	0	0,65	0	18,51	Covering of steel sheeting
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	23,89 m2	0	0	0	0,73	0	20,66	Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	29,37 m2	0	0	0	0,89	0	25,4	Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	37,82 m2	0	0	0	1,15	0	32,71	Windowsill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	54,16 m2	0,01	0	0	1,65	0	46,84	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	55,49 kg	0	0	0	0,43	0	12,23	Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	65 m2	0,01	0	0	1,98	0	56,21	Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	116,8 m2	0,01	0	0	3,55	0	101,01	Plate on wall
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	325 kg	0,01	0	0	2,52	0	71,61	Roof hood
Ventilation system with steel pipes, room area m2	Construction waste to landfill	2 703	0,86	0,43	0,12	451,56	0	3 351,65	Ventilation system
Air exchanger+heat recovery, 190 liters / s	Steel waste	1	0	0	0	0,84	0	23,95	Exhaust fan garbage room
Air exchanger+heat recovery, 190 liters / s	Steel waste	1	0	0	0	0,84	0	23,95	Duct [illegible] washr[illegible]

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Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Drainage system, PP, room area m2	Construction waste to landfill	2 000	2,2	1,09	0,31	1 149,2	0	8 529,82	Drainage system
Electricity cabling, room area m2	Construction waste to landfill	2 703	0,51	0,25	0,07	266,18	0	1 975,67	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	Construction waste to landfill	2 703	0,62	0,31	0,09	323,89	0	2 404,03	Heating system
Elevator components (per storey)	End of life of galvanised steel C4	8	0,01	0	0	2,13	0	31,78	Elevator components
Locking system for doors, TS 93 EN 2-5 (Dorma)	Disposal of inert material (e.g. Glass) C4	38	0,01	0	0	2,31	0	34,46	Locking system
Ventilator, central, 10.000 m3/h with heat recovery	End of life of galvanised steel C4	5	0,02	0	0	2,84	0	42,38	FTX
Ventilator, decentral (wall and ceiling), 60 m3/h	End of life of galvanised steel C4	37	0	0	0	0,03	0	0,4	Cooker hood
Pipesystem, hot and cold water supply, PEX, room area m2	Construction waste to landfill	2 703	2,33	1,16	0,33	1 217,81	0	9 039,14	Pipesystem, hot and cold water
Electricity, Sweden		17 940							Elförbrukning
Fortum Värme, s m Stockholms stad, Stockholm		139 275							Fjärrvärme
Tap water, clean		1 759							Vattenförbrukning
		Total	146,93	47,72	11,29	53 637,04	0	302 559,18	

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Appendix D – Inventory analysis for Quattro

Life-cycle assessment, EN-15978: Construction Materials

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)	500							
Electricity, Sweden	41 840							EL - produktion
Fortum Värme, s m Stockholms stad, Stockholm	45 600							Fjärrvärme - produktion
Diesel	2 300							Diesel - produktion
Tap water, clean	150							Tappvatten - produktion
Cardboard waste	750							Waste cardboard
Gypsum waste	2 750							Waste gypsum
Hazardous waste	14,5							Waste hazardous
Metal waste, average	3 700							Waste metal
Mixed waste	1 396							Waste unsorted
Plastic waste	2 200							Waste plastic
Wood waste	11 580							Wood waste
Bitumen-polymer membrane, groundings	0,01 m3	0,02	0	0	4,8	0	87,7	Synkoflex - Water bar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	143,3 m3	57,32	14,33	0	27 212,67	0	239 898,53	Base slab
Ready mix concrete, excluding rebar, C28/35	6,2 m3	0,96	0,19	2,69	1 163,94	0	6 722,73	Base slab
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	5 246 kg	4,09	0,89	0,33	1 941,02	0	31 197,96	Reinforcement base slab
Insulation, polyethylene foam	2,39 m3	13,37	1,82	2,29	8 377,18	0	127 872,1	Combi Floor Mat Tuplex
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	6,05 m3	1,61	0,31	0,25	546,32	0	8 950,67	Joist the screed
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	7,25 m3	1,93	0,37	0,3	654,68	0	10 726,01	Edge support beam element
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	64,76 m3	17,25	3,33	2,67	5 847,83	0	95 809,18	Base Plate
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	79,5 m3	21,17	4,09	3,28	7 178,85	0	117 616,28	Expanded plastic
Plastic, HDPE	1,6	7,68	1,92	1,01	2,88	0	51,68	Plate for fitting of different types of concrete
Plastic, HDPE	3	14,4	3,6	1,89	5,4	0	96,9	Spreader pipe
Plastic, HDPE	4	19,2	4,8	2,52	7,2	0	129,2	Buffer blocking
Plastic, LDPE	0,12	0,52	0,15	0,16	0,22	0	4,21	Backing rod
Steel, stainless, hot rolled (Outokumpu)	0,12 m3	21,05	0,94	1,75	2 607	0	38 943,84	Embedded fasteners
Steel, stainless, hot rolled (Outokumpu)	1 kg	0,02	0	0	2,75	0	41,08	Top Ladder
Steel, stainless, hot rolled (Outokumpu)	7 kg	0,16	0,01	0,01	19,25	0	287,56	Metal plate fastener
Steel, stainless, hot rolled (Outokumpu)	36,8 kg	0,82	0,04	0,07	101,2	0	1 511,74	Bottom Ruler
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	1 481 kg	0,36	0,19	1,5	490,21	0	13 047,61	Reinforcement wire mesh, base slab
Natural rubber sealing compound	0 m3	0	0	0	2,63	0	46,45	Neoprene rubber
Laminated plywood, waterproof, 10.2 mm	1,03 m3	6,52	1,26	0,77	299,84	0	42 098,37	Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	17,6 kg	0,39	0,04	0,02	58,08	0	969,76	Binding wire

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Glass wool/mineral wool insulation, roll, 100mm, 0.044 W/mK,...	0 m3	0	0	0	0,07	0	1,35	Mineral wool, yarn
Self-adhesive, fully bonded composite sheet membrane waterpr...	2,02 kg	0,02	0	0	6,16	0	112,24	Seld-adhesive
Mineral wool insulation, 0.036 W/mK, 3.89 Km2/W, 140 mm, 100...	0,45 m3	0,03	0,03	0,57	90,86	0	1 267,86	Facade insulation
Fibre cement board, 1550 kg/m3, Construction (Cembrit)	3,37 m3	8,04	1,2	0,96	3 416,17	0	55 891,45	Cement board
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	2,9 m3	3,83	0,63	0,39	1 687,8	0	30 914	Cembrit Multiforce, recycling building
Adhesive, deformable, fast-setting, 1650 kg/m3 (mixture), El...	35,5 kg	0,13	0,01	0,01	25,52	0	552,13	Adhesive
Gypsum plasterboard, windproofing, vapour resistant sheathin...	0,99 m3	0,87	0,11	0,09	198,4	0	3 999,33	Wind protection plate, recycling building
Exterior plaster, Stolit (sto)	9 m3	18,85	10,25	3,27	3 013,88	0	112 090,5	Plaster
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	274,38 m3	73,08	14,12	11,33	24 776,51	0	405 931,49	Blocks for wall, expanded plastic
Stone wool insulation, product group with density >120 kg/m...	0,07 m3	0,05	0	0,01	11,33	0	128,67	Fire sealant
Stone wool insulation, product group with density >120 kg/m...	25,7 m3	19,7	1,96	2,57	4 481,03	0	50 872,82	Fire Plate (insulation)
Plastic, HDPE	0,02	0,1	0,02	0,01	0,04	0	0,65	Cable Ties
Plastic, LDPE	6,2	27,03	7,75	8,06	11,59	0,01	217,62	Insulation nails / holders
Plastic, PVC	0,12	0	0	0	0,23	0	7,13	PVC tapes
Reinforcement mesh fabric (glass fibre), 0.16kg/m2, R131 (AD...	136	2 898,5	5,77	52,96	272	0	4 011,15	Reinforcement mesh fabric
Elastomer joint sealing tape, polyurethane	40	0,45	0,09	0,08	244,65	0	3 913,53	Expanding water bar
Sealing tapes, PE/PP foil	32,16 kg	0,14	0,01	0,03	81,24	0	1 178,31	Sealing tapes
Solvent-free façade sealant, 1.25 - 1.5 kg/dm3,, SikaHyflex-...	30,8 kg	0,08	0,08	0,44	143,53	0	2 235,46	Sealant, external
Sealing compound, acrylic	7,5 kg	0,1	0	0,01	21,45	0	367,96	Sealant, reinforcement
Silicon waterproofing compound	1,8 kg	0,04	0,01	0	13,39	0	253,99	Jointing mastic
Dried timber, conifer	3,48 m3	1,18	0,26	0,07	149,64	0	10 283,4	Nailing batten, recycling building
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	4,48 m3	1,48	0,35	0,18	268,8	0	10 357,76	120 Stud, recycling building
Planed timber, conifer	18,5 m3	7,58	1,66	0,49	980,5	0	70 892	Planed timber
Wooden façade external facing, thermo tree, pine	0,5 m3	1,06	0,94	0,06	264,14	0	5 229,01	Facade nailing batten
Wooden façade external facing, thermo tree, pine	2,74 m3	5,81	5,15	0,33	1 447,51	0	28 654,97	Lying panel, recycling building
Wooden façade external facing, pine, biochemical impregnatio...	1,45 m3	1,85	0,38	1,63	369,89	0	17 633,97	Pressure-treated woos
Cement (CEM II 32,5)	125 kg	0,13	0,01	0,02	104,84	0	325,36	Cement C30/37 (stairwell)
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	54,4 m3	21,76	5,44	0	10 330,56	0	91 071,04	Concrete, stairwell
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	107,5 m3	43	10,75	0	20 414,25	0	179 965,75	Concrete, wall
Precast concrete wall elements, UPB (Dzelzbetons MB)	30,6 m3	47,96	5,51	2,78	13 880,16	0	137 700	precast concrete wall element

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	1 200 kg	0,94	0,2	0,08	444	0	7 136,4	Reinforcement, precast concrete wall
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	1 770 kg	1,38	0,3	0,11	654,9	0	10 526,19	Reinforcement, stairwell
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	3 935 kg	3,07	0,67	0,25	1 455,95	0	23 401,44	Reinforcement, wall
Steel, stainless, hot rolled (Outokumpu)	627 kg	13,92	0,62	1,16	1 724,25	0	25 757,16	Embedded fasteners, stairwell
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	1 111 kg	0,27	0,15	1,12	367,74	0	9 787,91	Reinforcement wire mesh, wall
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	2 362,4 kg	0,58	0,31	2,39	781,95	0	20 812,74	Reinforcement wire mesh, stairwell
Non-Alloy Structural Steel (Direct Reduced Iron production r...	80,1 kg	1,15	0,12	0,09	235,49	0	3 463,52	Nails and screws non-alloy
Ceramic tiles, 15.1 kg/m2 (IKFP)	2,71 m3	6,06	0,58	0,48	2 920,78	0	52 712,38	Ceramic tiles
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	0,82 m3	1,09	0,18	0,11	479,38	0	8 780,43	Fibre cement, recycling building
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1450 k...	0,01 m3	0	0	0	3,19	0	21,11	Adhesive for kitchen ceramic
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	271,6 kg	0,13	0,07	0,02	128,2	0	1 090,2	Adhesive for ceramic tiles
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	172,5 m2	2,93	0,24	0,24	552	0	10 850,25	Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Sta...	2 350 m2	21,39	2,58	2,04	5 170	0	102 225	Plasterboard, normal
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	0,01 m3	2,37	0,62	0	6,84	0	415,19	T-molding, movement joint, Oak
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	0,07 m3	12,56	3,27	0,01	36,3	0	2 203,41	Floor beading Oak
Laminated wood beam, ash tree, 725 kg/m3, VIGAM-Fresno (Gami...	0,01 m3	2,28	0,59	0	4,06	0	375,2	T-molding, movement joint, ash
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	18,5 m2	0,37	0,04	0,03	179,45	0	3 238,6	Ceramic tile, kitchen
Plastic, HDPE	0,43	2,06	0,52	0,27	0,77	0	13,89	Plastic plug
Screws/fixings, galvanized	248,48 kg	2,76	0,25	0,36	892,52	0	11 452,19	Nails and screws, galvanized
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	0,06 m3	10,82	51,91	0,48	1 087,4	0	27 897,78	Nogging plate
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	0,22 m3	43,29	207,66	1,91	4 349,59	0	111 591,12	Fire resistant steel
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	154 kg	3,79	18,19	0,17	380,94	0	9 773,11	Sheet metal rail SK45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	909 kg	22,38	107,35	0,99	2 248,51	0	57 686,72	Sheet metal R45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	1 195 kg	29,42	141,12	1,3	2 955,96	0	75 836,78	Corner profile LP50
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	1 600 kg	39,39	188,95	1,73	3 957,77	0	101 538,78	Secondary stud
Sealing compound, acrylic	8,4 kg	0,12	0,01	0,01	24,03	0	412,11	Sealing compound
Wood board, particleboard	0,89 m3	0,87	0,16	0,04	174,44	0	3 399,8	OSB-board
Fibreboard, low density, 12 mm (Egger)	360 kg	1,19	0,16	0,18	352,29	0	12 594,86	Hard board

