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Karolinelund's Cargos

KAROLINELUND'S CARGOS

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FOREWORD

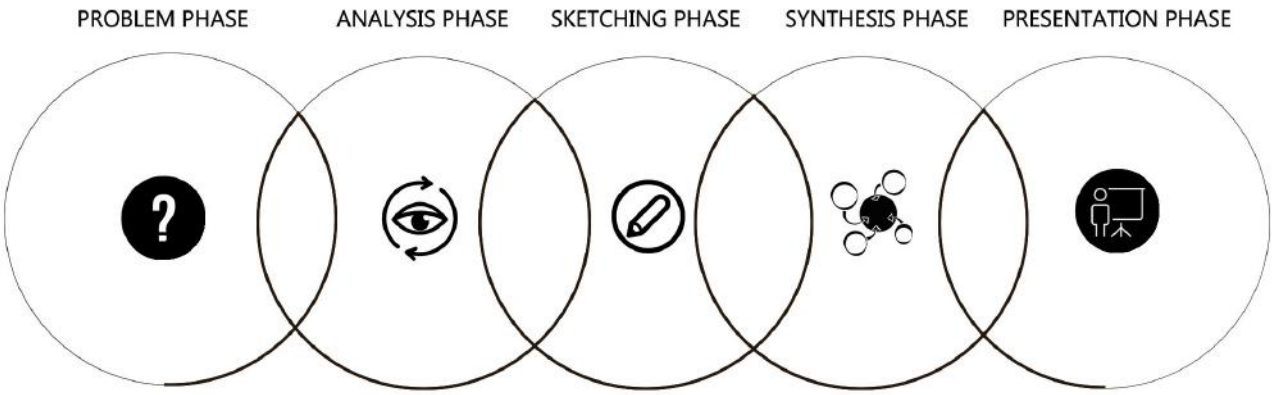
This report is the final result of Aalborg University 4th Master's semester in Architecture and Design. Conducted and developed by two south european students, Camilla and Joana, respectively from Italy (Rome) and Portugal (Lisbon).
The overall work is here documented and presented in what is believed to be the best way for a good understanding of the whole design. The project is moreover developed in accordance with the achievements, skills and competencies expected from the MSc04 ARK Semester description.

ABSTRACT

From a semester early stage, this project was seen both as an academic task and as an urgent Aalborg's necessity.
Throughout site daily visits, Karolinelund users interviews and debates hosted at the remaining building on site (Platform 4, Karolinelundvej 38-40) the design process was developed taking advantage of the site proximity.
The project itself aims to build knowledge of sustainable architecture through the design of a Market complex.
The implementing of an advanced integrated design process, brings technical, spatial, social, functional, logistical and aesthetic challenges and potentials to be solved, resulting in an informed design that combines social, environmental and economical sustainability.
An innovative approach that minimizes energy consumption and works with, rather than against, climatic conditions, will hopefully allow Aalborg habitants to have a better use of "Karolinelund".
A balance between aesthetics and technical issues, requiring creative and sensitive detailing, is equally important.

GUIDE OF READING

Nine chapters are following presented, placed in an order that is believed to be efficient for the understanding of Karolinelund's Cargos: Introduction; Analysis (divided in: site analysis, thematic analysis and inspirations); Design approach; Sustainable approach; Cargo's design process; Presentation and Building's performance. Then an Epilogue, including conclusions, reflections and references (made following the Harvard method). Finally some Annexes appear in the last pages of this report and are also digitally available.



METHODOLOGY

III.1 | Integrated design process

The method used in the development of the project is outlined in this section. In this project the sustainable architecture is investigated using the Integrated Design Process (IDP) as a tool.
IDP is a methodology developed by Mary- Ann Knudstrup [Knudstrup, 2005]. The process is divided into five phases, creating an iterative working method where aesthetic and technical aspects are equally considered in relation one to each other. In the development of the design, the IDP is not used in a chronological way, rather consisting of loops between the different phases, thus ensuring continual optimization of the process. The aim is to achieve an holistic design that relates to various aspects and achieves a good integration between the detailing and the whole.

THE FIVE PHASES

PROBLEM PHASE: The problem is initialized and articulated in: problem statement, main values and a vision.

ANALYSIS PHASE: Relevant premises are analyzed, concerning:

•Site analysis: Relevant aspects of the site and its surroundings will be investigated to clarify the qualities, potentials and limitations of the site.

•Theme analysis: The potentials and challenges of the themes, including sustainable architecture built from reused and recycled materials and zero-energy building, are clarified. The users, demography and building typologies of Aalborg are likewise explored to reach an understanding of the user groups and the aesthetic values to be followed.

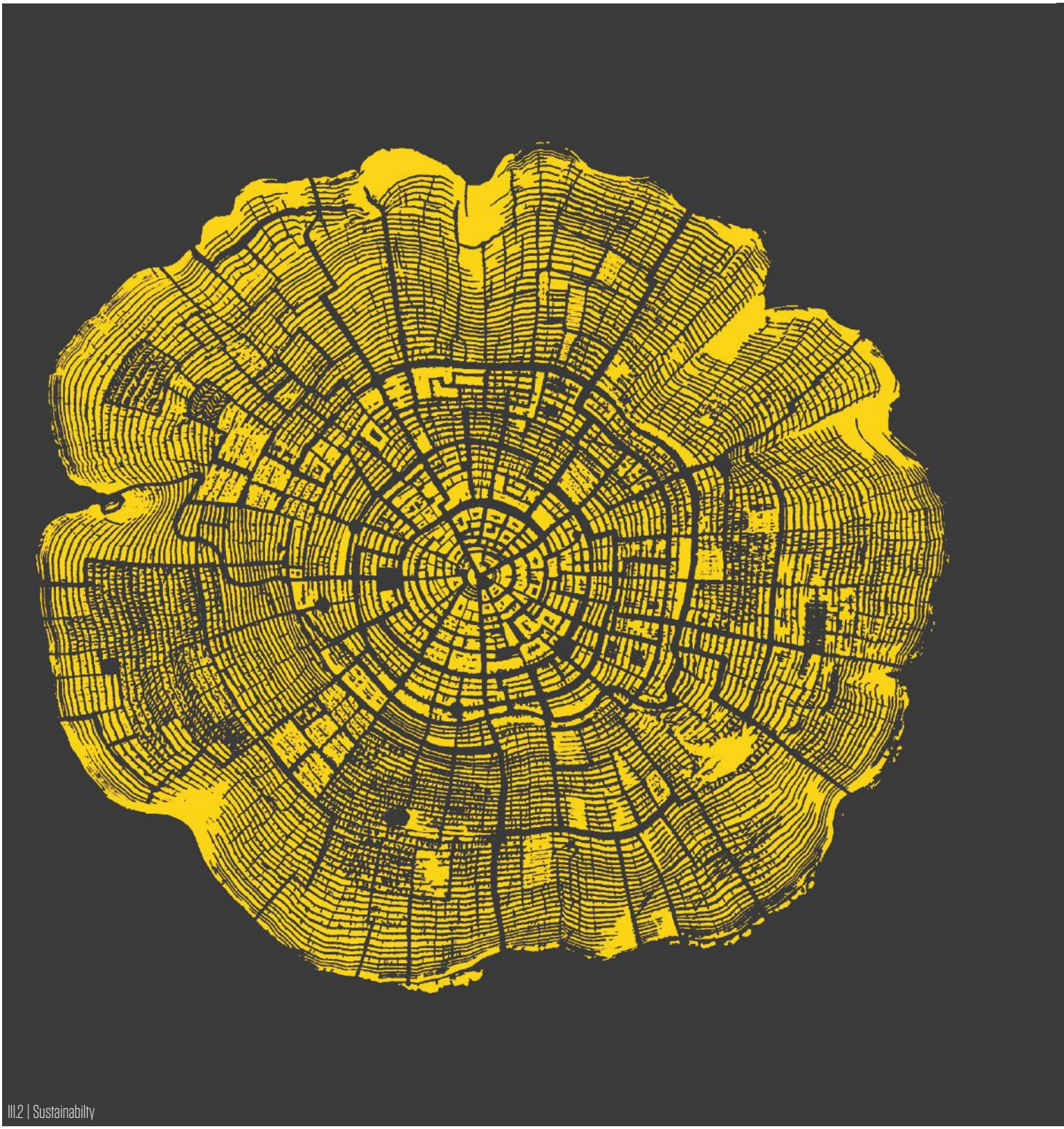
•Case studies: A method is developed to analyze the sustainable approach of existing architectural works. The studies are concluded with a reflection on the relevant aspects to be used in the further development of the project.

SKETCHING PHASE: Process sketches will be used to develop an idea or concept. In this phase hand sketches, 3D modeling, models, diagrams will be tools used to pursue an informed design. Architectural and engineering knowledge will be combined to inspire each other into a solution, optimized through both creative and technical concerns.

SYNTHESIS PHASE: Parameters, intentions and solutions explored in the previous phase are combined in the synthesis phase. Details will be optimized in relation to the whole, achieving symbiosis.

PRESENTATION PHASE: The final stage of the process, in which the promotional material of the project will be presented.

[Knudstrup, 2005]



III.2 | Sustainabilty

CONTENTS

"The great challenge of the twenty-first century is to raise people everywhere to a decent standard of living while preserving as much of the rest of life as possible."

- Edward O. Wilson, The Faith of Scientists: In Their Own Words, 2008 -

01

INTRODUCTION

Ill.3 | Karolinelund's indgang

One of the main issues in everyone's life today is to deal with the slow and inexorable damage of environment and natural resources. The importance and relevance of these aspects in our everyday life, pushes towards the research of a quick, effective and lasting solution to stop this dangerous tendency. From one hand the dependence on non-renewable energy, especially evident in the construction techniques and in the type of materials used in most of the buildings, and from the other hand the increasing overconsumption of goods and resources such as food and water, are the main attitudes responsible for the fast developement of these problems. Good building practices, and a healthy lifestyle are therefore two of the most effective answers to the problem. [greenhomebuilding, 2011]

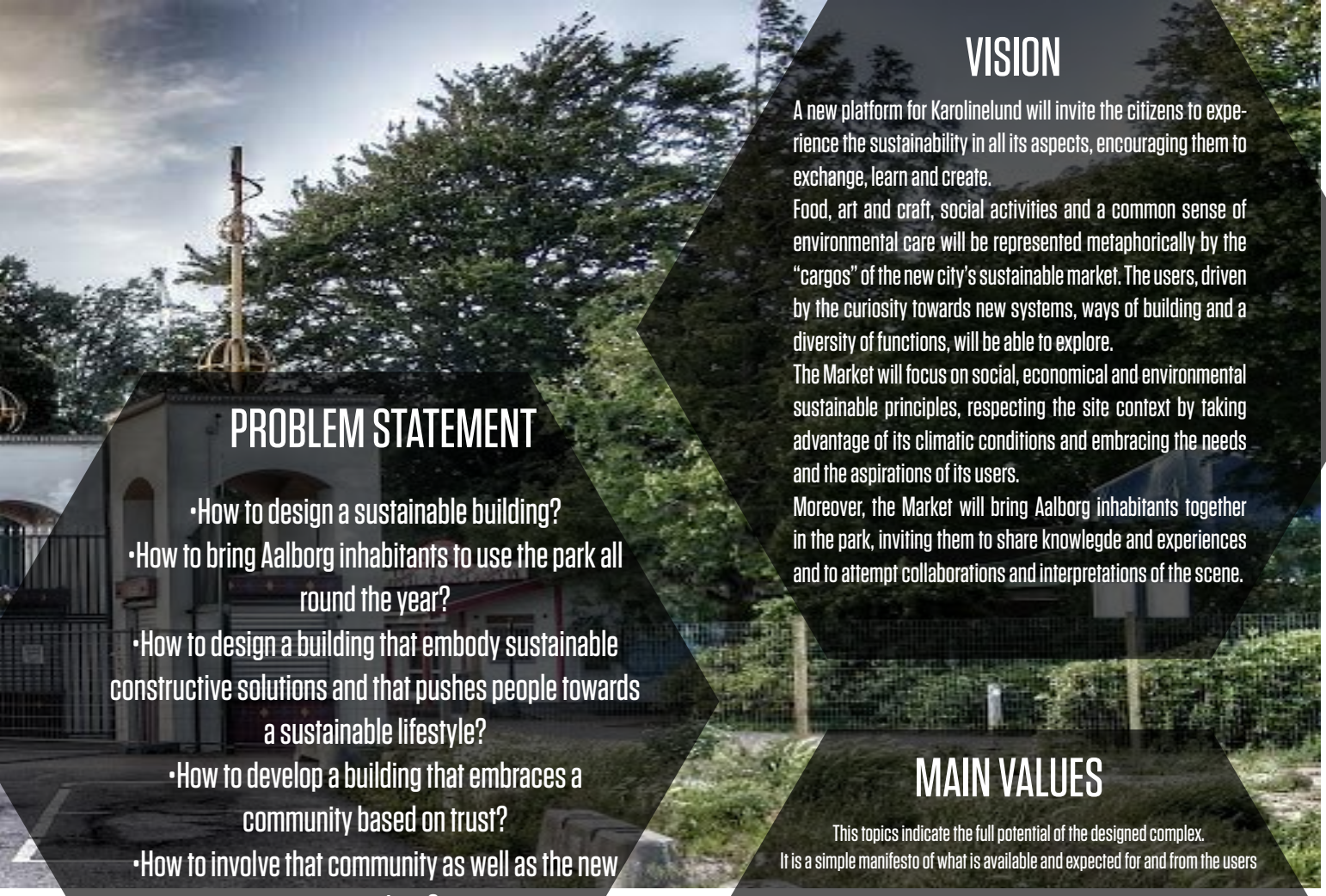
For this reason the goal of this project is to design a building that can embody both these solutions. By applying simple well-proven sustainable building techniques and by turning wrong attitudes into a more healthy and environmental friendly lifestyle, this project aims to build knowledge of sustainable architecture through the design of a sustainable Market complex.

Within the market, the users will be able to eat, share, learn, work and create together in a sustainable and responsible environment.

The project site is located in Aalborg old Tivoli Park named Karolinelund, in Denmark. After the amusement park closed down, few attempts to re-think the concept of the amusement park and thereby maintain Karolinelund as a contrasting and green venue, focusing on play and experience, have been done.

[Aalborg Kommune, 2016]

The new project for Karolinelund must continue this renewal trend , keeping Karolinelund as the Aalborg people's park and arranging the area in respect to user group's differentiated wishes. For this reason, well effective infrastructures will be developed in the site and an appropriate planning of urban spaces will be performed in order to ensure high accessibility and improve movements in and around the site. At the same time the building will be proposed as a new iconic market for the city and for the citizens.



VISION

A new platform for Karolinelund will invite the citizens to experience the sustainability in all its aspects, encouraging them to exchange, learn and create.
Food, art and craft, social activities and a common sense of environmental care will be represented metaphorically by the "cargos" of the new city's sustainable market. The users, driven by the curiosity towards new systems, ways of building and a diversity of functions, will be able to explore.
The Market will focus on social, economical and environmental sustainable principles, respecting the site context by taking advantage of its climatic conditions and embracing the needs and the aspirations of its users.
Moreover, the Market will bring Aalborg inhabitants together in the park, inviting them to share knowlegde and experiences and to attempt collaborations and interpretations of the scene.

PROBLEM STATEMENT

•How to design a sustainable building?
•How to bring Aalborg inhabitants to use the park all round the year?
•How to design a building that embody sustainable constructive solutions and that pushes people towards a sustainable lifestyle?
•How to develop a building that embraces a community based on trust?
•How to involve that community as well as the new generations?

MAIN VALUES

This topics indicate the full potential of the designed complex.
It is a simple manifesto of what is available and expected for and from the users

•Users should identify themselves with the market's sustainable principles.
•All the users will eat, share, learn and experiment together.
•As much as each stakeholder or staff member connects into the facility as more
pleasant their experience will be.
•Quality of products and quality of services generates quality of life.
•Everyone must have access, regardless ethnics, religions or economic situation.
•Everyone must feel the sense of "we are doing this together"
•Diversity is the key.
•Trust and commitment between users and staff for the lifetime and hopefully for
the future generations.

“Karolinelund is not going to be the amusement park we know today.
But what are we then going to use the site for?
The politicians are thinking of different ideas, but Nordjyske Aalborg editorial thinks that the citizens should have the opportunity to give some suggestions.

Should it be a folk park?
Should the municipality make profit from selling the site for construction or other purposes?
Should we invent something that no one has yet taught about? “

- Nordjyske Stiftstidende, 02.11.2010 -

02

ANALYSIS

SITE ANALYSIS

In this section the project area will be analyzed from different points of view. For this purpose a series of analyses and researches of different nature will be presented. First of all the site and its surroundings will be studied and presented in order to design a building that is able to respect and at the same time interact with the surrounding context. In particular the infrastructures and the available services will be considered in order to be able to design a building with good accessibility. A climatic analysis is then performed in order to have, in the design phase, some reference parameters to which work with. Eventually, to make the project able to embody the most correct answer to the different needs, a series of interviews to local people will be carried out.

A thematic analysis focused on technical and social aspects will finally be performed, in order to enlarge the potential of the project in a wider scale. Some case studies wil be also taken in consideration for a better understanding of the general and specific characteristics of a market.

KAROLINE LUND HISTORY

FROM AMUSEMENT PARK TO PEOPLE'S PARK

Tivoliland was born in 1947, but in October 2010 the municipality of Aalborg decided to close the park, since the economic loss due to the obsolete character of the amusement park was too big an it could no longer be paid. With this choice, the major historical city attractor was over. [Information.dk]

Even though the economic difficulties are the aspect that has characterized Tivoliland in recent years the most, at its opening 69 years ago and for many years, Karolinelund has been a popular and successful enterprise. In 1947, the theme park officially opened, and its stated goal was to become a meeting place for the residents of the city. The amusement park was founded by Volmer and Carl Lind and Karolinelund was selected as the place where people would meet to celebrate, play and have fun. This area quickly became an identity place, an oasis for the city and its citizens. In recent years, Tivoliland has been almost completely abandoned. The problematic years actually date back to 2006, when Torben "Træsko"Pedersen bought the theme park. After the acquisition, the park changed the name from Tivoliland park to Tivoli Karolinelund, and the plans for the future were to reinvent the park after the 60th anniversary, reopening the shops closed and strengthening the stage performances for young and old people. [bt.dk]

However, just 19 months after the sale to Torben "Træsko" Pedersen, the municipality of Aalborg decided to buy and renovate the park. After the acquisition, the municipality has invested lot of money in Karolinelund and since the perspectives were not indicating significant improvements, in 2010 the park was closed permanently. The acquisition by the municipality, despite having been a bad investment, is revealed today potentially important because of the perfect location next to Nordkraft and the Music House. Since the complete shutdown, many potential buyers have offered investments, presenting different proposals. However, in none of them the purchase of the area was allowed because all the projects have proved too risky or not valid enough. The city, however, remains, despite everything, particularly devoted to the cause of the park.

Nowadays Tivoliland is a place awaiting its fate. Meanwhile, some guidance on how the site in the future will remain a tourist attraction are being developed in the last period. Karolinelund is potentially placed in a position of advantage regarding the future of the City of Aalborg. The branding strategy of the city ensure that the redevelopment and transformation of the site can send a positive signal of sustaining cultural causes. The culturally popular soul of the site, suggests an equally folkloric function and a document, issued by the municipality in 2009, emphasizes that most of the area in the future is destined to be converted into a "park of the People." [nordjyske.dk]

Ill.4 | Karolinelund 1953

III.5 | Site location

POSITION AND IMPORTANCE OF THE SITE

Aalborg, with its 207.805 inhabitants, is Denmark's fourth largest city and the third densest municipality in the country. [Aalborg in figures, 2015]
The city was founded around the Limfjord, by exploiting its favorable position for trade and commerce, for this reason the city was mainly industry focused and its industrial past is still highly visible along the waterfront. Karolinelund park it is centrally located in Aalborg both from a physical and an historical point of view. For many years it was in fact the popular and folkloristic centre of the city and most of the citizens still feel deeply attached to this place. In the most recent years, with the transformation of Nordkraft, the presence of the Utzon centre, the Aalborg new architectural university and the opening of the Music House, the area became even more appealing. Karolinelund it is in fact centrally located in this cultural area, which is at the same time attracting attention to the city both regionally, nationally and internationally. This turn the area into a very significant and strategic location for the future development of Aalborg at different levels.

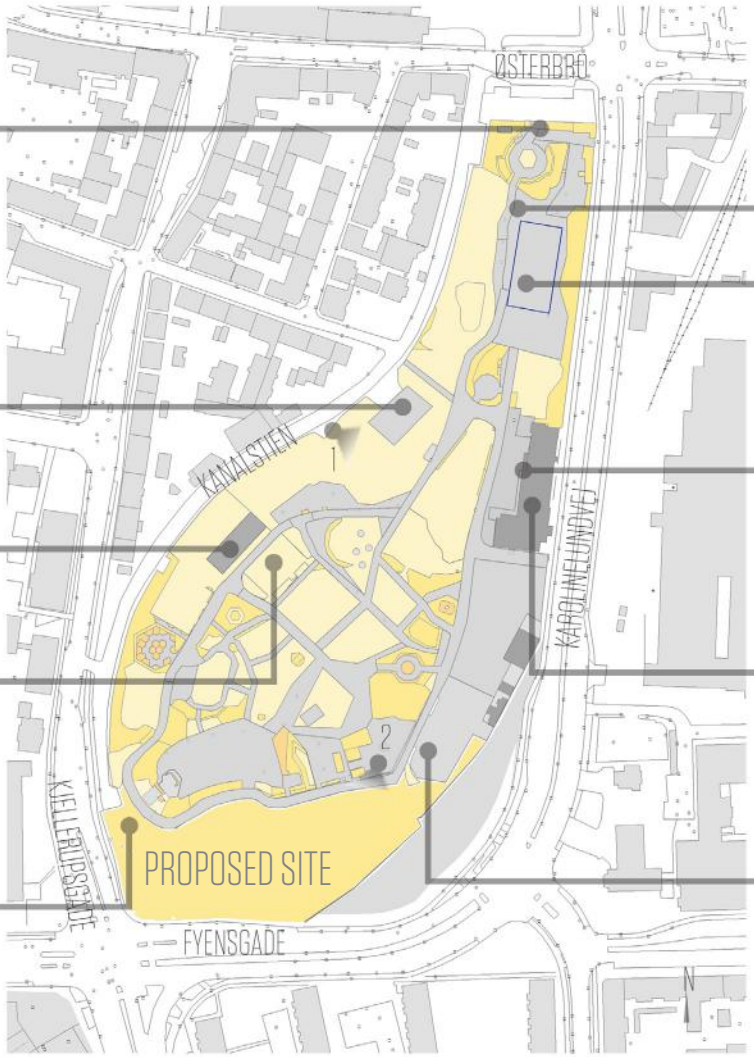
THE SITE

From the site itself, exudes an air of cultural and popular alternative ferment. A volunteer organization, Platform 4, is housed in the largest remaining building along the park's eastern side and it creates life thanks to concerts, café, workshops and artistic events. Also the graffiti and the urban gardens contribute to testify the alternative character of the site. Sportive people, joggers and skaters also make good use of the park, taking advantages of the challenging hills, edges and benches present. A small open air market, fødevarefællesskab, with agricultural products coming from the close farms, is performed every Wednesday.

THE EDGES

The park is still fenced by some of the walls that were used as entrances for the amusement park. In particular to the west, the park is bounded by a closed wall, while the northern part is bordered by a high fence. The south side is nowadays opened towards Fyensgade. For this reason the open sides are, to some extent, affected by the traffic noise.