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Plywood, spruce, uncoated	0,94 m3	0,85	0,18	0,05	113,26	0	5 990,4	Plywood, recycling building
Plywood, spruce, uncoated	7,64 m3	6,94	1,47	0,42	924,44	0	48 896	Plywood
Timber lining (interior), conifer	5 m3	2,05	0,45	0,13	278,57	0	19 142,86	Floor beading
Planed timber, conifer	0,99 m3	0,41	0,09	0,03	52,63	0	3 804,95	95-stud, recycling building
Planed timber, conifer	1,64 m3	0,67	0,15	0,04	86,81	0	6 276,82	70-stud, recycling building
Cement (CEM II 32,5)	750 kg	0,79	0,09	0,11	629,04	0	1 952,18	Grub-stone mortar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	107,5 m3	43	10,75	0	20 414,25	0	179 965,75	Concrete, flat concrete base
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	0,77 m3	1,02	0,17	0,1	450,47	0	8 250,84	Cembrit Roof, recycling building
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	25 kg	0,02	0	0	5,15	0	52,28	Self levelling screed
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	3 935 kg	3,07	0,67	0,25	1 455,95	0	23 401,44	Reinforcement, flat concrete base
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	310 m2	0,19	2,73	265 670	536,3	0	21 024,2	Membrane roofing SEP5500
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	0,58 m3	1,29	0,12	0,1	620,8	0	11 203,81	Ceramic tiles
Wood flooring, conifer	766,5 m2	4,4	0,96	0,28	568,74	0	41 121,19	Parquet
Insulation panel, 120 mm, Thane Sarking (KNAUF)	420 m2	47,88	7,01	3,58	7 686	0	201 768	Underlay felt YAP
Pre-slab reinforced concrete (CERIB)	920 m2	57,13	6,79	3,87	21 620	0	223 100	Flat concrete base
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	150 m3	9,64	1,82	0,58	2 250	0	74 642,86	Roof insulation (blowing wool)
Particleboard, expanded glass, 12 mm, StoVentec (sto)	2,59 m3	4,53	0,68	0,51	2 123,8	0	33 821,08	Ventec- boards
Sealing tapes, Butyl	1 kg	0,01	0	0	5,83	0	83,76	butyltape
Elastomer joint sealing tape, polyurethane	0,55	0,01	0	0	3,34	0	53,42	Insulating tape aeroflex
Elastomer joint sealer tape, silicon rubber	23,5	0,48	0,06	0,04	176,17	0	3 099,29	Vinyl Tape
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	25,34 kg	0,36	0,07	0,06	118,08	0	1 839,18	Flooring/ tile joint
Steel, hot-dip zinc coating	0,6 m3	182,17	58	10,04	12 353,86	0	0	Prefabricated roofing
Steel, hot-dip zinc coating	76,12 kg	2,94	0,94	0,16	199,66	0	0	Bracket, fink truss
Steel, stainless, cold rolled (Outokumpu)	0,04 m3	7,75	0,38	0,65	1 131,78	0	18 363,49	Fastening plate
Steel, stainless, cold rolled (Outokumpu)	415 kg	10,08	0,5	0,85	1 473,25	0	23 904	L-steel ramp
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	1 111 kg	0,27	0,15	1,12	367,74	0	9 787,91	Reinforcement wire mesh, flat concrete base
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	1 kg	0	0	0	0,25	0	3,06	Primer Weber
Fibreboard, low density, 12 mm (Egger)	80 kg	0,26	0,04	0,04	78,29	0	2 798,86	Protective plastic-coated cardboard
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,51 m3	0,17	0,04	0,02	30,71	0	1 183,28	Construction timber, recycling building
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	2,2 m3	0,73	0,17	0,09	132	0	5 086,4	Fixing stud

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Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	6,31 m3	2,08	0,49	0,25	378,72	0	14 593,34	Trusses
Natural stone tiles, 10 mm (EURO-ROC)	0,03 m3	0,06	0,01	0	22,81	0	396,43	Window ledge
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0 m3	0,05	0	0	8,88	0	157,81	Doormat frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,01 m3	1,32	0,07	0,08	253,8	0	4 509	Balcony rods
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,06 m3	7,94	0,44	0,47	1 522,8	0	27 054	Doormat, aluminium
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,07 m3	8,89	0,49	0,53	1 705,54	0	30 300,48	Balcony parapet
Glass, reflective, solar control, CVD coated, blue, 4 mm, LT...	0,01 m3	0,17	0,02	0,01	37,91	0	674,08	Toilet mirror
Glass, reflective, solar control, CVD coated, clear, 5 mm, L...	0,01 m3	0,13	0,04	0,01	27,54	0	360,34	Mirror to sliding door wardrobe
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	293 kg	0,23	0,05	0,02	108,41	0	1 742,47	Reinforcement, balcony
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	0,13 m3	0,12	0,02	0,01	25,09	0	488,96	Sliding Wardrobe
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	8 373,4 kg	12,2	2,25	0,57	2 460,55	0	47 955,6	Interior kitchen as well as closet, linen closet and broom closet
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	12	3,28	0,57	0,22	963,6	0	17 133,6	Porcelain sink
Porcelain WC kit (toilet and tank) (AFISB)	12	6,89	1,03	0,42	1 040,4	0	17 355,6	Porclain WC kit
Zinc plates, Naturel (NedZink)	126,6 kg	1,44	0,27	0,02	216,49	0	2 654,8	Bathroom cabinet
Plastic, LDPE	0,18	0,78	0,22	0,23	0,34	0	6,32	Clothing shelf, hook
Plastic, PET	0,18	0	0	0	0,39	0	5,9	Mirror clamp
Plastic profile, EPDM	12,5 kg	0,08	0,01	0,01	54,28	0	988,93	Radon sealing around pipes
Screws/fixings, galvanized	26,68 kg	0,3	0,03	0,04	95,83	0	1 229,65	Hinge
Steel, hot-dip zinc coating	0 m3	0,03	0,01	0	1,76	0	0	Clothing shelf, net of wire
Steel, hot-dip zinc coating	0 m3	0,39	0,12	0,02	26,18	0	0	Clothing shelf, wardrobe rod
Steel, hot-dip zinc coating	2,4 kg	0,09	0,03	0,01	6,29	0	0	Shower
Steel, hot-dip zinc coating	3,96 kg	0,15	0,05	0,01	10,39	0	0	Hooks, wet area
Steel, hot-dip zinc coating	3,96 kg	0,15	0,05	0,01	10,39	0	0	Toilet paper holder
Steel, hot-dip zinc coating	6 kg	0,23	0,07	0,01	15,74	0	0	Magazine rack
Steel, hot-dip zinc coating	6,36 kg	0,25	0,08	0,01	16,68	0	0	Kitchen faucet
Steel, hot-dip zinc coating	24,54 kg	0,95	0,3	0,05	64,37	0	0	Shower mixer
Steel, hot-dip zinc coating	35 kg	1,35	0,43	0,07	91,8	0	0	Postbox
Steel, hot-dip zinc coating	180 kg	6,96	2,22	0,38	472,12	0	0	Sink
Steel, stainless, hot rolled (Outokumpu)	274 kg	6,08	0,27	0,51	753,5	0	11 255,92	Embedded fasteners, balcony
Steel, color coated (EAPP)	10,08 kg	0,09	0,01	0,01	24,16	0	303,88	Wardrobe rod
Steel, color coated (EAPP)	41,58 kg	0,35	0,03	0,05	99,67	0	1 253,51	consoles shelf
Steel, color coated (EAPP)	100,56 kg	0,86	0,08	0,11	241,05	0	3 031,59	Wire basket

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Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, color coated (EAPP)	209,88 kg	1,79	0,16	0,23	503,09	0	6 327,26	shelfs
Steel, color coated (EAPP)	311,66 kg	2,66	0,23	0,34	747,07	0	9 395,63	Wire basket
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	384 kg	0,09	0,05	0,39	127,1	0	3 383,04	Reinforcement wire mesh, balcony
Natural rubber sealing compound	0,14 m3	0,76	0,09	0,16	518,24	0	9 161,8	Doormat, rubber
Laminated plywood, waterproof, 10.2 mm	0,14 m3	0,91	0,18	0,11	41,64	0	5 846,36	Countertop
Laminated plywood, waterproof, 10.2 mm	0,61 m3	3,89	0,75	0,46	179,03	0	25 136,41	Laminadet playwood
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	0,01 m3	0,07	0,01	0	1,61	0	109,52	Clothing shelf
Brass building components	8,16 kg	0,07	0	0	11,87	0	216,47	Handle Assa 1956 Epok
Balcony glass door, wood-alu frame, U-value 0.84	2,44	1,34	0,45	0,07	189,26	0	4 225,43	Inward main entrance door property
Balcony glass door, wood-alu frame, U-value 0.84	6,15	3,37	1,13	0,17	477,41	0	10 659,04	Outward opening door
Balcony glass door, wood-alu frame, U-value 0.84	18,46	10,12	3,4	0,52	1 432,25	0	31 977,33	Outgoing balcony (2-4)
Door glass/steel, 1.23x2.18 m (Novoferm)	2,44	1,04	0,12	0,1	242	0	3 809,2	Inward opening door, property
Door glass/steel, 1.23x2.18 m (Novoferm)	12,37	5,26	0,61	0,53	1 227,13	0	19 315,73	Outward opening entrance (3)
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	15,67	6,72	1,89	0,32	889,35	0	25 053,74	Inwards windows, 986x1445
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	72,26	30,96	8,73	1,5	4 100,67	0	115 519,86	Inwards windows, 986x1745
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	314,96 kg	12,18	3,88	0,67	826,11	0	0	Mounting plate
Steel, hot-dip zinc coating	33,41 kg	1,29	0,41	0,07	87,62	0	0	Handle
Door, steel, 1,23 x2,18 m (Novoferm)	0,39	0,48	0,05	0,06	136,27	0	1 952,84	Combination hatch, stairwell
Door, steel, 1,23 x2,18 m (Novoferm)	0,77	0,94	0,09	0,11	267,23	0	3 829,52	Outward opening entrance door, wheelchair room
Door, steel, 1,23 x2,18 m (Novoferm)	0,78	0,96	0,09	0,12	272,54	0	3 905,68	Roof hatch
Door, steel, 1,23 x2,18 m (Novoferm)	4,17	5,13	0,5	0,62	1 452,82	0	20 819,52	Outward opening entrance door, (2-4)
Door, steel, 1,23 x2,18 m (Novoferm)	4,61	5,67	0,55	0,69	1 603,49	0	22 978,8	Outward opening entrance door
Wooden inner door, painted	96,39	14,32	1,15	7,15	3 421,4	0	69 010,03	interior doors
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	0,35 m3	3,25	0,25	0	72,26	0	4 902,04	Frame interior doors
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	1 000 m2	1,44	0,61	0,24	304,18	0	4 586,94	Paint to plaster
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	235 m2	0,46	0,3	0,08	93,32	0	1 322	Paint balcony / stair railings
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	2 400 m2	4,72	3,08	0,83	953,03	0	13 501,23	Paint for concrete
Skylight, smoke lift, F100 (Lamilux)	1	0,36	0,04	0,06	67	0	3 096	Skylight, smoke lift
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	10,35 m2	1,57	0,5	0,09	106,55	0	0	Drip plate

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Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	14,69 m2	2,23	0,71	0,12	151,18	0	0	Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	18,91 m2	2,87	0,91	0,16	194,68	0	0	Window sill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,18 m2	4,13	1,31	0,23	279,81	0	0	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,74 kg	1,07	0,34	0,06	72,76	0	0	Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	29,8 m2	4,52	1,44	0,25	306,79	0	0	Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	81,25 kg	3,14	1	0,17	213,11	0	0	Roof hood
Ventilation system with steel pipes, room area m2	1 076	19,29	0,92	1,81	4 465,4	0	74 351,58	Ventilation system
Air exchanger+heat recovery, 190 liters / s	1	5,3	1,19	0,31	391	0	6 980,8	Air exchanger, recycling building
Air exchanger+heat recovery, 190 liters / s	1	5,3	1,19	0,31	391	0	6 980,8	Air exchanger
Air exchanger+heat recovery, 190 liters / s	12	63,56	14,3	3,7	4 692	0	83 769,58	FTX aggregates
Drainage system, PP, room area m2	1 076	135,04	32,82	8,07	38 810,78	0	455 698,99	Dranage system
Electricity cabling, room area m2	1 076	9,94	1,03	0,88	3 375,41	0	55 537,2	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	990	12,74	0,43	1,16	2 831,4	0	50 628,83	Heating system with distribution
Elevator components (per storey)	4	17,42	1,26	1,82	3 806,09	0	44 916,09	Elevator
Locking system for doors, TS 93 EN 2-5 (Dorma)	15	1,32	0,08	0,08	267	0	4 578	Locking system
Pipesystem, hot and cold water supply, PEX, room area m2	990	195,03	132,17	15,84	33 940,67	0	359 333,32	Pipesystem, hot and cold water supply
Electricity, Sweden	5 865							Fastighetsel
Fortum Värme, s m Stockholms stad, Stockholm	55 541							Fjärrvärme
Tap water, clean	642							Tap water
	Total	4 656,05	1 162,25	265 871,39	375 984,06	0,03	5 374 050,91	