PANORAMA 1



PANORAMA 2

III.6 | Site ambiences

USERS

In order to understand how Aalborg residents see and relate to Karolinelund, three crucial questions have been addressed to some of the users. The interviews were held in the period between February and May 2016. People were challenged to share their feelings about how the park looks like, how they would like it to be and their opinion about a hypothetic market placement. Based on their answers, wishes and needs, a design focus on them will be taken in serious consideration to facilitate the full potential of a market.

1. WHAT IS YOUR USE OF KAROLINELUND NOWADAYS?
2. HOW DO YOU SEE KAROLINELUND IN THE FUTURE?
3. DO YOU BELIEVE THAT A NEW MARKET, CLOSE TO THE SOUTH ENTRANCE WILL BE A POSITIVE INPUT TO THE AREA ITSELF? AND HOW?

LISE CHRISTENSEN | 26 YEARS OLD

1.

I think Karolinelund is such a beautiful place so I use the space and surroundings as an anti-stress space, where I know I can always go and and relax. I love the different arrangements that are being held and thrown it has been much needed in Aalborg! The fact that everyone can be a part of it is amazing. It makes me happy to look at the trees and birds.

2.

I hope to see more projects come to life, for imagination to blossom.

3.

The idea of a market is AMAZING and I would absolutely love it! I miss it a lot, and already love going to the smaller local markets in town. I rarely see other young people go to the markets, I think they have become unaware of the fact that you can go buy your veggies, meat, fish and so on, on a market instead of just going to Netto.
I think a market directed to everyone, especially young people, could encourage them to go the market in the future as well. To sell your own art, jewelry, tomatoes, instruments and so on could not only help an artist financially, it could potentially bring a lot more people together.
I imagine small shops selling food, people dancing around, drum circles, picnics, families and friends having a nice time.

GINTS VILKS | 39 YEARS OLD (His Kids: Manu and Luka)

1..

By my opinion it is one of the best places in Alborg to be together and play with my kids either it is a sunny afternoon or a weekend. It is also great place to meet with my friends and have some common recreational activities. Sometimes I come here also alone just to enjoy the peaceful environment in the middle of Aalborg.

2.

I hope to see all the good things about the place will be maintain in the best possible manner. With this I mean that the people who are behind the management and planning of the place will carefully maintain and implement new things in the park so it is not disturbing natural flow of the place. In other words it is good idea to look what people are doing here and ask them what would improve their experience while they are here.

3.

I believe it will be a positive input. First of all because there is no permanent market place in Aalborg where people who craft or grow some products themselves and have a chance to share or sell their product to other residents or tourists traveling through the city.

LAVINIA BONDOR | 24 YEARS OLD

1.

I use Karolinelund for various sport-involving activities (basketball and volleyball) but at the same time I see it also as a stress-free zone where you can relax by taking a walk after a long day.

2.

In the future, I think the area will be an attractive place for young people as more and more events are organized there in open air or at Platform 4.

3

I believe a new market will be a great idea as long as it's main products will be directly linked with the people who make use of the park on a daily basis.

THEA WINTHER | 23 YEARS OLD

1.

When it's winter I mostly use Karolinelund to visit platform4, but when it's summer I just love to sit in the park with friends. I love that there are so many different types of people and a lot of stuff to do. The urban gardening is really really lovely too, and I love to walk around and look at what people are growing.

2.

I hope karolinelund can stay like this open and free environment in the future. Aalborg is so blessed, that we have this room for creativity!

3.

A market place in karolinelund sounds awesome! I think this is one of the things we really need in Aalborg! I would love to walk around and look at the different stuff people are selling

ANDREAS SCHULTZ | 24 YEARS OLD

1.

I find myself going to some of the events hosted by platform 4 and using the park for playing basketball. My primary use of karolinelund have mostly been doing the summer, when the weather is good. Also to BBQ and hang out with friends

2.

In the future i see karolinelund still as a park but also with a community, where the different areas of karolinelund are more diverse and is based on being innovative with what they have.

3.

I think that putting a visible market in karolinelund will increase the amount of people going to karolinelund and attract a broader range of people. which will led to more awareness about karolinelund and hopefully attract people to come to the park and see what going on!

III.7 | Blue axes

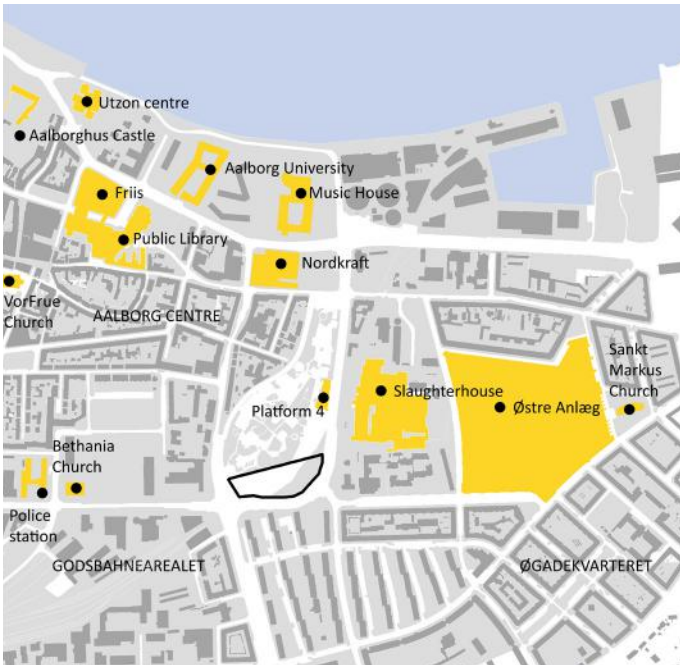
III.8 | Greeneries

BLUE AXES

Aalborg as a city, grew up around Østerå and Versterå , two wide streams, which in the past flowed into the Limfjord, providing access to shipping in the city. Østerå, in particular, was used as a harbor for light ships until the second half of the 19th century. However the river was piped in the late 1800s in order to be able to bypass the city center. Nonetheless, its original course is still recognizable in places like Karolinelund, where a differently paved path is crossing the whole park. In 2008, the city council decided in principle to reopen Østerå, so to reconnect the city with the Limfjord. This idea is now part of the planning and implementation of urban transformation of the city. [Aalborg Kommune, 2016]
The opening of Østerå has a very strong and strategic potential, as it can create a whole new recreational connection through the former industrial areas.

GREENERIES

Karolinelund represent itself a green attractive area for the surroundings. Its urban gardens are quite popular among Aalborg's citizens. Vegetables and flowers grow in all kind of boxes: planters, raised beds and even in a toilet and a bathtub. Many trees are scattered over the area and in most of the places they help to frame the smaller spaces and to create a cozy and natural environment, also preventing the area's exposure to the strong wind. Not far from Karolinelund there is also a beautiful park with a lake: Østre Anlæg. In this park is possible to find all kinds of facilities and atmospheres; from the bucolic path which surrounds the lake itself, to some open-air sport facilities, to a garden with flowers and fountains.



III.9 | Surrounding functions

III.10 | Interiors of Nordkraft

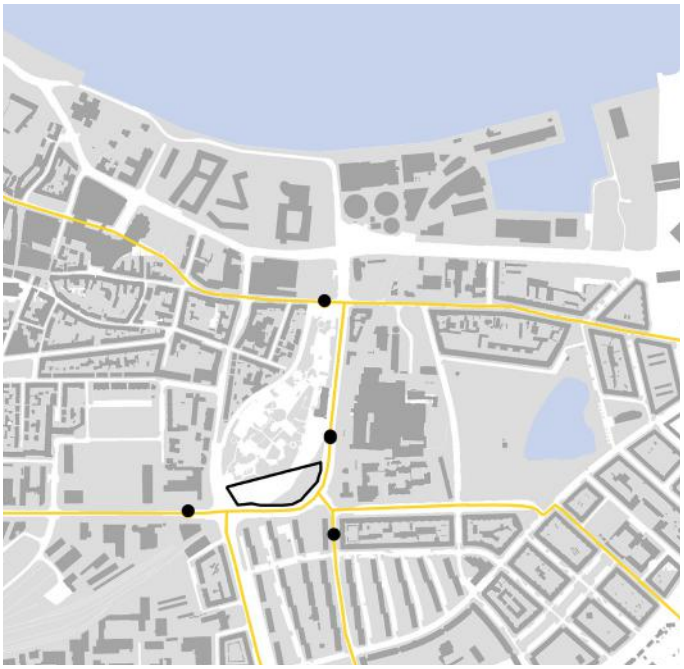
III.11 | Facade of a residential building in Færøgade

THE SURROUNDINGS

Karolinelund is located on the eastern periphery of Aalborg's residential centre and has a great potential as it is placed to the South of the cultural and experiential axis that extends from the renewed waterfront to the west, passing by the distinctive cultural institutions of Alborg Castle, and the main library as well as Utzon Center, Music House and Nordkraft. Karolinelund is moreover within a close walking distance from the city's shopping mall Friis, which contains several shops, restaurants, hotels and offices and it is adjacent to the pedestrian central zone in the West. Many close residential complexes and areas, create a big diversity in the composition of visitors of the area. Øgadekvarteret's residents are the first visitors from South East, while in the direct East is located a still active large slaughterhouse. The diversity of functions that surround Karolinelund contribute to the relevance of the area in the future development plan.

TYPOLOGIES

The different functions spread around the area are also reflected in the prevailing architecture and typologies. The industrial character of the area is recognizable in most of the surrounding buildings, although the residential ones follow the more traditional expression typical of Danish houses. The highest buildings are the ones facing the fjord. The big industrial concrete buildings are between 40-60 meters. Their characteristic chimneys outstand as landmarks in Aalborg vertical profile. Nordkraft, with its rustic appearance, is also, together with the slaughterhouse, an expression, even if more refined, of the industrial style of the area. The residential buildings vary between 4 and 6 floors. Their construction it is mainly characterized by the use of Danish bricks contrasting with the thick window frames, occasionally swapping with some charateristic balconies. An additional different expression has to be observed in the buildings of the waterfront. The Utzon Center, as well as the university and the Music House, stand out of the crowd with their absolutely peculiar expression.



III.12 | Bus lines and stops

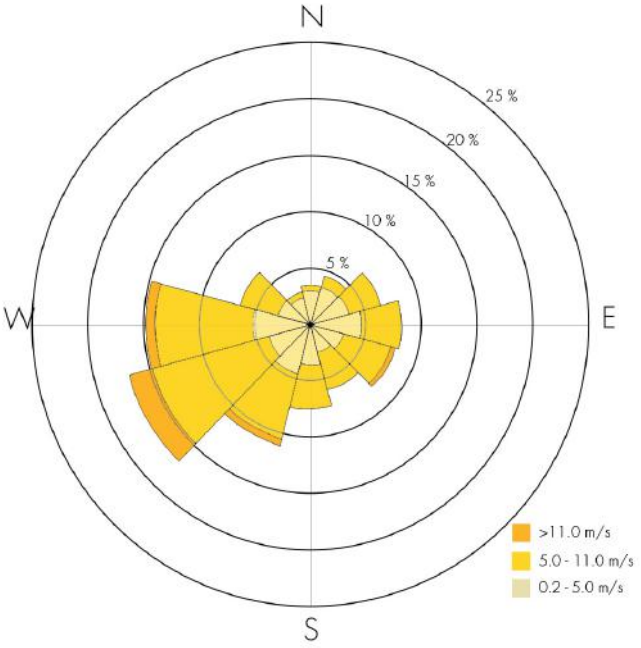
III.13 | Noise pollution

INFRASTRUCTURES

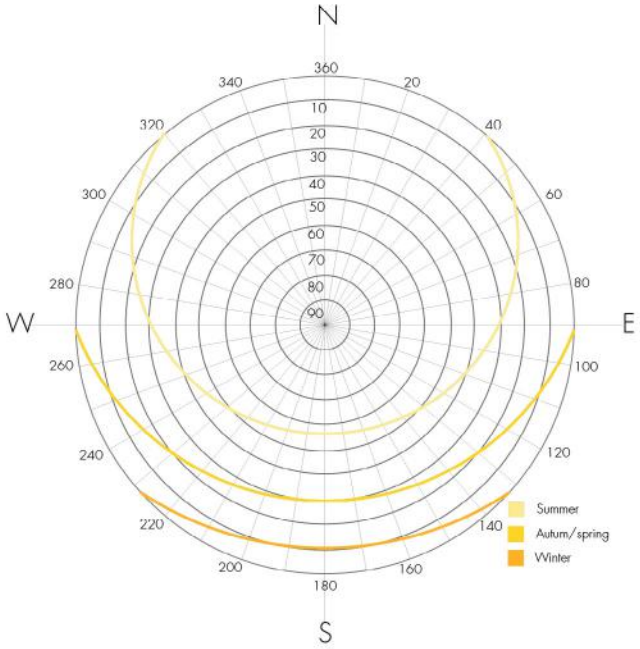
Karolinelund is located between the E45 motorway and the railway, well connected, therefore, to the infrastructural network. The area is easily reachable by car, that the visitors can park in the close public parking of Friis, and the main train station is only at a 15 minutes walking distance. Also the bus network around the area is quite extensive and many different bus stops are directly related with the plot. Walking and cycling paths are well located in and around the area, as it happens for most of the city area of Aalborg.