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Life-cycle assessment, EN-15978: Transportation to site

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)		500							
Electricity, Sweden		41 840							EL - produktion
Fortum Värme, s m Stockholms stad, Stockholm		45 600							Fjärrvärme - produktion
Diesel		2 300							Diesel - produktion
Tap water, clean		150							Tappvatten - produktion
Cardboard waste		750							Waste cardboard
Gypsum waste		2 750							Waste gypsum
Hazardous waste		14,5							Waste hazardous
Metal waste, average		3 700							Waste metal
Mixed waste		1 396							Waste unsorted
Plastic waste		2 200							Waste plastic
Wood waste		11 580							Wood waste
Bitumen-polymer membrane, groundings	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0	0	0	0,41	0	11,72	Synkoflex - Water bar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Concrete mixer truck, appr. 8 m3, 100% fill rate	143,3 m3	1,31	0,27	0,13	894,19	0	13 619,23	Base slab
Ready mix concrete, excluding rebar, C28/35	Concrete mixer truck, appr. 8 m3, 100% fill rate	6,2 m3	0,06	0,01	0,01	38,69	0	589,25	Base slab
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	5 246 kg	0,15	0,03	0	31,8	0	911	Reinforcement base slab
Insulation, polyethylene foam	Trailer combination, 40 ton capacity, 50% fill rate	2,39 m3	0,11	0,02	0	22,53	0	643,66	Combi Floor Mat Tuplex
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Trailer combination, 40 ton capacity, 50% fill rate	6,05 m3	0,01	0	0	2,05	0	58,69	Joist the screed
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Trailer combination, 40 ton capacity, 50% fill rate	7,25 m3	0,01	0	0	2,46	0	70,33	Edge support beam element
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Trailer combination, 40 ton capacity, 50% fill rate	64,76 m3	0,1	0,02	0	21,99	0	628,26	Base Plate
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Trailer combination, 40 ton capacity, 50% fill rate	79,5 m3	0,13	0,03	0	27	0	771,25	Expanded plastic
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	1,6	0	0	0	0,09	0	2,66	Plate for fitting of different types of concrete
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	3	0	0	0	0,17	0	4,99	Spreader pipe
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	4	0	0	0	0,23	0	6,65	Buffer blocking
Plastic, LDPE	Trailer combination, 40 ton capacity, 50% fill rate	0,12	0	0	0	0,01	0	0,2	Backing rod
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	0,12 m3	0,26	0,06	0,01	55,19	0	1 576,6	Embedded fasteners
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	1 kg	0	0	0	0,06	0	1,66	Top Ladder
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	7 kg	0	0	0	0,41	0	11,64	Metal plate fasten

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	36,8 kg	0,01	0	0	2,14	0	61,2	Bottom Ruler
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	1 481 kg	0,04	0,01	0	8,98	0	257,18	Reinforcement wire mesh, base slab
Natural rubber sealing compound	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0,04	0	1,09	Neoprene rubber
Laminated plywood, waterproof, 10.2 mm	Trailer combination, 40 ton capacity, 50% fill rate	1,03 m3	0,06	0,01	0	11,84	0	338,31	Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	Trailer combination, 40 ton capacity, 50% fill rate	17,6 kg	0	0	0	1,02	0	29,27	Binding wire
Glass wool/mineral wool insulation, roll, 100mm, 0.044 W/mK,...	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0	0	0,01	Mineral wool, yarn
Self-adhesive, fully bonded composite sheet membrane waterpr...	Trailer combination, 40 ton capacity, 50% fill rate	2,02 kg	0	0	0	0,12	0	3,35	Seld-adhesive
Mineral wool insulation, 0.036 W/mK, 3.89 Km2/W, 140 mm, 100...	Trailer combination, 40 ton capacity, 50% fill rate	0,45 m3	0	0	0	0,44	0	12,56	Facade insulation
Fibre cement board, 1550 kg/m3, Construction (Cembrit)	Trailer combination, 40 ton capacity, 50% fill rate	3,37 m3	0,83	0,18	0,02	177,4	0	5 067,47	Cement board
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Trailer combination, 40 ton capacity, 50% fill rate	2,9 m3	0,46	0,1	0,01	98,49	0	2 813,38	Cembrit Multiforce, recycling building
Adhesive, deformable, fast-setting, 1650 kg/m3 (mixture), El...	Trailer combination, 40 ton capacity, 50% fill rate	35,5 kg	0	0	0	0,52	0	14,76	Adhesive
Gypsum plasterboard, windproofing, vapour resistant sheathin...	Trailer combination, 40 ton capacity, 50% fill rate	0,99 m3	0,05	0,01	0	10,94	0	312,59	Wind protection plate, recycling building
Exterior plaster, Stolit (sto)	Trailer combination, 40 ton capacity, 50% fill rate	9 m3	0,88	0,19	0,02	186,67	0	5 332,25	Plaster
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Trailer combination, 40 ton capacity, 50% fill rate	274,38 m3	0,44	0,09	0,01	93,19	0	2 661,84	Blocks for wall, expanded plastic
Stone wool insulation, product group with density >120 kg/m...	Trailer combination, 40 ton capacity, 50% fill rate	0,07 m3	0	0	0	0,09	0	2,6	Fire sealant
Stone wool insulation, product group with density >120 kg/m...	Trailer combination, 40 ton capacity, 50% fill rate	25,7 m3	0,17	0,04	0	35,94	0	1 026,52	Fire Plate (insulation)
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	0,02	0	0	0	0	0	0,03	Cable Ties
Plastic, LDPE	Trailer combination, 40 ton capacity, 50% fill rate	6,2	0	0	0	0,36	0	10,31	Insulation nails / holders
Plastic, PVC	Trailer combination, 40 ton capacity, 50% fill rate	0,12	0	0	0	0,01	0	0,2	PVC tapes
Reinforcement mesh fabric (glass fibre), 0.16kg/m2, R131 (AD...	Trailer combination, 40 ton capacity, 50% fill rate	136	0,02	0	0	4,62	0	131,94	Reinforcement mesh fabric
Elastomer joint sealing tape, polyurethane	Trailer combination, 40 ton capacity, 50% fill rate	40	0,01	0	0	2,33	0	66,52	Expanding water bar
Sealing tapes, PE/PP foil	Trailer combination, 40 ton capacity, 50% fill rate	32,16 kg	0,01	0	0	1,87	0	53,48	Sealing tapes
Solvent-free façade sealant, 1.25 - 1.5 kg/dm3,, SikaHyflex-...	Trailer combination, 40 ton capacity, 50% fill rate	30,8 kg	0,01	0	0	1,79	0	51,22	Sealant, external
Sealing compound, acrylic	Trailer combination, 40 ton capacity, 50% fill rate	7,5 kg	0	0	0	0,44	0	12,47	Sealant, reinforcement
Silicon waterproofing compound	Trailer combination, 40 ton capacity, 50% fill rate	1,8 kg	0	0	0	0,1	0	2,99	Jointing mastic
Dried timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	3,48 m3	0,09	0,02	0	19,5	0	557,05	Nailing recycling building

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	4,48 m3	0,13	0,03	0	28,04	0	800,94	120 Stud, recycling building
Planed timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	18,5 m3	0,49	0,1	0,01	103,67	0	2 961,32	Planed timber
Wooden façade external facing, thermo tree, pine	Trailer combination, 40 ton capacity, 50% fill rate	0,5 m3	0,02	0	0	3,27	0	93,55	Facade nailing batten
Wooden façade external facing, thermo tree, pine	Trailer combination, 40 ton capacity, 50% fill rate	2,74 m3	0,08	0,02	0	17,95	0	512,64	Lying panel, recycling building
Wooden façade external facing, pine, biochemical impregnatio...	Trailer combination, 40 ton capacity, 50% fill rate	1,45 m3	0,05	0,01	0	10,31	0	294,59	Pressure-treated woos
Cement (CEM II 32,5)	Trailer combination, 40 ton capacity, 50% fill rate	125 kg	0,01	0	0	1,82	0	51,97	Cement C30/37 (stairwell)
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Trailer combination, 40 ton capacity, 100% fill rate	54,4 m3	0,46	0,1	0,01	98,93	0	2 834,07	Concrete, stairwell
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Trailer combination, 40 ton capacity, 100% fill rate	107,5 m3	0,91	0,19	0,02	195,5	0	5 600,41	Concrete, wall
Precast concrete wall elements, UPB (Dzelzbetons MB)	Trailer combination, 40 ton capacity, 50% fill rate	30,6 m3	5,02	1,07	0,11	1 068,95	0	30 534,15	precast concrete wall element
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	1 200 kg	0,03	0,01	0	7,27	0	208,39	Reinforcement, precast concrete wall
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	1 770 kg	0,05	0,01	0	10,73	0	307,37	Reinforcement, stairwell
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	3 935 kg	0,11	0,02	0	23,85	0	683,34	Reinforcement, wall
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	627 kg	0,17	0,04	0	36,51	0	1 042,75	Embedded fasteners, stairwell
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	1 111 kg	0,03	0,01	0	6,73	0	192,93	Reinforcement wire mesh, wall
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	2 362,4 kg	0,07	0,01	0	14,32	0	410,24	Reinforcement wire mesh, stairwell
Non-Alloy Structural Steel (Direct Reduced Iron production r...	Trailer combination, 40 ton capacity, 50% fill rate	80,1 kg	0,02	0	0	4,66	0	133,21	Nails and screws non-alloy
Ceramic tiles, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	2,71 m3	0,31	0,07	0,01	66,18	0	1 890,42	Ceramic tiles
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Trailer combination, 40 ton capacity, 50% fill rate	0,82 m3	0,13	0,03	0	27,97	0	799,08	Fibre cement, recycling building
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1450 k...	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0	0	0	0,12	0	3,51	Adhesive for kitchen ceramic
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	Trailer combination, 40 ton capacity, 50% fill rate	271,6 kg	0,02	0	0	3,95	0	112,92	Adhesive for ceramic tiles
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	Trailer combination, 40 ton capacity, 50% fill rate	172,5 m2	0,15	0,03	0	31,89	0	910,85	Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Sta...	Trailer combination, 40 ton capacity, 50% fill rate	2 350 m2	1,41	0,3	0,03	301,01	0	8 598,12	Plasterboard, normal
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0	0	0	0,15	0	4,27	T-molding, movement joint, Oak
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	Trailer combination, 40 ton capacity, 50% fill rate	0,07 m3	0	0	0	0,79	0	22,64	Floor [illegible] Oak

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Laminated wood beam, ash tree, 725 kg/m3, VIGAM-Fresno (Gami...	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0	0	0	0,13	0	3,78	T-molding, movement joint, ash
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	18,5 m2	0,02	0	0	4,07	0	116,15	Ceramic tile, kitchen
Plastic, HDPE	Trailer combination, 40 ton capacity, 50% fill rate	0,43	0	0	0	0,03	0	0,72	Plastic plug
Screws/fixings, galvanized	Trailer combination, 40 ton capacity, 50% fill rate	248,48 kg	0,07	0,01	0	14,47	0	413,24	Nails and screws, galvanized
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	0,06 m3	0,07	0,02	0	15,61	0	445,96	Nogging plate
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	0,22 m3	0,29	0,06	0,01	62,45	0	1 783,86	Fire resistant steel
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	154 kg	0,03	0,01	0	5,47	0	156,23	Sheet metal rail SK45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	909 kg	0,15	0,03	0	32,28	0	922,16	Sheet metal R45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	1 195 kg	0,2	0,04	0	42,44	0	1 212,3	Corner profile LP50
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	Trailer combination, 40 ton capacity, 50% fill rate	1 600 kg	0,27	0,06	0,01	56,82	0	1 623,17	Secondary stud
Sealing compound, acrylic	Trailer combination, 40 ton capacity, 50% fill rate	8,4 kg	0	0	0	0,49	0	13,97	Sealing compound
Wood board, particleboard	Trailer combination, 40 ton capacity, 50% fill rate	0,89 m3	0,04	0,01	0	8,61	0	246,07	OSB-board
Fibreboard, low density, 12 mm (Egger)	Trailer combination, 40 ton capacity, 50% fill rate	360 kg	0,02	0,01	0	5,24	0	149,68	Hard board
Plywood, spruce, uncoated	Trailer combination, 40 ton capacity, 50% fill rate	0,94 m3	0,03	0,01	0	6,27	0	179,01	Plywood, recycling building
Plywood, spruce, uncoated	Trailer combination, 40 ton capacity, 50% fill rate	7,64 m3	0,24	0,05	0,01	51,15	0	1 461,18	Plywood
Timber lining (interior), conifer	Trailer combination, 40 ton capacity, 50% fill rate	5 m3	0,13	0,03	0	28,02	0	800,36	Floor beading
Planed timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	0,99 m3	0,03	0,01	0	5,56	0	158,94	95-stud, recycling building
Planed timber, conifer	Trailer combination, 40 ton capacity, 50% fill rate	1,64 m3	0,04	0,01	0	9,18	0	262,2	70-stud, recycling building
Cement (CEM II 32,5)	Trailer combination, 40 ton capacity, 50% fill rate	750 kg	0,05	0,01	0	10,92	0	311,83	Grub-stone mortar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Concrete mixer truck, appr. 8 m3, 100% fill rate	107,5 m3	0,98	0,2	0,1	670,8	0	10 216,8	Concrete, flat concrete base
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Trailer combination, 40 ton capacity, 50% fill rate	0,77 m3	0,12	0,03	0	26,29	0	750,88	Cembrit Roof, recycling building
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	Trailer combination, 40 ton capacity, 50% fill rate	25 kg	0	0	0	0,36	0	10,39	Self levelling screed
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	3 935 kg	0,11	0,02	0	23,85	0	683,34	Reinforcement, flat concrete base
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	Trailer combination, 40 ton capacity, 50% fill rate	310 m2	0,29	0,06	0,01	60,7	0	1 733,81	Membrane roofing SEP5500
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Trailer combination, 40 ton capacity, 50% fill rate	0,58 m3	0,07	0,01	0	14,07	0	401,8	Ceramic tiles
Wood flooring, conifer	Trailer combination, 40 ton capacity, 50% fill rate	766,5 m2	1,13	0,24	0,02	240,54	0	6 870,91	Parquet

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Insulation panel, 120 mm, Thane Sarking (KNAUF)	Trailer combination, 40 ton capacity, 50% fill rate	420 m2	0,08	0,02	0	16,14	0	461,01	Underlay felt YAP
Pre-slab reinforced concrete (CERIB)	Trailer combination, 40 ton capacity, 50% fill rate	920 m2	7,87	1,68	0,17	1 673,87	0	47 813,55	Flat concrete base
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	Trailer combination, 40 ton capacity, 50% fill rate	150 m3	0,1	0,02	0	21,83	0	623,65	Roof insulation (blowing wool)
Particleboard, expanded glass, 12 mm, StoVentec (sto)	Trailer combination, 40 ton capacity, 50% fill rate	2,59 m3	0,2	0,04	0	43,01	0	1 228,68	Ventec- boards
Sealing tapes, Butyl	Trailer combination, 40 ton capacity, 50% fill rate	1 kg	0	0	0	0,06	0	1,66	butyltape
Elastomer joint sealing tape, polyurethane	Trailer combination, 40 ton capacity, 50% fill rate	0,55	0	0	0	0,03	0	0,91	Insulating tape aeroflex
Elastomer joint sealer tape, silicon rubber	Trailer combination, 40 ton capacity, 50% fill rate	23,5	0,01	0	0	1,37	0	39,08	Vinyl Tape
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	Trailer combination, 40 ton capacity, 50% fill rate	25,34 kg	0,01	0	0	1,48	0	42,14	Flooring/ tile joint
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0,6 m3	1,29	0,27	0,03	274,22	0	7 833,11	Prefabricated roofing
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	76,12 kg	0,02	0	0	4,43	0	126,59	Bracket, fink truss
Steel, stainless, cold rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	0,04 m3	0,09	0,02	0	18,56	0	530,21	Fastening plate
Steel, stainless, cold rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	415 kg	0,11	0,02	0	24,16	0	690,18	L-steel ramp
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	1 111 kg	0,03	0,01	0	6,73	0	192,93	Reinforcement wire mesh, flat concrete base
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	Trailer combination, 40 ton capacity, 50% fill rate	1 kg	0	0	0	0,01	0	0,42	Primer Weber
Fibreboard, low density, 12 mm (Egger)	Trailer combination, 40 ton capacity, 50% fill rate	80 kg	0,01	0	0	1,16	0	33,26	Protective plastic-coated cardboard
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	0,51 m3	0,02	0	0	3,2	0	91,5	Construction timber, recycling building
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	2,2 m3	0,06	0,01	0	13,77	0	393,32	Fixing stud
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Trailer combination, 40 ton capacity, 50% fill rate	6,31 m3	0,19	0,04	0	39,51	0	1 128,47	Trusses
Natural stone tiles, 10 mm (EURO-ROC)	Trailer combination, 40 ton capacity, 50% fill rate	0,03 m3	0,01	0	0	3,04	0	86,77	Window ledge
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0,06	0	1,57	Doormat frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0,01	0	0	1,57	0	44,9	Balcony rods
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0,06 m3	0,04	0,01	0	9,43	0	269,42	Doormat, aluminium
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Trailer combination, 40 ton capacity, 50% fill rate	0,07 m3	0,05	0,01	0	10,56	0	301,75	Balcony parapet
Glass, reflective, solar control, CVD coated, blue, 4 mm, LT...	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0,01	0	0	1,89	0	53,88	Toilet mirror
Glass, reflective, solar control, CVD coated, clear, 5 mm, L...	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0,01	0	0	1,23	0	35,13	Mirror to sliding door wardrobe
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Trailer combination, 40 ton capacity, 100% fill rate	293 kg	0,01	0	0	1,78	0	50,88	Reinforcement, balco

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	Trailer combination, 40 ton capacity, 50% fill rate	0,13 m3	0,01	0	0	1,24	0	35,5	Sliding Wardrobe
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	Trailer combination, 40 ton capacity, 50% fill rate	8 373,4 kg	0,57	0,12	0,01	121,88	0	3 481,41	Interior kitchen as well as closet, linen closet and broom closet
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	Trailer combination, 40 ton capacity, 50% fill rate	12	0,05	0,01	0	10,48	0	299,35	Porcelain sink
Porcelain WC kit (toilet and tank) (AFISB)	Trailer combination, 40 ton capacity, 50% fill rate	12	0,12	0,02	0	24,87	0	710,47	Porclain WC kit
Zinc plates, Naturel (NedZink)	Trailer combination, 40 ton capacity, 50% fill rate	126,6 kg	0,03	0,01	0	7,37	0	210,55	Bathroom cabinet
Plastic, LDPE	Trailer combination, 40 ton capacity, 50% fill rate	0,18	0	0	0	0,01	0	0,3	Clothing shelf, hook
Plastic, PET	Trailer combination, 40 ton capacity, 50% fill rate	0,18	0	0	0	0,01	0	0,3	Mirror clamp
Plastic profile, EPDM	Trailer combination, 40 ton capacity, 50% fill rate	12,5 kg	0	0	0	0,73	0	20,79	Radon sealing around pipes
Screws/fixings, galvanized	Trailer combination, 40 ton capacity, 50% fill rate	26,68 kg	0,01	0	0	1,55	0	44,37	Hinge
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0,04	0	1,12	Clothing shelf, net of wire
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	0 m3	0	0	0	0,58	0	16,6	Clothing shelf, wardrobe rod
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	2,4 kg	0	0	0	0,14	0	3,99	Shower
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	3,96 kg	0	0	0	0,23	0	6,59	Hooks, wet area
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	3,96 kg	0	0	0	0,23	0	6,59	Toilet paper holder
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	6 kg	0	0	0	0,35	0	9,98	Magazine rack
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	6,36 kg	0	0	0	0,37	0	10,58	Kitchen faucet
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	24,54 kg	0,01	0	0	1,43	0	40,81	Shower mixer
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	35 kg	0,01	0	0	2,04	0	58,21	Postbox
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	180 kg	0,05	0,01	0	10,48	0	299,35	Sink
Steel, stainless, hot rolled (Outokumpu)	Trailer combination, 40 ton capacity, 50% fill rate	274 kg	0,07	0,02	0	15,95	0	455,68	Embedded fasteners, balcony
Steel, color coated (EAPP)	Trailer combination, 40 ton capacity, 50% fill rate	10,08 kg	0	0	0	0,59	0	16,76	Wardrobe rod
Steel, color coated (EAPP)	Trailer combination, 40 ton capacity, 50% fill rate	41,58 kg	0,01	0	0	2,42	0	69,15	consoles shelf
Steel, color coated (EAPP)	Trailer combination, 40 ton capacity, 50% fill rate	100,56 kg	0,03	0,01	0	5,85	0	167,24	Wire basket
Steel, color coated (EAPP)	Trailer combination, 40 ton capacity, 50% fill rate	209,88 kg	0,06	0,01	0	12,22	0	349,05	shelfs
Steel, color coated (EAPP)	Trailer combination, 40 ton capacity, 50% fill rate	311,66 kg	0,09	0,02	0	18,15	0	518,32	Wire basket
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	Trailer combination, 40 ton capacity, 100% fill rate	384 kg	0,01	0	0	2,33	0	66,68	Reinforcement wire m balcon

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Natural rubber sealing compound	Trailer combination, 40 ton capacity, 50% fill rate	0,14 m3	0,04	0,01	0	7,52	0	214,9	Doormat, rubber
Laminated plywood, waterproof, 10.2 mm	Trailer combination, 40 ton capacity, 50% fill rate	0,14 m3	0,01	0	0	1,64	0	46,98	Countertop
Laminated plywood, waterproof, 10.2 mm	Trailer combination, 40 ton capacity, 50% fill rate	0,61 m3	0,03	0,01	0	7,07	0	202	Laminadet playwood
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	Trailer combination, 40 ton capacity, 50% fill rate	0,01 m3	0	0	0	0,08	0	2,23	Clothing shelf
Brass building components	Trailer combination, 40 ton capacity, 50% fill rate	8,16 kg	0	0	0	0,48	0	13,57	Handle Assa 1956 Epok
Balcony glass door, wood-alu frame, U-value 0.84	Trailer combination, 40 ton capacity, 50% fill rate	2,44	0,01	0	0	2,36	0	67,35	Inward main entrance door property
Balcony glass door, wood-alu frame, U-value 0.84	Trailer combination, 40 ton capacity, 50% fill rate	6,15	0,03	0,01	0	5,95	0	169,9	Outward opening door
Balcony glass door, wood-alu frame, U-value 0.84	Trailer combination, 40 ton capacity, 50% fill rate	18,46	0,08	0,02	0	17,84	0	509,7	Outgoing balcony (2-4)
Door glass/steel, 1.23x2.18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	2,44	0,01	0	0	2,58	0	73,76	Inward opening door, property
Door glass/steel, 1.23x2.18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	12,37	0,06	0,01	0	13,09	0	374,02	Outward opening entrance (3)
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	Trailer combination, 40 ton capacity, 50% fill rate	15,67	0,06	0,01	0	13,46	0	384,5	Inwards windows, 986x1445
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	Trailer combination, 40 ton capacity, 50% fill rate	72,26	0,29	0,06	0,01	62,07	0	1 772,88	Inwards windows, 986x1745
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	314,96 kg	0,09	0,02	0	18,34	0	523,8	Mounting plate
Steel, hot-dip zinc coating	Trailer combination, 40 ton capacity, 50% fill rate	33,41 kg	0,01	0	0	1,94	0	55,56	Handle
Door, steel, 1,23 x2,18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	0,39	0,01	0	0	1,34	0	38,26	Combination hatch, stairwell
Door, steel, 1,23 x2,18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	0,77	0,01	0	0	2,63	0	75,03	Outward opening entrance door, wheelchair room
Door, steel, 1,23 x2,18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	0,78	0,01	0	0	2,68	0	76,52	Roof hatch
Door, steel, 1,23 x2,18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	4,17	0,07	0,01	0	14,28	0	407,9	Outward opening entrance door, (2-4)
Door, steel, 1,23 x2,18 m (Novoferm)	Trailer combination, 40 ton capacity, 50% fill rate	4,61	0,07	0,02	0	15,76	0	450,2	Outward opening entrance door
Wooden inner door, painted	Trailer combination, 40 ton capacity, 50% fill rate	96,39	0,34	0,07	0,01	72,68	0	2 075,94	interior doors
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	Trailer combination, 40 ton capacity, 50% fill rate	0,35 m3	0,02	0	0	3,5	0	100,01	Frame interior doors
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	Trailer combination, 40 ton capacity, 50% fill rate	1 000 m2	0,03	0,01	0	6,06	0	173,17	Paint to plaster
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Trailer combination, 40 ton capacity, 50% fill rate	235 m2	0,01	0	0	1,61	0	46,08	Paint balcony / stair railings
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Trailer combination, 40 ton capacity, 50% fill rate	2 400 m2	0,08	0,02	0	16,47	0	470,59	Paint for concrete
Skylight, smoke lift, F100 (Lamilux)	Trailer combination, 40 ton capacity, 50% fill rate	1	0	0	0	0,98	0	28,04	Skylight, smoke lift
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	10,35 m2	0,01	0	0	2,37	0	67,56	Drip p