NOISE

Along the edge of Karolinelundsvej the noise, due to the traffic, reaches sometimes the 70 dB during the day. This is definitly something to consider when it comes to designing something in this area, as most of the residential, office and public functions have a limit of around 60 dB in the outdoor noise level. Anyway a number of different strategies can be applied in order to solve the problem. [Miljøministeriet, 2016]



III.14 | Wind rose



III.15 | Sun path

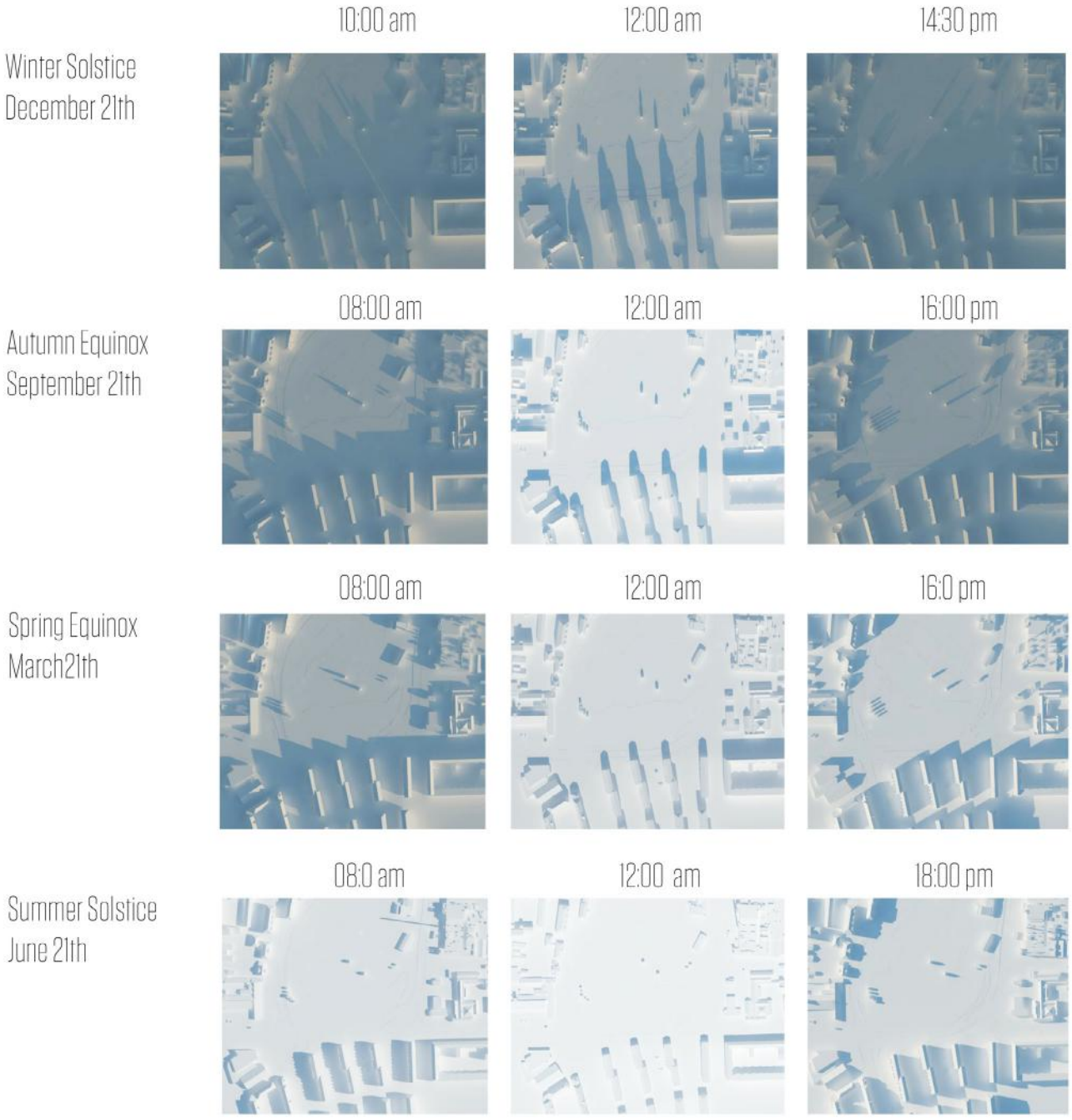
WIND

The predominant wind in the area blows from the west in most of the year, with the exception of October and November, when it mainly blows from the south. The wind's strength is relatively constant with few extreme fluctuations. The Average speed is 5,8 m /s. The high presence of trees partly absorbs the wind strength so that the area is anyway quite comfortable to live.
[dmi.dk]

SUN

The surrounding buildings in the area are mainly 4 storey high . This does not affect significantly the area in terms of shade. The trees are mainly the cause of shadows in the area throughout the day, but this kind of shadow, being natural and almost casual, it contribute to create a diversified experience, positively influencing the conditions of stay. The path and angle of the sun goes from 57º in summer to 10º in winter. The longest day goes from 4:25 to 22:19 while the shortest starts at 8:57 to finish at 15:49.
[Gaisma. com]

SUN ANALYSIS ON THE SITE



III.16 | Site sun exposure

CONCLUSIONS

From the analysis of the history, surroundings, and climatic conditions of the site, some main issues can be outlined and used for describing potential and needs of the area. The central location of the site, both from a geographical, functional and historical point of view, makes it the perfect place for the development of a new project, especially if related to cultural themes. The dynamic atmosphere of the site suggests, from many directions, the need for a platform (besides the existing platform 4, focused on musical and technological activities), hosting the already existing activities related to food. A market would therefore embody not only the actual local turmoil connected with such thematic, but also the historical popular spirit of the site itself. Moreover, this kind of new platform would match perfectly in the surroundings and with the branding directions of the city, providing to the local community, but also to the foreign visitors, a place for the displacement and promotion of local food and craft traditions in an area that is potentially becoming the cultural centre of Aalborg. The easy accessibility of the area, connected to many main infrastructures, make the site even more interesting for the design of such a building. The surrounding typologies and the previous presence of water in the site, suggest a particular attention when it comes to expression and building techniques.

The weather conditions represent from one hand a challenge and from the other hand a big potential for the site. The steady wind coming from west could be optimal for applying natural ventilation strategies inside the building. The high exposure to the sun generates from one hand the problem of the overheating, especially in a place for the sale of fresh food, but at the same time provides a potential for attracting and gathering people, and a good source of solar energy. The quite significant situation in terms of noise and pollution pushes towards the research of a natural or artificial screen to protect the area.

THEMATIC ANALYSIS

After the site analysis, a more detailed research on some specific themes, considered relevant for the preliminary approach of the design, has been done.

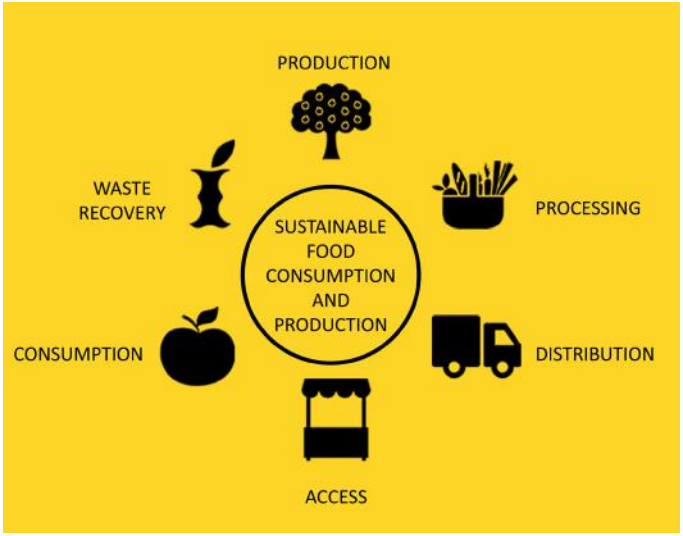
To start, the applied approaches towards sustainable food consumption and production have been investigated in order to design a space specially thought to express the needs of such approach and to provide efficient facilities to serve such purpose.

Afterwards, a research on the sustainable strategies adopted, when it comes to design spaces for the food sale, has been attempted, dividing the mentioned strategies into the 3 aspects of the sustainability: economical, environmental and social. It was also very important to consider the potential application of each strategy while designing.

Consequently, a more detailed study about Danish habits in the food sector, concerning both food consumption and specific current regulations to follow, led the analysis to a more specific approach of the design focus, providing the first numerical and normative data that will become the basis of the project.

Finally in the last chapter: Inspirations, a series of case studies has been selected and investigated. The picked projects to be analyzed respond to a specific criteria: the analysis of the different approaches adopted in three completely different European countries when it comes to designing a market. The reason of this choice has to be related with the provenience of the two designers that, coming both from southern European countries, have experienced firsthand the huge difference that stands out in the social and, consequently architectural meaning attributed to "a market" in the southern, central and northern Europe.
The case studies were therefore analyzed according to three key criteria: the architecture of the whole, the atmosphere inside of each building, and the sustainable approach to the design. Each of these aspects is considered an effective key for the understanding, and it will therefore be placed as a base for achieving an holistic and optimal design which will be capable of taking inspiration from each positive aspect highlighted and of avoiding the negative ones.

For this reason, at the end of the analysis of the inspirations, a series of final reflections, exactly on the pros and cons of each project, is presented and used as an additional starting point and a tool for the designing of the whole market complex.



III.17 | Sustainable food consumption and production

SUSTAINABLE FOOD CONSUMPTION AND PRODUCTION

Food consumption has become the object of many important discussions in the very last years, so much so that it represented the central thematic of Milan Expo in 2015. The reason for this is that food consumption and production are among the main causes of stress on the environment. This is due to the techniques used nowadays for the production, processing, transport and consume of food but also to the global demand of food that is constantly and rapidly increasing. In turn, the choice of food consumption from the consumers is influenced by factors directly connected with the production and sale of food, including food availability and food accessibility. Some changes in the production techniques are therefore not only needed but also indispensable for achieving an overall sustainable development. [fao, 2016]

As the High Level Panel of Experts on food security and nutrition (HLPE) says: "a sustainable food system (SFS) is a food system that delivers food security and nutrition for all, in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised". [afsic, 2007]

The development of a sustainable behavior towards the consumption and production of food has therefore a very important role in the current debate on sustainability. The sustainable approach has, in this sense, to be directed towards the integrated implementation of some specific techniques to be adopted in this process. It is very important to respect and keep in mind the capacities of natural ecosystems. This include a very serious consideration of all the aspects involved in the life of a product, from production to consumption. Sustainable diets and sustainable lifestyle embody in this way an answer to this problem, representing a very efficient way to manage food losses and food waste. These two aspects are directly related with the way agriculture is performed. Most of the essential goods we consume every day come from farms and this brings agriculture in a leading position in solving the problem. Sustainable agriculture should look for environmental respect, food diversity and local traditions preservation keeping, at the same time, high quality standards. The use of pesticides, fertilizers and the intensive use of farm land has to change as well as the way in which animals are treated in the system. The sale of the products also becomes part of the problem solving process, and is therefore essential, when it comes to designing a market, to keep in mind all the aspects mentioned and maintain a hard look on how to make a sustainable sale of products from the economical, social and environmental point of view. [Mary V. Gold,2016]

"Agricultural sustainability doesn't depend on agritechnology. To believe it does is to put the emphasis on the wrong bit of 'agriculture.' What sustainability depends on isn't agri- so much as culture."