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Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	14,69 m2	0,02	0	0	3,36	0	95,86	Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	18,91 m2	0,02	0	0	4,32	0	123,44	Window sill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	27,18 m2	0,03	0,01	0	6,21	0	177,42	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	27,74 kg	0,01	0	0	1,62	0	46,13	Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	29,8 m2	0,03	0,01	0	6,81	0	194,52	Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Trailer combination, 40 ton capacity, 50% fill rate	81,25 kg	0,02	0	0	4,73	0	135,13	Roof hood
Ventilation system with steel pipes, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	1 076	1,13	0,24	0,02	240,19	0	6 860,84	Ventilation system
Air exchanger+heat recovery, 190 liters / s	Trailer combination, 40 ton capacity, 50% fill rate	1	0,03	0,01	0	6,33	0	180,78	Air exchanger, recycling building
Air exchanger+heat recovery, 190 liters / s	Trailer combination, 40 ton capacity, 50% fill rate	1	0,03	0,01	0	6,33	0	180,78	Air exchanger
Air exchanger+heat recovery, 190 liters / s	Trailer combination, 40 ton capacity, 50% fill rate	12	0,36	0,08	0,01	75,94	0	2 169,32	FTX aggregates
Drainage system, PP, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	1 076	3,88	0,83	0,08	826,13	0	23 597,97	Dranage system
Electricity cabling, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	1 076	0,67	0,14	0,01	141,58	0	4 044,21	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	Trailer combination, 40 ton capacity, 50% fill rate	990	0,75	0,16	0,02	158,51	0	4 527,74	Heating system with distribution
Elevator components (per storey)	Trailer combination, 40 ton capacity, 50% fill rate	4	0,36	0,08	0,01	76,85	0	2 195,27	Elevator
Locking system for doors, TS 93 EN 2-5 (Dorma)	Trailer combination, 40 ton capacity, 50% fill rate	15	0,01	0	0	1,63	0	46,67	Locking system
Pipesystem, hot and cold water supply, PEX, room area m2	Trailer combination, 40 ton capacity, 50% fill rate	990	2,8	0,6	0,06	595,99	0	17 024,28	Pipesystem, hot and cold water supply
Electricity, Sweden		5 865							Fastighetsel
Fortum Värme, s m Stockholms stad, Stockholm		55 541							Fjärrvärme
Tap water, clean		642							Tap water
		Total	42,18	8,97	1,08	10 082,55	0	266 656,34	

Life-cycle assessment, EN-15978: Construction/installation process

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)	500	54,88	33,26	1,86	15 171,74	0	283 411,24	
Electricity, Sweden	41 840	13,97	4,7	0,22	1 748,44	0	376 682,07	EL - produktion
Fortum Värme, s m Stockholms stad, Stockholm	45 600	44,75	14,73	0,69	6 347,6	0	246 267,93	Fjärrvärme - produktion
Diesel	2 300	10,92	2,23	1,12	7 452	0	113 735	Diesel - produktion
Tap water, clean	150	0,24	0,12	0,01	45	0	951,37	Tappvatten - produktion
Cardboard waste	750	0,02	0	0	5,81	0	165,25	Waste cardboard
Gypsum waste	2 750	0,14	0,03	0	19,62	0	546,48	Waste gypsum
Hazardous waste	14,5	0,07	0,04	0,02	36,39	0	163,56	Waste hazardous
Metal waste, average	3 700	0,11	0,02	0	28,68	0	815,22	Waste metal
Mixed waste	1 396	0,2	3,64	0,06	510,94	0	787,2	Waste unsorted
Plastic waste	2 200	8,8	0,62	0,02	5 236	0	1 019,26	Waste plastic
Wood waste	11 580	2,55	3,36	0,03	104,68	0	1 210,69	Wood waste
Bitumen-polymer membrane, groundings	0,01 m3							Synkoflex - Water bar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	143,3 m3							Base slab
Ready mix concrete, excluding rebar, C28/35	6,2 m3							Base slab
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	5 246 kg							Reinforcement base slab
Insulation, polyethylene foam	2,39 m3							Combi Floor Mat Tuplex
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	6,05 m3							Joist the screed
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	7,25 m3							Edge support beam element
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	64,76 m3							Base Plate
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	79,5 m3							Expanded plastic
Plastic, HDPE	1,6							Plate for fitting of different types of concrete
Plastic, HDPE	3							Spreader pipe
Plastic, HDPE	4							Buffer blocking
Plastic, LDPE	0,12							Backing rod
Steel, stainless, hot rolled (Outokumpu)	0,12 m3							Embedded fasteners
Steel, stainless, hot rolled (Outokumpu)	1 kg							Top Ladder
Steel, stainless, hot rolled (Outokumpu)	7 kg							Metal plate fastener
Steel, stainless, hot rolled (Outokumpu)	36,8 kg							Bottom Ruler
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	1 481 kg							Reinforcement wire mesh, base slab
Natural rubber sealing compound	0 m3							Neoprene rubber
Laminated plywood, waterproof, 10.2 mm	1,03 m3							Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	17,6 kg							Binding wire

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Life-cycle assessment, EN-15978: Maintenance and material replacement

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)	500							
Electricity, Sweden	41 840							EL - produktion
Fortum Värme, s m Stockholms stad, Stockholm	45 600							Fjärrvärme - produktion
Diesel	2 300							Diesel - produktion
Tap water, clean	150							Tappvatten - produktion
Cardboard waste	750							Waste cardboard
Gypsum waste	2 750							Waste gypsum
Hazardous waste	14,5							Waste hazardous
Metal waste, average	3 700							Waste metal
Mixed waste	1 396							Waste unsorted
Plastic waste	2 200							Waste plastic
Wood waste	11 580							Wood waste
Bitumen-polymer membrane, groundings	0,01 m3							Synkoflex - Water bar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	143,3 m3							Base slab
Ready mix concrete, excluding rebar, C28/35	6,2 m3							Base slab
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	5 246 kg							Reinforcement base slab
Insulation, polyethylene foam	2,39 m3							Combi Floor Mat Tuplex
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	6,05 m3							Joist the screed
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	7,25 m3							Edge support beam element
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	64,76 m3							Base Plate
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	79,5 m3							Expanded plastic
Plastic, HDPE	1,6							Plate for fitting of different types of concrete
Plastic, HDPE	3							Spreader pipe
Plastic, HDPE	4							Buffer blocking
Plastic, LDPE	0,12							Backing rod
Steel, stainless, hot rolled (Outokumpu)	0,12 m3							Embedded fasteners
Steel, stainless, hot rolled (Outokumpu)	1 kg							Top Ladder
Steel, stainless, hot rolled (Outokumpu)	7 kg							Metal plate fastener
Steel, stainless, hot rolled (Outokumpu)	36,8 kg							Bottom Ruler
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	1 481 kg							Reinforcement wire mesh, base slab
Natural rubber sealing compound	0 m3							Neoprene rubber
Laminated plywood, waterproof, 10.2 mm	1,03 m3							Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	17,6 kg							Binding wire

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Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Glass wool/mineral wool insulation, roll, 100mm, 0.044 W/mK,...	0 m3							Mineral wool, yarn
Self-adhesive, fully bonded composite sheet membrane waterpr...	2,02 kg							Seld-adhesive
Mineral wool insulation, 0.036 W/mK, 3.89 Km2/W, 140 mm, 100...	0,45 m3	0,03	0,03	0,57	90,86	0	1 267,86	Facade insulation
Fibre cement board, 1550 kg/m3, Construction (Cembrit)	3,37 m3	8,04	1,2	0,96	3 416,17	0	55 891,45	Cement board
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	2,9 m3	3,83	0,63	0,39	1 687,8	0	30 914	Cembrit Multiforce, recycling building
Adhesive, deformable, fast-setting, 1650 kg/m3 (mixture), El...	35,5 kg							Adhesive
Gypsum plasterboard, windproofing, vapour resistant sheathin...	0,99 m3							Wind protection plate, recycling building
Exterior plaster, Stolit (sto)	9 m3							Plaster
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	274,38 m3							Blocks for wall, expanded plastic
Stone wool insulation, product group with density >120 kg/m...	0,07 m3	0,05	0	0,01	11,33	0	128,67	Fire sealant
Stone wool insulation, product group with density >120 kg/m...	25,7 m3	19,7	1,96	2,57	4 481,03	0	50 872,82	Fire Plate (insulation)
Plastic, HDPE	0,02							Cable Ties
Plastic, LDPE	6,2							Insulation nails / holders
Plastic, PVC	0,12	0	0	0	0,23	0	7,13	PVC tapes
Reinforcement mesh fabric (glass fibre), 0.16kg/m2, R131 (AD...	136							Reinforcement mesh fabric
Elastomer joint sealing tape, polyurethane	40	0,91	0,18	0,17	489,3	0	7 827,06	Expanding water bar
Sealing tapes, PE/PP foil	32,16 kg	0,14	0,01	0,03	81,24	0	1 178,31	Sealing tapes
Solvent-free façade sealant, 1.25 - 1.5 kg/dm3,, SikaHyflex-...	30,8 kg	0,66	0,62	3,52	1 148,22	0	17 883,71	Sealant, external
Sealing compound, acrylic	7,5 kg							Sealant, reinforcement
Silicon waterproofing compound	1,8 kg							Jointing mastic
Dried timber, conifer	3,48 m3							Nailing batten, recycling building
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	4,48 m3							120 Stud, recycling building
Planed timber, conifer	18,5 m3							Planed timber
Wooden façade external facing, thermo tree, pine	0,5 m3							Facade nailing batten
Wooden façade external facing, thermo tree, pine	2,74 m3							Lying panel, recycling building
Wooden façade external facing, pine, biochemical impregnatio...	1,45 m3							Pressure-treated woos
Cement (CEM II 32,5)	125 kg							Cement C30/37 (stairwell)
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	54,4 m3							Concrete, stairwell
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	107,5 m3							Concrete, wall
Precast concrete wall elements, UPB (Dzelzbetons MB)	30,6 m3							precast concrete wall element

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	1 200 kg							Reinforcement, precast concrete wall
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	1 770 kg							Reinforcement, stairwell
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	3 935 kg							Reinforcement, wall
Steel, stainless, hot rolled (Outokumpu)	627 kg							Embedded fasteners, stairwell
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	1 111 kg							Reinforcement wire mesh, wall
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	2 362,4 kg							Reinforcement wire mesh, stairwell
Non-Alloy Structural Steel (Direct Reduced Iron production r...	80,1 kg							Nails and screws non-alloy
Ceramic tiles, 15.1 kg/m2 (IKFP)	2,71 m3	6,06	0,58	0,48	2 920,78	0	52 712,38	Ceramic tiles
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	0,82 m3	1,09	0,18	0,11	479,38	0	8 780,43	Fibre cement, recycling building
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1450 k...	0,01 m3							Adhesive for kitchen ceramic
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	271,6 kg							Adhesive for ceramic tiles
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	172,5 m2							Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Sta...	2 350 m2							Plasterboard, normal
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	0,01 m3							T-molding, movement joint, Oak
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	0,07 m3							Floor beading Oak
Laminated wood beam, ash tree, 725 kg/m3, VIGAM-Fresno (Gami...	0,01 m3							T-molding, movement joint, ash
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	18,5 m2	0,37	0,04	0,03	179,45	0	3 238,6	Ceramic tile, kitchen
Plastic, HDPE	0,43							Plastic plug
Screws/fixings, galvanized	248,48 kg							Nails and screws, galvanized
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	0,06 m3							Nogging plate
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	0,22 m3							Fire resistant steel
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	154 kg							Sheet metal rail SK45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	909 kg							Sheet metal R45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	1 195 kg							Corner profile LP50
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	1 600 kg							Secondary stud
Sealing compound, acrylic	8,4 kg	0,23	0,01	0,02	48,06	0	824,22	Sealing compound
Wood board, particleboard	0,89 m3							OSB-board
Fibreboard, low density, 12 mm (Egger)	360 kg							Hard board

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Plywood, spruce, uncoated	0,94 m3							Plywood, recycling building
Plywood, spruce, uncoated	7,64 m3							Plywood
Timber lining (interior), conifer	5 m3							Floor beading
Planed timber, conifer	0,99 m3							95-stud, recycling building
Planed timber, conifer	1,64 m3							70-stud, recycling building
Cement (CEM II 32,5)	750 kg							Grub-stone mortar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	107,5 m3							Concrete, flat concrete base
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	0,77 m3	1,02	0,17	0,1	450,47	0	8 250,84	Cembrit Roof, recycling building
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	25 kg							Self levelling screed
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	3 935 kg							Reinforcement, flat concrete base
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	310 m2	0,19	2,73	265 670	536,3	0	21 024,2	Membrane roofing SEP5500
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	0,58 m3	1,29	0,12	0,1	620,8	0	11 203,81	Ceramic tiles
Wood flooring, conifer	766,5 m2	4,4	0,96	0,28	568,74	0	41 121,19	Parquet
Insulation panel, 120 mm, Thane Sarking (KNAUF)	420 m2	47,88	7,01	3,58	7 686	0	201 768	Underlay felt YAP
Pre-slab reinforced concrete (CERIB)	920 m2							Flat concrete base
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	150 m3							Roof insulation (blowing wool)
Particleboard, expanded glass, 12 mm, StoVentec (sto)	2,59 m3	4,53	0,68	0,51	2 123,8	0	33 821,08	Ventec- boards
Sealing tapes, Butyl	1 kg	0,02	0	0	11,65	0	167,53	butyltape
Elastomer joint sealing tape, polyurethane	0,55	0,01	0	0	6,68	0	106,84	Insulating tape aeroflex
Elastomer joint sealer tape, silicon rubber	23,5	0,97	0,12	0,09	352,35	0	6 198,59	Vinyl Tape
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	25,34 kg	2,9	0,54	0,51	944,68	0	14 713,42	Flooring/ tile joint
Steel, hot-dip zinc coating	0,6 m3							Prefabricated roofing
Steel, hot-dip zinc coating	76,12 kg							Bracket, fink truss
Steel, stainless, cold rolled (Outokumpu)	0,04 m3							Fastening plate
Steel, stainless, cold rolled (Outokumpu)	415 kg							L-steel ramp
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	1 111 kg							Reinforcement wire mesh, flat concrete base
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	1 kg							Primer Weber
Fibreboard, low density, 12 mm (Egger)	80 kg							Protective plastic-coated cardboard
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	0,51 m3							Construction timber, recycling building
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	2,2 m3							Fixing stud