- Raj Patel, The Value of Nothing: How to Reshape Market Society and Redefine Democracy , 2010-

SUSTAINABLE STRATEGIES

III.18 | Sustainable strategies

ENVIRONMENTAL STRATEGIES

The food consumption and production has a very big impact on the environment: water consumption and pollution, land use and soil degradation, biodiversity loss and GHG emissions are only some of the aspects responsible of this impact. The challenge is therefore to minimize in particular GHG emissions caused by the use of synthetic pesticides, fertilizers and transportation, as well as by the process of food packaging and conservation. [Lucia Reisch, 2015]
Some of the efficient strategies to contrast these problems have to be researched in simple daily behaviors both from producers, consumers and retailers. When it comes to the designing of a market, it is really important to think about how to minimize the environmental impact of the sale. 0 Km food is for example one of the very efficient strategies available in this sense. The concept, originated in Italy in the latest years, consist in the sale of natural local products which come straight from the local farms to the market place. The sale of local products instead of import products, it represent the best approach to minimize CO2 emissions due to transportations. Also the building itself should represent a sustainable strategy: the design of a zero energy building for the sale of local food it is the key for a very drastic reduction of the environmental impact of this process. The use of recycled and healthy materials must also be applied.

ECONOMICAL STRATEGIES

Organic food is most of the time associated with expensive food. The economic strategies must, for this reason, mostly be oriented towards the reduction of price difference. In this sense a very good example comes from one of the leaders in the Danish market: Coop. In 1993 Coop decided in fact to fully eliminate the sales-price difference between organic milk and conventional milk, thereby bringing about an early breakthrough of organic products in Denmark. The organization of "organic weeks" or "organic months" in which all organic products are offered with a price reduction of the full value added tax, is also a very good strategy applied. [Schmidt et al, 2009]
Coming to the markets, some other advantages can be obtained. The shortening of the sale process, eliminating some of the intermediaries between the production and the sale, can contribute even more (compared to the longer sale chain used in the supermarkets) to the price reduction of the products.

SOCIAL STRATEGIES

From a social point of view it is very important, in order to generate a responsible and sustainable behavior in the consumers, to involve them as much as possible in the sale chain. This can be implemented in different ways: the direct interaction with the seller and the range of different informative means, such as conferences, meeting or social events, stimulates the consumers interest encouraging them to be more careful and aware when buying a certain product.
The same principle could be applied in the process of designing the building of the market. The involvement of the local community, especially since it is particularly fond of Karolinelund's fate, would generate a feeling of belonging and deep involvement in the users and it would be a further encouragement to the use of the market and to a more responsible and sustainable consumption.

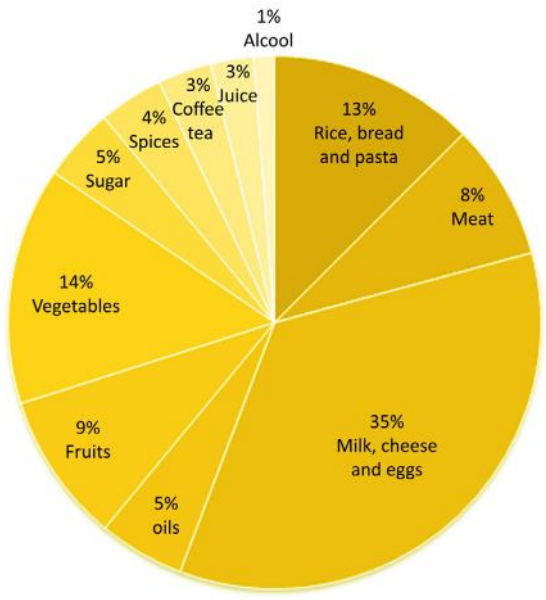
DANISH FOOD CONSUMPTION

The Danish consumption of food is mainly represented by the consumption of essential goods such as milk cheese and eggs, which alone accounts for 35% of the total food consumption. It is followed by the consumption of vegetables (14%) bread, pasta and rice (13%). Fruit consumption only accounts for 9% of the total consumption, and the meat and fish consumption for 8%. The rest of the total consumption is represented by oil and butter, spices, coffee and tea, fruit juice and alcohol. Particular attention should be paid to the consumption of sweets that only represents 5% of total because of the awareness-raising policies addressed towards a reduction in the consumption of sweets and sugary drinks. [Statistic Denmark, 2016]

Denmark is moreover one of the leaders in terms of organic consumption per capita. Around 5% of all food products sold in Denmark is represented by organic food. The reason for this has to be researched in the commitment of Danish authorities towards the building of a consumer confidence supported by a public organic control system from "farm to fork" and by the existence of a credible organic sector. [Ministry of food, agriculture and fisheries, 2012]

This is evident also at Karolinelund with the presence of the weekly food delivery activity: fødevarefællesskab [see page 14, The site].

These data and information are of primary importance for the choice of the type of products sold in the market and, accordingly, for an evaluation of the facilities needed for the sale and storage of such foods and products.



III.19 | Danish food consumption

FOOD REGULATIONS IN DENMARK

According to the Danish Ministry of Food, Agriculture and Fisheries there is no official regulation for storing and serving food in Denmark. Instead some suggestions about how to self regulate and proceed can be found in their website. In addition, a list of relevant food handling practices is provided. Generally sellers must be aware of good work practices, food safety, correct waste disposals and good hygiene practice. A regular control of temperature in products during storage, heating and cooling must be carried out in order to minimize the risk of serving potentially poisoning food. These good practices must be applied during the entire process of receiving, producing, warming and cooling, storing and serving food products. [Ministry of Food, Agriculture and Fisheries, 2015]

RECEIVING AND STORING PRODUCTS

During this phase, the risk of bacterial growth is relatively high due to the transport and storage of the food in the trucks. If, for example, chilled products are stored at inappropriately high temperatures, this may cause damage to the foods themselves. [Ministry of Food, Agriculture and Fisheries, 2015]

For this reason, when designing a market, it is really important to reserve an appropriate area for the delivery of products. This area should be a covered parking spot directly connected with the storage space in order to be able to immediately transfer the food from the track to a cold conservation space and to avoid that the transferred foods get contaminated by external agents.

PRODUCING AND SERVING FOOD

When a store also produces and sells its own food, it is really important to be careful that products do not contaminate each other. [Ministry of Food, Agriculture and Fisheries, 2015]

For this reason it is significant to keep in mind, during the design phase, the need to wash the cutlery and the crockery used in the production. Every stall, if the food will be produced directly there, should therefore be provided with its own sink. Since Also the temperature of the food served must be constantly kept under control, for this reason, depending on whether it is produced and served hot or cold food, it is necessary to equip the stalls with refrigerated and heated compartments.

INSPIRATIONS

Ill.20 | Santa Caterina Market in Barcelona

SANTA CATERINA MARKET IN BARCELONA

THE MARKET AS A PLAZA

Santa Caterina's market in Barcelona, designed by the architects Enric Miralles and Benedetta Tagliabue, has been, since its inauguration in 2005, one of the most popular icons of the Catalan capital. It is not simply a decontextualized market, but an architectural intervention and a urban regeneration complex for the inhabitants of the Ciutat Vella district. The design was developed in the context of the requalification of the old neighborhood market, designed in 1848 on the ruins of the convent of Santa Caterina. In the words of the designer herself: "the market of Santa Caterina originated from the design of the overlap of the different historical periods have occurred in the place. From the market square you can see the archaeological fragments of the different churches of St. Catherine ".
[Benedetta Tagliabue, 2011]
The building of the new market retains only three outer walls of the previous one, while the fourth, facing south, has been totally rebuilt. The new structure is independent from the static point of view, as it rests on seven pillars, creating a flexible space, adaptable to future possible changes in the layout. The new roof is similar to a bi-warp system composed of steel and concrete beams resting on columns made of concrete and steel tubes. On top of this structure are grafted irregular vaults in laminated wood and, on the exterior, wooden planks covered with multicolored ceramic which reproduce the giant picture of a fruit and vegetables Mediterranean stand. [Valeria Bormolini, Claudia Brunelli, Margherita Parati, 2008]

THE ATMOSPHERE

Only by experiencing the atmosphere of the Santa Caterina market it is possible to get an idea of its many features, for example by observing how it is experienced. Indeed it appears as an ideal space for social life. Comfortable rest areas, for chats between the neighbors of the district, are spread among the stalls, the bar or in the thematic restaurant "street food" which is also equipped with a "library". The two basement levels are a parking lot of 4800 square meters and a central pneumatic collection of mixed municipal waste; in the ground floor is placed a museum area for the accommodation of archaeological finds and a business area of 1600 square meters of which 40% is meant for stores, 30% for restaurants, while the remaining 30% is divided between distributive functions, a supermarket, a second-hand market and other spaces for solidarity activities destined to the inhabitants of the neighborhood. In the upper floor there are the management offices and even a multifunctional space for cultural events.
[Giovanna Barbaro, 2013]

THE SUSTAINABILITY

The architectural complex of Miralles -Tagliabue serves two of the three aspects of sustainability: at first the environmental aspect, preserving much of the previous market and of the archaeological findings, and secondly the social aspect, not only revitalizing a rundown building in an impenetrable neighborhood, but also adding new features in respect of the Mediterranean folk tradition, essentially based on the building of neighborly relations. The result is a square with facilitated access and contemplation but also a place of passage, with a lot of interconnected flows.
[Giovanna Barbaro, 2013]

MARKTHAL IN ROTTERDAM
THE MARKET AS A COMBINATION OF FUNCTIONS

This building is "a sustainable combination of food, leisure, living and parking, all fully integrated to enhance and make the most of the synergetic possibilities of the different functions." [mvrdv.nl]
The municipality of Rotterdam has announced, in 2004, a competition for the design and realization of a Market hall in Binnerotte square. The building needed to be a covered market, according to the stricter European rules that will not allow the open air sale of fresh and chilled food anymore, and it needed to increase the amount of inhabitants in the city area. MVRDV won the competition with the proposal of a mixed used building that cleverly combines housing, parking and a market hall. The hall is the result of the tilting of two slabs of private apartments in the shape of an arch. The covered space in between, acts as a proper market during the day and as a restaurant area after closing hours. Markthal is a building without a backside, therefore an important aspect is the distributive solution of the project. The entire supply for the hall, the shops and the restaurants is located underground. A court, in which the delivery can happen, is located in the basement, together with some supermarkets, storage rooms and shared bicycle rooms for the inhabitants. The delivery for the stores is organized through an underground tunnel leading to hidden elevators at Binnenrotte square. From the court, some elevators reach the market hall, so that the inhabitants are never disturbed by distribution activities that often happen in the early hours of the morning. Inhabitants can reach their apartments from the basement thanks to different entrances leading to elevators and staircases. Markthal represent an important impulse to its surrounding area and a strong contribution to the urban economy of the entire city. [Archdaily, 2014]

THE ATMOSPHERE

Markthal is a hybrid between a market hall and a housing project. The inspiration is clearly to be researched in the traditional open markets of Southern Europe with their location most of the time in public squares surrounded by residential buildings. In the Markethal it is possible to find many of the traditional elements of a market: the admixture of activities, smells, sounds and flows, create the dynamic and pleasant atmosphere typical of the markets. However, the search for a practical solution to the normative request of designing a closed market, gives to the place an additional value that makes it stand out from the classic southern European market and characterizes it as a new type of Central European market. This value is the background scenery, the orderly and regulated substrate of a building that, rather than exclusively undergo people, guide them into a stream of activities and organized routes, always keeping the attention focused on the balance between quality and price of the products sold.

III.21 | Markthal in Rotterdam

THE SUSTAINABILITY

The different functions in the building can exchange heat and cold, so that the combination of various functions itself makes the installation technology and the thermal performance of the building more efficient. For the hall itself, a comfortable interior climate with an extremely low energy use it has been achieved. The hall is in fact naturally ventilated through the glass façade that allows the fresh air to flow in, rise towards the roof and leave the hall through ventilation shafts in the roof. To make people aware of the sustainable efficiency of the building, an informative panel inside the market, illustrates the energy use and CO2 savings. Also the apartments are designed according to Dutch natural daylight requirements: all the living spaces are in fact placed on the outside, while the functional rooms are positioned at the market side, establishing a connection to the market. [Archdaily, 2014]

Ill.22 | Torvehallerne in Copenhagen

Ill.23 | Torvehallerne in Copenhagen-stall 4c

TORVEHALLERNE IN COPENHAGEN

THE MARKET AS AN EXPENSIVE GROCERIE'S SHOW

Torvehallerne market is located in Copenhagen's Israels Plads, a place that was once hosting a vibrant outdoor market, daily standing there until the mid-20th century. After many years of neglect towards Israels Plads, the square has been revitalized, conceiving a new public food market, designed by the Danish architect Hans Peter Hagens.

The market construction is very simple: two covered markets embrace a square for the carrying out of the outdoor market. The structure of the covered market connects the vendor stalls to the roof of the hall, generating an elegant and light triangulated system of steel tubes which supports the slightly pitched roof.

A linear skylight follows the whole length of the structure for the supply of daylight. The modules of the stalls can be used by a single vendor or be subdivided to accommodate up to four separate vendors. Each stall is designed independently and it has its own design style, characterizing the project with a combination of difference and repetition. The relation between the market halls and the plaza is a really important aspect in the Torvehallerne market. The trees of the outdoor area follow the same grid and rhythm of the steel columns of the market hall so that the users will be able to ideally relate one space to the other and move in a highly fluid space. The idea is also to highline the public character of the market, generating the feeling that it is belonging to the public street. From the other hand, the presence of the outdoor market brings a more diverse clientele to the market. [Chris DeHenzel, 2012]

THE ATMOSPHERE

Besides the concept of quality based on the organic, sustainable and locally-sourced food sold, and besides the idea of a farmer's market, one might ask whether this market functions or not as a real food market.

Torvehallerne definitely expresses the trendy character of the Danish capital, selling quality food at prices that are prohibitive for most of the inhabitants and the visitors but exposing them in an absolutely skilful, organized and appealing way. What brings the people inside this place is, therefore, not the extraordinary quality of the food but instead the marketing campaign hidden behind the beautiful and trendy appearance of the stalls. Not a farmer's market, but instead something more similar to a shopping mall or a chain shop, It transpires from the Torvehallerne's scenario. The atmosphere that generates inside, is nonetheless pleasant and succeeding. The market halls act as a covered square where the visitor can walk, holding a cup of coffee, surrounded by beautiful and trendy products.

THE SUSTAINABILITY

The sustainable aspect of Torvehallerne, is not to be researched in the structure itself but rather in the concept of the farmers market, selling only local and organic foods. The vision of the project has been to create a direct relation between small producers and their customers, through the use of small stalls of fresh food brought from all around the country. The products are seasonal and varied and therefore there is a rotation of products between the permanent stalls, housed in the covered market, and the temporary outdoor stalls that can be rented even for one day only. This market is in this way a very good opportunity to make known the excellent Danish products and to promote local production and short supply, crafts and responsible consumption .

REFLECTIONS

Aalborg is a city in turmoil from the point of view of markets; several temporary open markets are present in the city throughout the year. Some examples of this are: Grønttorvet in Agade that hosts a green market each Wednesday and Saturday between 7 and 2 o'clock. The square in Nørresundby that lends its space to a green market every Friday between 8 and 5 o'clock and Gammeltorv hosting temporary Markets(e.g. Christmas market, Asian food Festival, both yearly). However, no permanent indoor market exists within the city. By choosing three completely different European Market layouts it shows diversity as well as inspiration for the further design of Karolinelund's Cargos. Despite Denmark having a growing interest in this type of building, the country has not yet found its own expression in unified market planning. Inspiration in this regard must therefore be sought from countries where the tradition of markets has been rooted for centuries.

However, these examples will be used only as inspiration and a more careful development of this topic will be addressed towards finding a completely Danish expression to be given to this traditionally Mediterranean typology.

The comparison between the different types of market designed in the three European areas analyzed, leads to a reflection towards the architectural, social and sustainable qualities of each solution. This reflection takes into account the different climatic, social and normative conditions of the countries in which the buildings are located but at the same time, outlines the main virtues of the designs in order to make them easily available as inspirations when designing Karolinelund's Cargos. For this purpose a table divided into qualities, awareness's and design aspirations is displayed.

	Santa Caterina Market	Markthal	Torvehallerne
Qualities	• Regards towards the historical surroundings • Pleasent space for gatherning and interaction of people • Good mixture of functions • Close interaction between sellers and clients	• New impulse for the surrounding and the city • Good indoor environment and presentation of the sustainable aspects to the users • God mixture of functions • Airy architectural spaces, suitable to host many users	• Elegant and simple nordic expression • Well organized and clear exposition of goods • Good interaction between outdor and indoor spaces
Awarenesses	• The outlined good qualities of this project are largely attributable to the Latin and open culture of the country and to the climatic conditions, favorable for most of the year. • The historical presence of the old market contribute to the success of the renovation keeping the tradition of the place itself.	• The particularly eccentric architectural expression is responsible for much of the quality of this project. However it should be noticed that such a whimsical style would not be appropriate in a country like Denmark, voted to composure and simplicity. • Having a mix of too many different functions in one enclosed space, could lead to confusion and mess and it could contribute to a loss of identity.	• Much of the order and elegance in the product arrangement is given by the rather high economical target of themarket, which allows to invest a greater attention to details such as product's display. • The indoor qualities are compromised by a low ceiling that compress the space contributing to a claustrofobic feeling during crowded days. • Despite the good architectural relation between inside and outside, the social qualities are not completely fulfilled due to a too sharp separation between the functions.
Design aspirations	• Host the spirit of Karolinelund and the industrial and traditional expression of the close surroundings trough the architecture • Designing of equipped open spaces for social gathering • Implement the mediterrean vibe trhough the design of common spaces and public spaces, promoting people's interaction	• Designing a new iconic building for the city of Aalborg • High ceilings and well designed wide spaces • Clever accomodation and distribution of different functions	• Honesty in the use of materials and in the structural design • Clear division between the stalls and unified overall expressions • Well defined paths • Flexible connections between covered and uncovered spaces, taking into account the variable climatic conditions

III.24 | Table 1 - Inspirations reflections

“You can design and create, and build the most wonderful place in the world. But it takes people to make the dream a reality.”

- Walt Disney -

03

DESIGN APPROACH

WHY?

Ill.25 | Karolinelund activities in focus

DESIGN FOCUS

After analyzing the site (focusing on user urgent needs and visitors wishes) and drawing inspiration from the case studies, a design focus is formulated, explaining the reasons of the interest of this project in the site location and in the kind of functions chosen. This focus is therefore presented, outlining and extrapolating from the analysis the reasons of the site's choice and those of the facilities to be designed.

SITE'S CHOICE

From the site analysis carried out, it is clear that Karolinelund represents, for Aalborg, a strategic point of innovation and expansion. In particular the site, with its hybrid location between the residential city and the park, is considered by the designers, whom as inhabitants of the city experience it every day, the perfect starting point for a turnaround in the use of the park itself. The proposed design offers therefore a suggestion for the transformation of the park from Sunday meeting place for families and friends, to green pulsating heart of the whole city.

ACTIVITIE'S CHOICE

Among all the evidence of abandon and, at the same time, of self-management of the park, three user groups have been found out to be in urgent need of a designed place to carry out their activities. Those three groups of people are what the design of Karolinelund's Cargos will mostly be addressed for.

1 | Workshops

Some workshops currently using Platform4's tool shop, need to be expanded as well as provided with better work conditions.

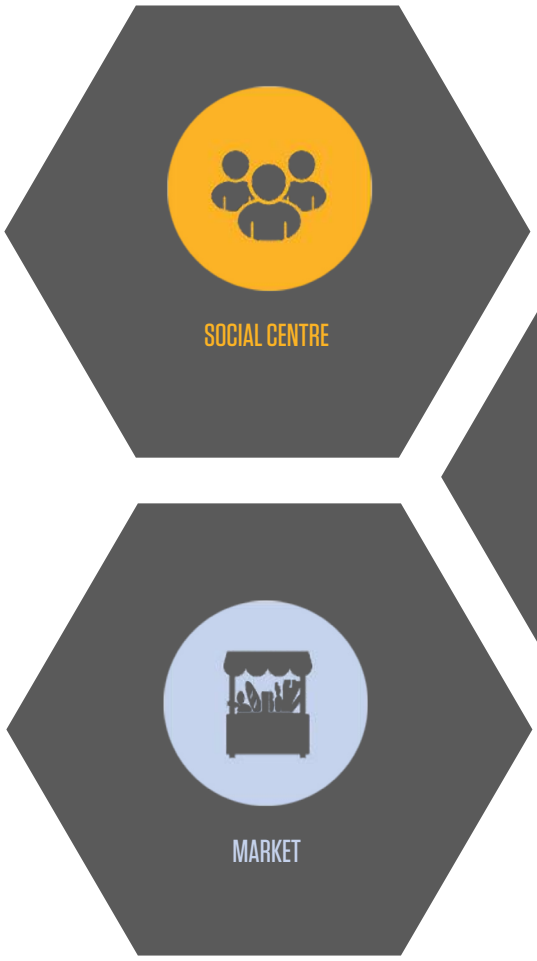
2 | Community gardens

An area placed on the west side of the park is dedicated to the urban gardens, where people grow their own vegetables in boxes placed outside. Due to the adverse climate during Winter, this community gardens have almost no activity and it is evident the total absence of people during that period.

3 | Fødevarefællesskab

The existing food distribution association, currently using Platform4's terrace, every Wednesdays afternoon.

WHAT?



Ill.26 | Facilities to be futher developed

Ill.27 | Cargos's Sustainability

FUNCTION'S DEFINITION

For all the reasons just mentioned, the following facilities will be designed with the main goal of give a sustainable, holistic and efficient answer to the outlined needs. Each of the function presented will therefore express one of the three aspects of the sustainability. Social responsibility, economic prosperity and environmental conditions will, in this way, be holistically approached.

A Social Centre will invite people to learn and share, providing space for the existing workshops and for other social activities. This building will represent a place for the social interaction and will, for this reason, embody the socially sustainable aspect.
A Green House will instead answer the need for a place of the existing community gardens, avoiding the absence of activities related to farming during winter.

This will generate a sense of collaboration and environmental respect and empathy that will represent the environmental sustainable aspect. The grown products will subsequently become part of the sale chain hosted by the next presented function.

A market, considered the central point of the design, will represent not only the architectural solution to provide a space for the existing just mentioned fødevarefællesskab but also a more complete answer to the high need of the city for a reference place for the purchase of fresh, organic and local products.
This last building will consequently become symbol of the economical sustainability.

HOW?