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	6,31 m3							Trusses
Natural stone tiles, 10 mm (EURO-ROC)	0,03 m3							Window ledge
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0 m3							Doormat frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,01 m3							Balcony rods
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,06 m3							Doormat, aluminium
Aluminium, blank sheet, 2700 kg/m3 (GAA)	0,07 m3							Balcony parapet
Glass, reflective, solar control, CVD coated, blue, 4 mm, LT...	0,01 m3							Toilet mirror
Glass, reflective, solar control, CVD coated, clear, 5 mm, L...	0,01 m3							Mirror to sliding door wardrobe
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	293 kg							Reinforcement, balcony
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	0,13 m3							Sliding Wardrobe
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	8 373,4 kg							Interior kitchen as well as closet, linen closet and broom closet
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	12	6,55	1,13	0,44	1 927,2	0	34 267,2	Porcelain sink
Porcelain WC kit (toilet and tank) (AFISB)	12	13,78	2,05	0,84	2 080,8	0	34 711,2	Porclain WC kit
Zinc plates, Naturel (NedZink)	126,6 kg							Bathroom cabinet
Plastic, LDPE	0,18							Clothing shelf, hook
Plastic, PET	0,18							Mirror clamp
Plastic profile, EPDM	12,5 kg	0,08	0,01	0,01	54,28	0	988,93	Radon sealing around pipes
Screws/fixings, galvanized	26,68 kg	0,3	0,03	0,04	95,83	0	1 229,65	Hinge
Steel, hot-dip zinc coating	0 m3							Clothing shelf, net of wire
Steel, hot-dip zinc coating	0 m3							Clothing shelf, wardrobe rod
Steel, hot-dip zinc coating	2,4 kg							Shower
Steel, hot-dip zinc coating	3,96 kg							Hooks, wet area
Steel, hot-dip zinc coating	3,96 kg							Toilet paper holder
Steel, hot-dip zinc coating	6 kg							Magazine rack
Steel, hot-dip zinc coating	6,36 kg							Kitchen faucet
Steel, hot-dip zinc coating	24,54 kg							Shower mixer
Steel, hot-dip zinc coating	35 kg							Postbox
Steel, hot-dip zinc coating	180 kg							Sink
Steel, stainless, hot rolled (Outokumpu)	274 kg							Embedded fasteners, balcony
Steel, color coated (EAPP)	10,08 kg							Wardrobe rod
Steel, color coated (EAPP)	41,58 kg							consoles shelf
Steel, color coated (EAPP)	100,56 kg							Wire basket

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel, color coated (EAPP)	209,88 kg							shelfs
Steel, color coated (EAPP)	311,66 kg							Wire basket
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	384 kg							Reinforcement wire mesh, balcony
Natural rubber sealing compound	0,14 m3	1,52	0,19	0,33	1 036,48	0	18 323,6	Doormat, rubber
Laminated plywood, waterproof, 10.2 mm	0,14 m3	1,81	0,35	0,21	83,28	0	11 692,72	Countertop
Laminated plywood, waterproof, 10.2 mm	0,61 m3	3,89	0,75	0,46	179,03	0	25 136,41	Laminadet playwood
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	0,01 m3	0,07	0,01	0	1,61	0	109,52	Clothing shelf
Brass building components	8,16 kg	0,07	0	0	11,87	0	216,47	Handle Assa 1956 Epok
Balcony glass door, wood-alu frame, U-value 0.84	2,44							Inward main entrance door property
Balcony glass door, wood-alu frame, U-value 0.84	6,15							Outward opening door
Balcony glass door, wood-alu frame, U-value 0.84	18,46							Outgoing balcony (2-4)
Door glass/steel, 1.23x2.18 m (Novoferm)	2,44							Inward opening door, property
Door glass/steel, 1.23x2.18 m (Novoferm)	12,37							Outward opening entrance (3)
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	15,67	6,72	1,89	0,32	889,35	0	25 053,74	Inwards windows, 986x1445
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	72,26	30,96	8,73	1,5	4 100,67	0	115 519,86	Inwards windows, 986x1745
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	314,96 kg							Mounting plate
Steel, hot-dip zinc coating	33,41 kg							Handle
Door, steel, 1,23 x2,18 m (Novoferm)	0,39							Combination hatch, stairwell
Door, steel, 1,23 x2,18 m (Novoferm)	0,77							Outward opening entrance door, wheelchair room
Door, steel, 1,23 x2,18 m (Novoferm)	0,78							Roof hatch
Door, steel, 1,23 x2,18 m (Novoferm)	4,17							Outward opening entrance door, (2-4)
Door, steel, 1,23 x2,18 m (Novoferm)	4,61							Outward opening entrance door
Wooden inner door, painted	96,39	14,32	1,15	7,15	3 421,4	0	69 010,03	interior doors
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	0,35 m3	3,25	0,25	0	72,26	0	4 902,04	Frame interior doors
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	1 000 m2	7,21	3,06	1,19	1 520,9	0	22 934,71	Paint to plaster
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	235 m2	2,31	1,51	0,41	466,59	0	6 609,98	Paint balcony / stair railings
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	2 400 m2	23,59	15,41	4,17	4 765,14	0	67 506,17	Paint for concrete
Skylight, smoke lift, F100 (Lamilux)	1	0,72	0,08	0,12	134	0	6 192	Skylight, smoke lift
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	10,35 m2							Drip plate

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	14,69 m2							Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	18,91 m2							Window sill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,18 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,74 kg							Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	29,8 m2							Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	81,25 kg							Roof hood
Ventilation system with steel pipes, room area m2	1 076	38,57	1,85	3,63	8 930,8	0	148 703,16	Ventilation system
Air exchanger+heat recovery, 190 liters / s	1	10,59	2,38	0,62	782	0	13 961,6	Air exchanger, recycling building
Air exchanger+heat recovery, 190 liters / s	1	10,59	2,38	0,62	782	0	13 961,6	Air exchanger
Air exchanger+heat recovery, 190 liters / s	12	127,13	28,59	7,4	9 384	0	167 539,16	FTX aggregates
Drainage system, PP, room area m2	1 076	135,04	32,82	8,07	38 810,78	0	455 698,99	Dranage system
Electricity cabling, room area m2	1 076	9,94	1,03	0,88	3 375,41	0	55 537,2	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	990	12,74	0,43	1,16	2 831,4	0	50 628,83	Heating system with distribution
Elevator components (per storey)	4	17,42	1,26	1,82	3 806,09	0	44 916,09	Elevator
Locking system for doors, TS 93 EN 2-5 (Dorma)	15	1,32	0,08	0,08	267	0	4 578	Locking system
Pipesystem, hot and cold water supply, PEX, room area m2	990	195,03	132,17	15,84	33 940,67	0	359 333,32	Pipesystem, hot and cold water supply
Electricity, Sweden	5 865							Fastighetsel
Fortum Värme, s m Stockholms stad, Stockholm	55 541							Fjärrvärme
Tap water, clean	642							Tap water
	Total	779,85	257,38	265 741,33	152 086,16	0,01	2 329 164,32	

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	10,35 m2							Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	14,69 m2							Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	18,91 m2							Window sill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,18 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,74 kg							Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	29,8 m2							Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	81,25 kg							Roof hood
Ventilation system with steel pipes, room area m2	1 076							Ventilation system
Air exchanger+heat recovery, 190 liters / s	1							Air exchanger, recycling building
Air exchanger+heat recovery, 190 liters / s	1							Air exchanger
Air exchanger+heat recovery, 190 liters / s	12							FTX aggregates
Drainage system, PP, room area m2	1 076							Dranage system
Electricity cabling, room area m2	1 076							Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	990							Heating system with distribution
Elevator components (per storey)	4							Elevator
Locking system for doors, TS 93 EN 2-5 (Dorma)	15							Locking system
Pipesystem, hot and cold water supply, PEX, room area m2	990							Pipesystem, hot and cold water supply
Electricity, Sweden	5 865	117,48	39,52	1,83	14 705,48	0,02	3 168 126,69	Fastighetsel
Fortum Värme, s m Stockholms stad, Stockholm	55 541	3 270,41	1 076,75	50,75	463 884,25	0,22	17 997 325,34	Fjärrvärme
Tap water, clean	642							Tap water
	Total	3 387,89	1 116,27	52,58	478 589,73	0,24	21 165 452,03	

Resource	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,18 m2							Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	27,74 kg							Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	29,8 m2							Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	81,25 kg							Roof hood
Ventilation system with steel pipes, room area m2	1 076							Ventilation system
Air exchanger+heat recovery, 190 liters / s	1							Air exchanger, recycling building
Air exchanger+heat recovery, 190 liters / s	1							Air exchanger
Air exchanger+heat recovery, 190 liters / s	12							FTX aggregates
Drainage system, PP, room area m2	1 076							Dranage system
Electricity cabling, room area m2	1 076							Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	990							Heating system with distribution
Elevator components (per storey)	4							Elevator
Locking system for doors, TS 93 EN 2-5 (Dorma)	15							Locking system
Pipesystem, hot and cold water supply, PEX, room area m2	990							Pipesystem, hot and cold water supply
Electricity, Sweden	5 865							Fastighetsel
Fortum Värme, s m Stockholms stad, Stockholm	55 541							Fjärrvärme
Tap water, clean	642	62,57	31,66	2,82	11 556	0	244 312,44	Tap water
	Total	62,57	31,66	2,82	11 556	0	244 312,44	

Life-cycle assessment, EN-15978: Deconstruction

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Average site impacts - temperate climate (North)		500							
Electricity, Sweden		41 840							EL - produktion
Fortum Värme, s m Stockholms stad, Stockholm		45 600							Fjärrvärme - produktion
Diesel		2 300							Diesel - produktion
Tap water, clean		150							Tappvatten - produktion
Cardboard waste		750							Waste cardboard
Gypsum waste		2 750							Waste gypsum
Hazardous waste		14,5							Waste hazardous
Metal waste, average		3 700							Waste metal
Mixed waste		1 396							Waste unsorted
Plastic waste		2 200							Waste plastic
Wood waste		11 580							Wood waste
Bitumen-polymer membrane, groundings	Bitumen waste	0,01 m3	0	0	0	16,49	0	4,28	Synkoflex - Water bar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Preparation of construction waste	143,3 m3	6,63	1,65	0,94	938,26	0	19 517,99	Base slab
Ready mix concrete, excluding rebar, C28/35	Preparation of construction waste	6,2 m3	0,29	0,07	0,04	40,59	0	844,46	Base slab
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	5 246 kg	0,1	0,03	0,01	14,31	0	297,72	Reinforcement base slab
Insulation, polyethylene foam	Disposal of inert material (e.g. Glass) C4	2,39 m3	0,19	0,03	0,02	31,44	0	469,05	Combi Floor Mat Tuplex
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Plastic waste	6,05 m3	0,85	0,06	0	503,96	0	98,1	Joist the screed
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Plastic waste	7,25 m3	1,02	0,07	0	603,92	0	117,56	Edge support beam element
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Plastic waste	64,76 m3	9,07	0,63	0,02	5 394,51	0	1 050,12	Base Plate
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Plastic waste	79,5 m3	11,13	0,78	0,02	6 622,35	0	1 289,13	Expanded plastic
Plastic, HDPE	Plastic waste	1,6	0,01	0	0	3,81	0	0,74	Plate for fitting of different types of concrete
Plastic, HDPE	Plastic waste	3	0,01	0	0	7,14	0	1,39	Spreader pipe
Plastic, HDPE	Plastic waste	4	0,02	0	0	9,52	0	1,85	Buffer blocking
Plastic, LDPE	Plastic waste	0,12	0	0	0	0,29	0	0,06	Backing rod
Steel, stainless, hot rolled (Outokumpu)	Steel waste	0,12 m3	0,03	0,01	0	7,35	0	208,87	Embedded fasteners
Steel, stainless, hot rolled (Outokumpu)	Steel waste	1 kg	0	0	0	0,01	0	0,22	Top Ladder
Steel, stainless, hot rolled (Outokumpu)	Steel waste	7 kg	0	0	0	0,05	0	1,54	Metal plate fastener
Steel, stainless, hot rolled (Outokumpu)	Steel waste	36,8 kg	0	0	0	0,29	0	8,11	Bottom Ruler
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	1 481 kg	0,01	0	0	1,19	0	17,83	Reinfor[illegible] wire m[illegible]e slab

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Natural rubber sealing compound	Disposal of inert material (e.g. Glass) C4	0 m3	0	0	0	0,01	0	0,13	Neoprene rubber
Laminated plywood, waterproof, 10.2 mm	Wood waste	1,03 m3	0,18	0,24	0	7,36	0	85,07	Concrete mould
Zinc wire, 7200 kg/m3, Blank Zink (VM Zinc)	Metal waste, average	17,6 kg	0	0	0	0,14	0	3,88	Binding wire
Glass wool/mineral wool insulation, roll, 100mm, 0.044 W/mK,...	Disposal of inert material (e.g. Glass) C4	0 m3	0	0	0	0	0	0,01	Mineral wool, yarn
Self-adhesive, fully bonded composite sheet membrane waterpr...	Incineration of plastic (including benefits) C4	2,02 kg	0	0	0	5,09	0	2,7	Seld-adhesive
Mineral wool insulation, 0.036 W/mK, 3.89 Km2/W, 140 mm, 100...	Disposal of inert material (e.g. Glass) C4	0,45 m3	0	0	0	0,61	0	9,15	Facade insulation
Fibre cement board, 1550 kg/m3, Construction (Cembrit)	Disposal of inert material (e.g. Glass) C4	3,37 m3	0,44	0,06	0,04	70,71	0	1 055,08	Cement board
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Disposal of inert material (e.g. Glass) C4	2,9 m3	0,24	0,04	0,02	39,26	0	585,76	Cembrit Multiforce, recycling building
Adhesive, deformable, fast-setting, 1650 kg/m3 (mixture), El...	Preparation of construction waste	35,5 kg	0	0	0	0,1	0	2,01	Adhesive
Gypsum plasterboard, windproofing, vapour resistant sheathin...	Preparation of construction waste	0,99 m3	0,01	0	0	2,05	0	42,67	Wind protection plate, recycling building
Exterior plaster, Stolit (sto)	Construction waste to landfill	9 m3	1,07	0,53	0,15	558,82	0	4 147,8	Plaster
Insulation, XPS, 35 kg/m3 (Finnfoam (Finland))	Plastic waste	274,38 m3	38,41	2,69	0,09	22 855,85	0	4 449,21	Blocks for wall, expanded plastic
Stone wool insulation, product group with density >120 kg/m...	Disposal of inert material (e.g. Glass) C4	0,07 m3	0	0	0	0,13	0	1,89	Fire sealant
Stone wool insulation, product group with density >120 kg/m...	Disposal of inert material (e.g. Glass) C4	25,7 m3	0,31	0,04	0,03	50,13	0	748,05	Fire Plate (insulation)
Plastic, HDPE	Plastic waste	0,02	0	0	0	0,05	0	0,01	Cable Ties
Plastic, LDPE	Plastic waste	6,2	0,02	0	0	14,76	0	2,87	Insulation nails / holders
Plastic, PVC	Plastic waste	0,12	0	0	0	0,29	0	0,06	PVC tapes
Reinforcement mesh fabric (glass fibre), 0.16kg/m2, R131 (AD...	Plastic waste	136	0,54	0,04	0	323,68	0	63,01	Reinforcement mesh fabric
Elastomer joint sealing tape, polyurethane	Disposal of inert material (e.g. Glass) C4	40	0	0	0	0,54	0	8,08	Expanding water bar
Sealing tapes, PE/PP foil	Incineration of plastic (including benefits) C4	32,16 kg	0,02	0	0	81,22	0	43,07	Sealing tapes
Solvent-free façade sealant, 1.25 - 1.5 kg/dm3,, SikaHyflex-...	Disposal of inert material (e.g. Glass) C4	30,8 kg	0	0	0	0,42	0	6,22	Sealant, external
Sealing compound, acrylic	Disposal of inert material (e.g. Glass) C4	7,5 kg	0	0	0	0,1	0	1,51	Sealant, reinforcement
Silicon waterproofing compound	Disposal of inert material (e.g. Glass) C4	1,8 kg	0	0	0	0,02	0	0,36	Jointing mastic
Dried timber, conifer	Wood waste	3,48 m3	0,29	0,39	0	12,11	0	140,08	Nailing batten, recycling building
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	4,48 m3	0,34	0,07	0,03	241,8	0	852,69	120 Stud, recycling building
Planed timber, conifer	Wood waste	18,5 m3	1,57	2,07	0,02	64,39	0	744,66	Planed timber
Wooden façade external facing, thermo tree, pine	Wood waste	0,5 m3	0,05	0,07	0	2,03	0	23,52	Facad[illegible] batten

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Wooden façade external facing, thermo tree, pine	Wood waste	2,74 m3	0,27	0,36	0	11,15	0	128,91	Lying panel, recycling building
Wooden façade external facing, pine, biochemical impregnatio...	Wood waste	1,45 m3	0,16	0,21	0	6,41	0	74,08	Pressure-treated woos
Cement (CEM II 32,5)	Preparation of construction waste	125 kg	0	0	0	0,34	0	7,09	Cement C30/37 (stairwell)
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Preparation of construction waste	54,4 m3	2,52	0,63	0,36	356,19	0	7 409,48	Concrete, stairwell
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Preparation of construction waste	107,5 m3	4,97	1,24	0,71	703,86	0	14 641,89	Concrete, wall
Precast concrete wall elements, UPB (Dzelzbetons MB)	Preparation of construction waste	30,6 m3	1,42	0,35	0,2	200,35	0	4 167,83	precast concrete wall element
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	1 200 kg	0,02	0,01	0	3,27	0	68,1	Reinforcement, precast concrete wall
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	1 770 kg	0,03	0,01	0	4,83	0	100,45	Reinforcement, stairwell
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	3 935 kg	0,08	0,02	0,01	10,74	0	223,32	Reinforcement, wall
Steel, stainless, hot rolled (Outokumpu)	Steel waste	627 kg	0,02	0	0	4,86	0	138,15	Embedded fasteners, stairwell
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	1 111 kg	0,01	0	0	0,9	0	13,38	Reinforcement wire mesh, wall
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	2 362,4 kg	0,01	0	0	1,91	0	28,44	Reinforcement wire mesh, stairwell
Non-Alloy Structural Steel (Direct Reduced Iron production r...	End of life of steel profiles C4	80,1 kg	0	0	0	0,06	0	0,96	Nails and screws non-alloy
Ceramic tiles, 15.1 kg/m2 (IKFP)	Ceramic waste	2,71 m3	0,16	0,04	0	50,42	0	1 235,11	Ceramic tiles
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Disposal of inert material (e.g. Glass) C4	0,82 m3	0,07	0,01	0,01	11,15	0	166,37	Fibre cement, recycling building
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1450 k...	Preparation of construction waste	0,01 m3	0	0	0	0,02	0	0,48	Adhesive for kitchen ceramic
Adhesive, cementitious, for tiles, 1300 kg/m3 (bulk), 1500 k...	Preparation of construction waste	271,6 kg	0,01	0	0	0,74	0	15,41	Adhesive for ceramic tiles
Gypsum plasterboard, fire resistant, 15.4x900/1200 mm, 12.7 ...	Preparation of construction waste	172,5 m2	0,04	0,01	0,01	5,98	0	124,33	Plasterboard, fire resistant
Gypsum plasterboard, 12.5x900/1200 mm, 8.8 kg/m2, Normal Sta...	Preparation of construction waste	2 350 m2	0,4	0,1	0,06	56,42	0	1 173,62	Plasterboard, normal
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	Preparation of construction waste	0,01 m3	0	0	0	0,03	0	0,58	T-molding, movement joint, Oak
Laminated wood, oak, 750 kg/m3, PERFIGAM-Roble (Gamiz)	Preparation of construction waste	0,07 m3	0	0	0	0,15	0	3,09	Floor beading Oak
Laminated wood beam, ash tree, 725 kg/m3, VIGAM-Fresno (Gami...	Preparation of construction waste	0,01 m3	0	0	0	0,02	0	0,52	T-molding, movement joint, ash
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Ceramic waste	18,5 m2	0,01	0	0	3,1	0	75,88	Ceramic tile, kitchen
Plastic, HDPE	Plastic waste	0,43	0	0	0	1,02	0	0,2	Plastic plug
Screws/fixings, galvanized	End of life of galvanised steel C4	248,48 kg	0	0	0	0,2	0	2,99	Nails and screws, galvanized
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	0,06 m3	0	0	0	0,22	0	3,23	Noggin

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	0,22 m3	0,01	0	0	0,87	0	12,91	Fire resistant steel
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	154 kg	0	0	0	0,08	0	1,13	Sheet metal rail SK45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	909 kg	0	0	0	0,45	0	6,68	Sheet metal R45
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	1 195 kg	0	0	0	0,59	0	8,78	Corner profile LP50
Steel profile for inner wall, 0.61kg/m, 7850 kg/m3 (Norgips)	End of life of stainless steel C4	1 600 kg	0	0	0	0,79	0	11,75	Secondary stud
Sealing compound, acrylic	Disposal of inert material (e.g. Glass) C4	8,4 kg	0	0	0	0,11	0	1,7	Sealing compound
Wood board, particleboard	Wood waste	0,89 m3	0,13	0,17	0	5,35	0	61,88	OSB-board
Fibreboard, low density, 12 mm (Egger)	Wood waste	360 kg	0,08	0,1	0	3,25	0	37,64	Hard board
Plywood, spruce, uncoated	Wood waste	0,94 m3	0,09	0,12	0	3,89	0	45,02	Plywood, recycling building
Plywood, spruce, uncoated	Wood waste	7,64 m3	0,77	1,02	0,01	31,77	0	367,43	Plywood
Timber lining (interior), conifer	Wood waste	5 m3	0,42	0,56	0,01	17,4	0	201,26	Floor beading
Planed timber, conifer	Wood waste	0,99 m3	0,08	0,11	0	3,46	0	39,97	95-stud, recycling building
Planed timber, conifer	Wood waste	1,64 m3	0,14	0,18	0	5,7	0	65,93	70-stud, recycling building
Cement (CEM II 32,5)	Preparation of construction waste	750 kg	0,01	0	0	2,05	0	42,56	Grub-stone mortar
Ready mix concrete, excluding rebar, C25/30 (B25 M60)	Preparation of construction waste	107,5 m3	4,97	1,24	0,71	703,86	0	14 641,89	Concrete, flat concrete base
Fibre cement board, 1000 kg/m3, Multi Force (Cembrit)	Disposal of inert material (e.g. Glass) C4	0,77 m3	0,06	0,01	0,01	10,48	0	156,34	Cembrit Roof, recycling building
Screed, flooring, self levelling, 4-40 mm, Floor 110 Fine (w...	Preparation of construction waste	25 kg	0	0	0	0,07	0	1,42	Self levelling screed
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	3 935 kg	0,08	0,02	0,01	10,74	0	223,32	Reinforcement, flat concrete base
APP/SBS polymer-modified bitumen membrane roofing, 3 mm, 112...	Preparation of construction waste	310 m2	0,02	0,01	0	2,84	0	59,17	Membrane roofing SEP5500
Ceramic tile for wet area, 15.1 kg/m2 (IKFP)	Ceramic waste	0,58 m3	0,03	0,01	0	10,72	0	262,52	Ceramic tiles
Wood flooring, conifer	Wood waste	766,5 m2	0,91	1,2	0,01	37,35	0	431,94	Parquet
Insulation panel, 120 mm, Thane Sarking (KNAUF)	Incineration of plastic (including benefits) C4	420 m2	1	0,08	0,05	4 200,47	0	2 227,2	Underlay felt YAP
Pre-slab reinforced concrete (CERIB)	Preparation of construction waste	920 m2	2,22	0,55	0,32	313,74	0	6 526,43	Flat concrete base
Glass wool insulation, 42 mm, 0.042 W/mK, 630 g/m2, 15 kg/m...	Disposal of inert material (e.g. Glass) C4	150 m3	0,19	0,03	0,02	30,46	0	454,47	Roof insulation (blowing wool)
Particleboard, expanded glass, 12 mm, StoVentec (sto)	Construction waste to landfill	2,59 m3	0,11	0,05	0,01	55,19	0	409,61	Ventec- boards
Sealing tapes, Butyl	Disposal of inert material (e.g. Glass) C4	1 kg	0	0	0	0,01	0	0,2	butyltape
Elastomer joint sealing tape, polyurethane	Disposal of inert material (e.g. Glass) C4	0,55	0	0	0	0,01	0	0,11	Insulating tape aerofle