III.28 | Cargos's Distibution

III.29 | From container to content

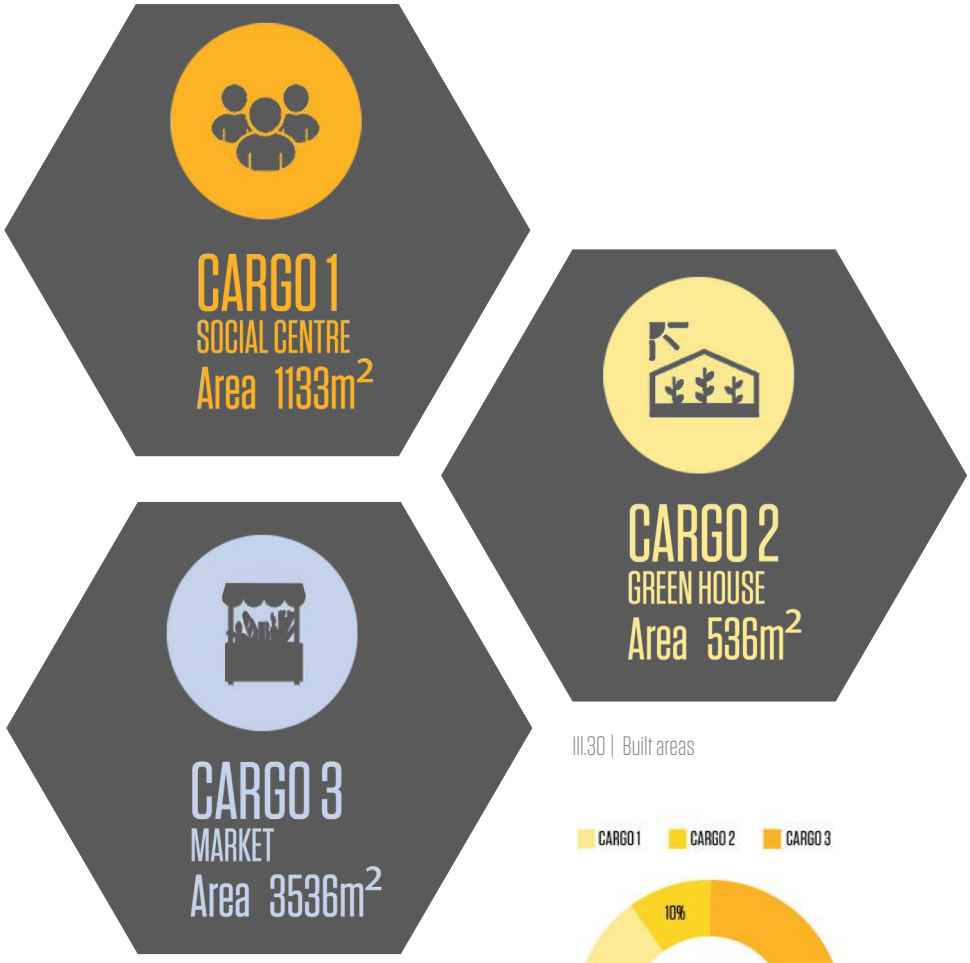
EXPRESSION

The whole design development will take in consideration, as a base for design choices such as layout distribution, urban spaces and final aesthetics, some of the themes raised in the subject analysis, including social diversity, connections and accesses, future development, potential flexibility, public and urban spaces, climate and sustainability.
Moreover, the final expression of the complex, emulating the industrial look of Aalborg harbor history and holistically interpreting the sustainability, will arise metaphorically from the CARGOS definition, literally meaning "goods or merchandise conveyed in a ship, airplane, or vehicle".
The reasons and meaning of this choice are here better explained by the concept definition.

CONCEPT

From transportation to final consumption, a circular process could be provided by reusing the materials involved in this process. Goods, usually arriving packed on pallets inside containers, will be then displayed in the containers themselves, turning the transport material into a construction material. By simply making the containers habitable, providing option for cooking, storing or displaying, the containers themselves will acquire immediately a new meaning. In this way the goods become the content of the same container that ideally brought them to the spot.

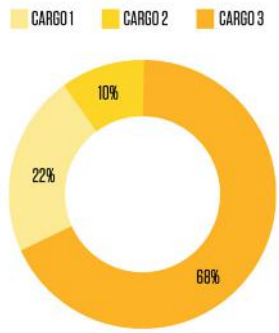
HOW MUCH?

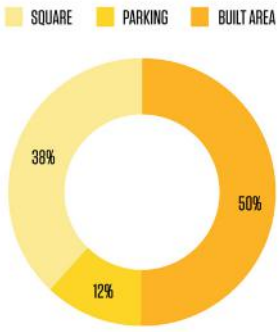


III.30 | Built areas

PERCENTAGES OF BUILT AREA

The primary focus of the design is the development of Cargo 3.
The Food Market will in fact represent the heart of the project, covering in this way the majority of the built area, meaning the 68% of the total area.
The two other functions, in the features of Cargo 1 and Cargo 2, will represent instead respectively the 22% and the 10% of the total built area.
The whole complex, with a total extension of 5205 m2, is approximately going to occupy the only 50% of the total site area (10390 m2). The remaining square meters are represented by designed urban spaces in the guise of: parking spots, both for bicycles and cars (12% of the site area) and a public square (38% of the total site area).





III.31 | Percentages of built areas

GENERAL PROGRAM OF FUNCTIONS

As already announced, the program will allocate three separate but integrated zones: Cargo 1, Cargo 2 and Cargo 3. The "Cargos" will embody the three different contents of the market and are here presented more in detail.

Cargo 1 offer to the users a multifunctional hall and a workshop for the integration of the community. For meetings, or to cover logistic and administrative needs, a meeting room and some offices are also be provided. The social sustainable approach is in this way achieved.

On Cargo 2 a green house will challenge people to participate. The users are here invited to grow vegetables, fruits or herbs, having in this way the opportunity to learn, share knowledge or simply distract the attention from the daily routine, through the practice of productive and directly eco-friendly activities . This cargo, therefore, is the one based on environmental sustainability.

Cargo 3 finally hosts the market and its related functions. Temporary and permanent stalls are available depending on the needs of each user as well as kiosks and restaurants. Rooms for display, storage of goods and allocation of technical equipment are also provided. A central open courtyard acts as the heart of the market. A large food court is also provided as a recreational space to eat or to enjoy. This cargo represent in this way the economically sustainable approach of the project.

The combination of all these functions lead to the realization of a sustainable holistic design that integrates and interprets the diverse and variegate character of the area, increasing at the same time the social interaction.
The coexistence of the mentioned functions in a relatively small area, ideally decreases, moreover, the commuting distances, resulting in a lower level of greenhouse gas emissions.

Zones	Spaces	No. (containers)	TotalArea (m²)	Comments
CARGO 1	Info point	1 (small)	11	Reception & information about activities related to the market
	Welcome Hall	10 (small)	145	Public cloakroom & lounge space
	Staff Hall	2 (large)	55	Staff cloakroom & lounge space
	Offices	3 (large)	80	For market administration and organization
	Meeting rooms	3 (small)	50	For meetings about the market
	W.C. & Showers	6 (small)	74	Both for public and staff use
	Bar & Kitchen	2 (large) & 1 (small)	69	Both for public and staff use
	Workshops	6 (large)	164	Creative workspaces
	Multifuntional hall	1 (large) & 7 (small)	140	Only open on special occasions
	Storage	3 (small)	46	Including space for garbage storage and collection
	Distribution	6 (small)	83	Multiple use
	Terraces		216	Green rooftops
	TOTAL CARGO 1	37(small) / 12(large)	1133 m²	
CARGO 2	Kiosks	4 (small)	44	Place for convenient shops
	Storage	4 (small)	44	For GreenHouse tools storage
	Green House	10 (large)	280	Vertical general gardening
	Distribution	12 (small)	168	Multiple use
	TOTAL CARGO 2	20(small)/10(large)	536 m²	
CARGO 3	Temporary Stalls	14 (small)	175	Temporary rental spaces for multiple purposes
	Permanent Stalls	12 (large)	336	Permanent food stalls
	W.C.	6 (small)	80	Market public use
	Kiosks	6 (small)	80	For Take Away products
	Courtyard		193	Outdoor space
	Food Court Mezzanine	15 (large) & 49 (small)	1120	Sitting area on top of Market First floor
	Petanque Recreational Area	2 (small)	28	For petanque supporters and associates
	Storages	3 (large) & 9 (small)	201	For petanque equipment, market mantainance and stalls
	Technical areas	2 (small)	26	Allocating technical equipment
	Distribution		1297	Multiple use
	TOTAL CARGO 3	88(small)/30(large)	3536 m²	
PARKING	Loading Area		87	Goods delivering area
	Bike Parking	104 spaces	250	Public use
	Car Parking	80 spaces	920	Public use
	TOTAL PARKING AREA		1257 m²	
	TOTAL CONTAINERS (No.)	145(small)/52(large) =	197	
	TOTAL BUILT AREA		5205 m²	
	TOTAL SITE AREA		10390 m²	

III.32| Table 2 - General built areas

Ill.33 | Containers architecture

04

SUSTAINABLE APPROACH

III.34 | Electricity and Water

THE 3R's PRINCIPLE

Global warming, deforestation and earth pollution ask for the research of an effective and fast way to be applied in everyday life in order to solve these problems. An answer to this statement comes from the formulation of the 3R's principle, developed over 50 years ago. The three Rs principle stands for Reduce, Reuse and Recycle and each of these steps has to be considered in order to minimize and delay materials entering the waste stream. Products manufacturing and transportation involve, indeed, resources consumption, gradually leading to a poorer environment. [nrdc, 2011]

These three simple steps represent therefore an effective and easy approach for the avoidance of overconsumption. Nowadays the 3Rs are increasingly seen, in architecture, as a framework for conducting high quality design with the focus on developing alternative approaches, but they can be applied in every aspect of our daily life, including food consumption. A more detailed presentation of the principle is here performed.

REDUCE

To "reduce" is the first and most effective step of the principle to be applied. Using fewer resources, in the first place, has the objective of minimizing the amount of what will eventually become waste. [nrdc, 2011]]

In architectural terms and in the specific case of a market, the principle can be applied in several ways. A list of possible approaches is here presented:

- Sell goods produced locally in order to reduce the energy used for transporting them to the market
- Avoid goods and building materials whose extraction or processing are especially damaging for the environment
- Avoid the sale of overly packaged goods
- Reduce the water use, both in the construction and in the operation of the building
- Prefer the use of low energy demanding appliances and equipments

Ill.35 | Container and Pallet

Ill.36 | Lego pieces and Recycling

REUSE

The "reuse" concept, keeps new resources from being used for a while longer, and old resources from entering the waste stream. [nrdc.org - 2011]]
The choice of appropriate construction materials and technologies should directly be related to the availability of skills and materials in a particular region. In this way not only the overall building cost can be kept low but the building itself would be a result of the growing interest towards environmentally friendly aspects.
In designing Karolinelund cargos, the principle of reuse will be applied. Reusing materials already available around the site area, the intention is, on one hand, to make the envelope materials interpret the expression of the surroundings and on the other hand to design a sustainable and environmental friendly building in all its aspects. The use of waste as a construction material will moreover hopefully arise the people's consciousness and interest towards the building.

RECYCLE

To "recycle" is the last, but not for this less important, principle to be applied in the process. Architecturally speaking a quite efficient way to apply the recycling concept is to take in consideration, when designing, every phase of a building's life, including design, construction, operation, and end of life. In other words: building for disassemble. This means, in practical terms, that the architect should design flexible and temporary buildings able, after the hosted function becomes obsolete, to be readapted or completely reused. All the materials selected for the construction and all the building techniques should therefore take in consideration this principle. Dry construction, visible joints, healthy materials and standard dimensions of the constructive elements should be preferred in order to keep assembly simple and separable.
The reason for doing this, correspond to a great vision for the future: " that one day cities and infrastructure will be built in a way that acknowledges their ephemeral nature and designed into their first life the ability to build a second."
[lineshapespace.com]
For all the reasons mentioned until now, the design of Karolinelund's Cargos will be performed with the use of reused and recycled standard dimensioned materials.

III.37 | Pop Brixton

SHIPPING CONTAINERS

Shipping container architecture gets a lot of encouraging coverage in the design world as a trendy green alternative to traditional building materials [Brian Pagnotta, 2011]. It is definitely an intelligent option, considering the abundance of containers abandoned around the world, as it costs more money to do a return journey rather than leave them in the delivery destination.