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Elastomer joint sealer tape, silicon rubber	Disposal of inert material (e.g. Glass) C4	23,5	0	0	0	0,32	0	4,75	Vinyl Tape
Flooring adhesive sealats, 1.25 - 1.65 kg/dm3,, SikaBond-54 ...	Disposal of inert material (e.g. Glass) C4	25,34 kg	0	0	0	0,34	0	5,12	Flooring/ tile joint
Steel, hot-dip zinc coating	Steel waste	0,6 m3	0,15	0,03	0	36,5	0	1 037,75	Prefabricated roofing
Steel, hot-dip zinc coating	Steel waste	76,12 kg	0	0	0	0,59	0	16,77	Bracket, fink truss
Steel, stainless, cold rolled (Outokumpu)	Steel waste	0,04 m3	0,01	0	0	2,47	0	70,24	Fastening plate
Steel, stainless, cold rolled (Outokumpu)	Steel waste	415 kg	0,01	0	0	3,22	0	91,44	L-steel ramp
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	1 111 kg	0,01	0	0	0,9	0	13,38	Reinforcement wire mesh, flat concrete base
Multipurpose floor leveling screed, 1700kg/m3, 4-30mm/5-50mm...	Disposal of inert material (e.g. Glass) C4	1 kg	0	0	0	0,01	0	0,2	Primer Weber
Fibreboard, low density, 12 mm (Egger)	Wood waste	80 kg	0,02	0,02	0	0,72	0	8,36	Protective plastic-coated cardboard
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	0,51 m3	0,04	0,01	0	27,62	0	97,41	Construction timber, recycling building
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	2,2 m3	0,17	0,04	0,02	118,74	0	418,73	Fixing stud
Load bearing timber, 430 kg/m3, Moistr. 12%, KL-wood (Martin...	Incineration of wood C3 (without biogenic CO2)	6,31 m3	0,47	0,1	0,04	340,67	0	1 201,38	Trusses
Natural stone tiles, 10 mm (EURO-ROC)	Soil waste	0,03 m3	0	0	0	0,69	0	20,66	Window ledge
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0 m3	0	0	0	0,01	0	0,21	Doormat frame
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0,01 m3	0	0	0	0,21	0	5,95	Balcony rods
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0,06 m3	0	0	0	1,26	0	35,69	Doormat, aluminium
Aluminium, blank sheet, 2700 kg/m3 (GAA)	Aluminium waste	0,07 m3	0,01	0	0	1,41	0	39,98	Balcony parapet
Glass, reflective, solar control, CVD coated, blue, 4 mm, LT...	Preparation of construction waste	0,01 m3	0	0	0	0,09	0	1,84	Toilet mirror
Glass, reflective, solar control, CVD coated, clear, 5 mm, L...	Preparation of construction waste	0,01 m3	0	0	0	0,06	0	1,2	Mirror to sliding door wardrobe
Steel, reinforcement/rebar, 4-40mm, 7700 kg/m3 (Celsa)	Preparation of construction waste	293 kg	0,01	0	0	0,8	0	16,63	Reinforcement, balcony
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	Disposal of inert material (e.g. Glass) C4	0,13 m3	0,01	0	0	1,16	0	17,24	Sliding Wardrobe
Wooden particleboard, 630 - 700 kg/m3, 6 - 40 mm, Standard ...	Disposal of inert material (e.g. Glass) C4	8 373,4 kg	0,7	0,1	0,07	113,35	0	1 691,32	Interior kitchen as well as closet, linen closet and broom closet
Porcelain sink, 50 to 64 cm (IDÉAL STANDARD)	Preparation of construction waste	12	0	0	0	0,49	0	10,22	Porcelain sink
Porcelain WC kit (toilet and tank) (AFISB)	Preparation of construction waste	12	0,01	0	0	1,17	0	24,24	Porclain WC kit
Zinc plates, Naturel (NedZink)	Preparation of construction waste	126,6 kg	0	0	0	0,35	0	7,18	Bathroom cabinet
Plastic, LDPE	Plastic waste	0,18	0	0	0	0,43	0	0,08	Clothin hook

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Plastic, PET	Plastic waste	0,18	0	0	0	0,43	0	0,08	Mirror clamp
Plastic profile, EPDM	Incineration of plastic (including benefits) C4	12,5 kg	0,01	0	0	31,57	0	16,74	Radon sealing around pipes
Screws/fixings, galvanized	End of life of galvanised steel C4	26,68 kg	0	0	0	0,02	0	0,32	Hinge
Steel, hot-dip zinc coating	Steel waste	0 m3	0	0	0	0,01	0	0,15	Clothing shelf, net of wire
Steel, hot-dip zinc coating	Steel waste	0 m3	0	0	0	0,08	0	2,2	Clothing shelf, wardrobe rod
Steel, hot-dip zinc coating	Steel waste	2,4 kg	0	0	0	0,02	0	0,53	Shower
Steel, hot-dip zinc coating	Steel waste	3,96 kg	0	0	0	0,03	0	0,87	Hooks, wet area
Steel, hot-dip zinc coating	Steel waste	3,96 kg	0	0	0	0,03	0	0,87	Toilet paper holder
Steel, hot-dip zinc coating	Steel waste	6 kg	0	0	0	0,05	0	1,32	Magazine rack
Steel, hot-dip zinc coating	Steel waste	6,36 kg	0	0	0	0,05	0	1,4	Kitchen faucet
Steel, hot-dip zinc coating	Steel waste	24,54 kg	0	0	0	0,19	0	5,41	Shower mixer
Steel, hot-dip zinc coating	Steel waste	35 kg	0	0	0	0,27	0	7,71	Postbox
Steel, hot-dip zinc coating	Steel waste	180 kg	0,01	0	0	1,4	0	39,66	Sink
Steel, stainless, hot rolled (Outokumpu)	Steel waste	274 kg	0,01	0	0	2,12	0	60,37	Embedded fasteners, balcony
Steel, color coated (EAPP)	Steel waste	10,08 kg	0	0	0	0,08	0	2,22	Wardrobe rod
Steel, color coated (EAPP)	Steel waste	41,58 kg	0	0	0	0,32	0	9,16	consoles shelf
Steel, color coated (EAPP)	Steel waste	100,56 kg	0	0	0	0,78	0	22,16	Wire basket
Steel, color coated (EAPP)	Steel waste	209,88 kg	0,01	0	0	1,63	0	46,24	shelfs
Steel, color coated (EAPP)	Steel waste	311,66 kg	0,01	0	0	2,42	0	68,67	Wire basket
Steel reinforcement wire mesh, 7850kg/m3, scrap - 100%, Wire...	End of life of steel profiles C4	384 kg	0	0	0	0,31	0	4,62	Reinforcement wire mesh, balcony
Natural rubber sealing compound	Disposal of inert material (e.g. Glass) C4	0,14 m3	0,01	0	0	1,75	0	26,1	Doormat, rubber
Laminated plywood, waterproof, 10.2 mm	Wood waste	0,14 m3	0,02	0,03	0	1,02	0	11,81	Countertop
Laminated plywood, waterproof, 10.2 mm	Wood waste	0,61 m3	0,11	0,14	0	4,39	0	50,8	Laminadet playwood
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	Incineration of wood C3 (without biogenic CO2)	0,01 m3	0	0	0	0,67	0	2,38	Clothing shelf
Brass building components	Preparation of construction waste	8,16 kg	0	0	0	0,02	0	0,46	Handle Assa 1956 Epok
Balcony glass door, wood-alu frame, U-value 0.84	Construction waste to landfill	2,44	0,01	0	0	4,24	0	31,43	Inward main entrance door property
Balcony glass door, wood-alu frame, U-value 0.84	Construction waste to landfill	6,15	0,02	0,01	0	10,68	0	79,3	Outward opening door
Balcony glass door, wood-alu frame, U-value 0.84	Construction waste to landfill	18,46	0,06	0,03	0,01	32,05	0	237,89	Outgoing balcony (2-4)
Door glass/steel, 1.23x2.18 m (Novoferm)	Construction waste to landfill	2,44	0,01	0	0	4,64	0	34,43	Inward door, p

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Door glass/steel, 1.23x2.18 m (Novoferm)	Construction waste to landfill	12,37	0,05	0,02	0,01	23,52	0	174,56	Outward opening entrance (3)
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	Disposal of inert material (e.g. Glass) C4	15,67	0,05	0,01	0	7,51	0	112,08	Inwards windows, 986x1445
Inward opening tilt & turn window, Frame/sash: 105/80 mm, 0....	Disposal of inert material (e.g. Glass) C4	72,26	0,21	0,03	0,02	34,63	0	516,78	Inwards windows, 986x1745
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	314,96 kg	0,01	0	0	2,44	0	69,4	Mounting plate
Steel, hot-dip zinc coating	Steel waste	33,41 kg	0	0	0	0,26	0	7,36	Handle
Door, steel, 1,23 x2,18 m (Novoferm)	Steel waste	0,39	0	0	0	0,43	0	12,17	Combination hatch, stairwell
Door, steel, 1,23 x2,18 m (Novoferm)	Steel waste	0,77	0	0	0	0,84	0	23,86	Outward opening entrance door, wheelchair room
Door, steel, 1,23 x2,18 m (Novoferm)	Steel waste	0,78	0	0	0	0,86	0	24,33	Roof hatch
Door, steel, 1,23 x2,18 m (Novoferm)	Steel waste	4,17	0,02	0	0	4,56	0	129,7	Outward opening entrance door, (2-4)
Door, steel, 1,23 x2,18 m (Novoferm)	Steel waste	4,61	0,02	0	0	5,04	0	143,15	Outward opening entrance door
Wooden inner door, painted	Wood waste	96,39	0,66	0,87	0,01	27,08	0	313,21	interior doors
Wooden material, 680kg/m3, Moistr. 12%, Radiata (Kebony)	Incineration of wood C3 (without biogenic CO2)	0,35 m3	0,04	0,01	0	30,19	0	106,47	Frame interior doors
Paint, water-based, mid sheen finish, indoor use, 12 m2/l, J...	Disposal of inert material (e.g. Glass) C4	1 000 m2	0,01	0	0	1,41	0	21,03	Paint to plaster
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Disposal of inert material (e.g. Glass) C4	235 m2	0	0	0	0,38	0	5,6	Paint balcony / stair railings
Paint, water-based gloss, indoor and outdoor use, 10-12 m2/l...	Disposal of inert material (e.g. Glass) C4	2 400 m2	0,02	0	0	3,83	0	57,15	Paint for concrete
Skylight, smoke lift, F100 (Lamilux)	Disposal of inert material (e.g. Glass) C4	1	0	0	0	0,55	0	8,17	Skylight, smoke lift
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	10,35 m2	0	0	0	0,31	0	8,95	Drip plate
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	14,69 m2	0	0	0	0,45	0	12,7	Socket fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	18,91 m2	0	0	0	0,58	0	16,35	Window sill
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	27,18 m2	0	0	0	0,83	0	23,51	Fittings
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	27,74 kg	0	0	0	0,21	0	6,11	Gutter
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	29,8 m2	0	0	0	0,91	0	25,77	Downpipes
Profiled steel sheeting, hot-dip galvanized, 0.5 mm	Steel waste	81,25 kg	0	0	0	0,63	0	17,9	Roof hood
Ventilation system with steel pipes, room area m2	Construction waste to landfill	1 076	0,34	0,17	0,05	179,75	0	1 334,21	Ventilation system
Air exchanger+heat recovery, 190 liters / s	Steel waste	1	0	0	0	0,84	0	23,95	Air exchanger, recycling building
Air exchanger+heat recovery, 190 liters / s	Steel waste	1	0	0	0	0,84	0	23,95	Air exchanger
Air exchanger+heat recovery, 190 liters / s	Steel waste	12	0,04	0,01	0	10,11	0	287,4	FTX ag[illegible]

Resource	Transformation process	User input	Acidification kg SO2e	Eutrophication kg PO4e	Formation of ozone of lower atmosphere kg Ethenee	Global warming kg CO2e	Ozone depletion potential kg CFC11e	Primary energy MJ	Comments
Drainage system, PP, room area m2	Construction waste to landfill	1 076	1,18	0,59	0,17	618,27	0	4 589,04	Dranage system
Electricity cabling, room area m2	Construction waste to landfill	1 076	0,2	0,1	0,03	105,96	0	786,47	Electricity cabeling
Heating system (steel pipes and heat distribution center), r...	Construction waste to landfill	990	0,23	0,11	0,03	118,63	0	880,5	Heating system with distribution
Elevator components (per storey)	End of life of galvanised steel C4	4	0,01	0	0	1,06	0	15,89	Elevator
Locking system for doors, TS 93 EN 2-5 (Dorma)	Disposal of inert material (e.g. Glass) C4	15	0,01	0	0	0,91	0	13,6	Locking system
Pipesystem, hot and cold water supply, PEX, room area m2	Construction waste to landfill	990	0,85	0,42	0,12	446,04	0	3 310,67	Pipesystem, hot and cold water supply
Electricity, Sweden		5 865							Fastighetsel
Fortum Värme, s m Stockholms stad, Stockholm		55 541							Fjärrvärme
Tap water, clean		642							Tap water
		Total	100,31	20,95	4,62	47 797,79	0	111 757,01	