Apart from being environmental friendly and cost effective, (due to its materiality and modular shape) a container is also durable, stackable, cuttable, movable, affordable and an easy and fast material to find, transport and retrofit.

Another advantage is that no foundations are necessary when building with containers and, although the labor required for constructing with this material is quite specialized, the overall building expenses are still lower than conventional construction.

Being structurally resistant to harsh environments, the containers most of the times also contain a number of harmful chemicals used to protect them from ocean rough weather conditions. If that is the case and to avoid any type of contamination, the surfaces must be cleaned, abrasive blasted and re-painted. [CNN, 2008]

THE POP BRIXTON EXAMPLE

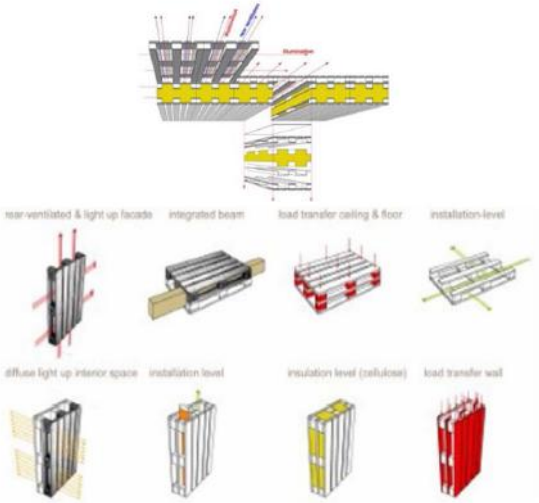
Hosting mostly local food, retail and design enterprises, this project, made entirely from shipping containers, works with and for the local community. Based on volunteering, the social spirit of this project is emphasized by the presence of functions that facilitate the people interaction like a greenhouse and some multifunctional spaces for the carrying out of the events. The project also allocate a local radio, gardening activities and different workshops for the reintegration of ex-offenders, vulnerable people in need or job seekers.

III.38 | Pop Brixton module plan

Backed by the council, the plan simply englobes shipping containers stacked on top of each other, flowing around a central dinning area. Their hefty and industrial look, underlines the low cost solution, but also surprises how well they thought out space inside, with originality and warmth. [Phil Hernden, 2015]

Each container is fully insulated and the safety is also approached by the choice of keeping the secure container's well sealed door.

Inside, and to protect each container from potential health damage, they were retrofitted mostly with fiberboard. Double glazed windows, lighting coming from the wooden ceiling and two power points are also available on each. There is no doubt that using containers for building purposes is a healthy thing to do for the environment, but can also be unhealthy for the humans usage. This project successfully shows how containers can have a unique new life, inspired by Brixton local community, but also shows how to be aware in order not to compromise the health and safety of using such material, by adopting good renovation techniques and a clever choice of materials. [Phil Hernden, 2015]



III.39| Pallettenhaus

WOODEN PALLETS

The pallets are platforms made of wooden planks, used to facilitate the movement of goods. As it happens with shipping containers, not all the pallets are reused for further transport cycles, as organizing a return trip for the empty pallets is more expensive than buying new ones. For that reason pallets are extremely easy to find. Despite the fact that pallets are light, they are also very resistant to heavy loads.

Therefore it is the ideal component to build flexible and modular buildings, adaptable to different climatic regions around the globe. [Alberto Mesa, 2012]

Different insulation materials should be chosen considering the climate where the building is constructed. In a dry hot climate for example, the use of sand and cheap plastic elements for heating and cooling should be considered, while in a cold climate the choice of cellulose and glass panels for insulation are more convenient.

THE PALLETTENHAUS EXAMPLE

Gregor Pils and Andreas Claus Schnetzer, both Austrians, materialized the idea of building a house out of pallets, named Palettenhaus. It is a 60 square meters house consisting of 800 recycled pallets, costing about 5 euro each. These two young Viennese have understood that pallets, holding universal standard measurements, are low cost, easily portable, available everywhere and they found essential to reuse them rather than burnt or dispose them away.

In this prototype sited in Brussels, the glass wool panels provide thermal insulation of the structure. A ventilation system provides winter heating and summer cooling of the house, with very little energy used: about 24 kWh / m2 per year for heating, a parameter still further improved.

For domestic use rainwater it is recovered at the roof and stored in a tank, to be used for the toilets or to water the plants in the garden. The Palettenhaus, meant to be used as a first aid station, housing for needy families or as a temporary accommodation for the displaced, has been ranked number one in the European sustainable architecture competition GAU: DI (Governance, Architecture, Urbanism: a Democratic Interaction), and it was exposed, until 24 September 2011 at the Venice Biennale of Architecture, when it was moved to Brussels. [Rinnovabili.it, 2008]

NEARLY ZERO ENERGY BUILDING

The Danish building regulation goal is, by 2050, to reach independency from fossil fuels. The modern challenge of Architects and Engineers is therefore to provide buildings able to support this goal as well as possible. For this reason, also the design of Karolinelund's Cargos will try to be as close as possible to the Zero Energy standards on an annual basis.

A Zero Energy Building, whose abbreviation is ZEB, is in few words a building that produces as much energy as it consumes. Good levels of comfort and minimal energy requirement are the main goals of a ZEB. A nearly zero-energy building is defined as "a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby" [EPBD, 2014].

With the aim of achieving this, the building will be optimized as much as possible in terms of passive strategies, before resorting to the active strategies to balance the energy level.

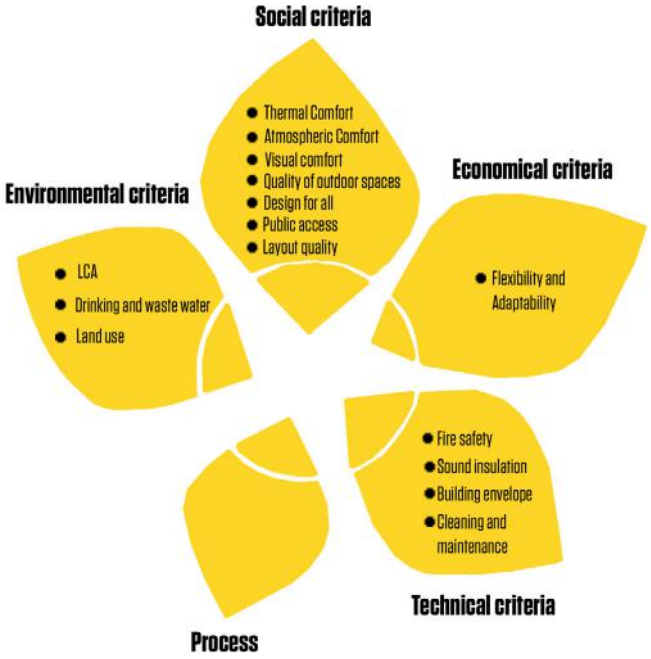
Different kinds of Zero and Nearly Zero Energy Buildings can be further defined starting from this basic assumption. Regarding the origin of the energy used in running the building for example, it is possible to list different approaches of the building. In the case of Karolinelund's Cargos, a Net-ZEB will be designed. In this way the building will be connected to the grid with the possibility of exchanging energy with it.

Some specific tools will be used in order to ensure the achievement of the mentioned goals. Be15 will be used to calculate the energy consumption, making sure to come as close as possible to the BR2020 energy requirement standards of 20 kilowatt hour per year maximum. BSim will, on the other hand, be used for the simulation and calculation of thermal indoor climate, energy consumption, daylight conditions, natural ventilation, moisture and electrical yield from building integrated photovoltaic systems.

The designing of a nearly zero energy building will in this case, not only satisfy the environmental and political Danish requirements, but it will also be part of the concept itself. The goal of designing a space able to invite the people to a journey through the sustainability will indeed be supported and even embodied by the sustainability of the building itself, ensuring design coherence to the whole project.

DGNB CRITERIA

The DGNB scheme it is a voluntary scheme, originally developed in Germany, based on the performances of the building during its life-cycle. An holistic and flexible approach is carried out to define some criteria to take into consideration when designing a sustainable building. [Steen Larsen, 2015] In the design of Karolinelund's Cargos, the following selected criteria are specified and will be used as design parameters and guidelines for the project.



III.40 | DGNB selected criterias

ENVIRONMENTAL CRITERIA

LCA

The Life cycle assessment (LCA) is a tool used to quantify, and therefore help to reduce, the environmental impact of a building's construction from the material production, to the construction and refurbishment, operation and maintenance, demolition and removal and disposal. [Le Dréau, 2015]

Considering the kind of materials that will be involved in the construction of the market and the constructive methods that will be taken in consideration, LCA will be used in this project as a supple-

mentary tool for the understanding and directing of the responsible and aware design decisions.

DRINKING AND WASTE WATER

The natural waste water treatment is one of the most efficient, eco-friendly strategies that can be applied in a building. From its simple reuse, numerous consequent aesthetical and functional benefits can be observed. For this reason, the grey water from the building and the rain water will ideally be collected, going then through a cleaning treatment process in order to be able to reuse it a second time for watering vegetation on site and flushing toilets.

LAND USE

The choice of the project site considers the criteria of the land use from the very beginning. The currently abandoned area is a green field victim of neglect and carelessness. For the project, the area will therefore be cleaned and arranged, offering in exchange a sustainable building and a new attractive face.

SOCIAL CRITERIA

THERMAL COMFORT

The thermal comfort is the experienced temperature satisfaction in a building. This involves: the mean radiant temperature (in other words the temperature that a person would feel), the humidity and the air flow.

There are not detailed specifications for what the temperature inside a market should be. However the reference parameters of the Danish standards for Department store will be used. The inside temperature of the market should therefore not surpass 25 C° and not drop below 16 C° throughout the year. According to the same standards, for the offices and the conference rooms present in the project, a temperature between 20 and 26 C° will instead be maintained. The design strategies and the kind of passive and active strategies chosen will be applied referring to these parameters in order to constantly control the temperature inside the building.

ATMOSPHERIC COMFORT

The atmospheric comfort, differently from the thermal comfort, is defined as the perceived air quality in a space. Smell and moisture are the key factors responsible for this perception as well as the more measurable parameter of the CO2 level (which should never surpass the value of 850ppm). The level of usage and the kind of activity performed in the space are the ones directly affecting the atmospheric comfort. Considering the amount of people and the activities carried out in a market, the atmospheric comfort will be a very important parameter to keep in mind when designing. The recommended ventilation rates for a Department store, considered as a non-low polluted building, is set as 3,6 l/s,m2.[Danish standards]

This value will be used as the reference while designing the market. Also in this case, several passive strategies can be applied in order to achieve a good atmospheric comfort, before starting implementing the mechanical ventilation. A building layout to ensure cross and stack ventilation will therefore be designed. Finally, mechanical ventilation will also be applied, as necessary.

VISUAL COMFORT

The visual comfort is the perceived quality of light in a space. In order to allow people to perform visual tasks in an efficient and accurate way, an adequate amount of clean natural light (without glare and blinding) should be provided and supported by a good artificial light design. The daylight factor is the key factor when it comes to natural light. It is expressed as the percentage of the internal light in relation to the external light level and it is measured in Lux. According to Danish regulations, the daylight factor of half a living space should never undergo 2% DF. [Danish standards]

The visual connection between an indoor space and an outdoor one is also very relevant as a positive impact on the users, especially when designing big public spaces. For this reason both the "measurable" and "unmeasurable" visual goals will be taken into account in the design.

QUALITY OF OUTDOOR SPACES

Considering the current use of the area, directly related to outdoor activities, and the meaning of the site for the whole city, the importance of designing outdoor spaces of good quality is evident. Both in regards the city, that would largely benefit from this approach using the outdoor area, and in regards the building that will in this way become more attractive and appealing.

DESIGN FOR ALL

A sustainable building worthy of respect, especially if it is a public building, must be completely accessible to ensure that disabled or elderly people and parents with kids, can have free access to the

building without running into barriers of any kind.

PUBLIC ACCESS

The accessibility of the site in terms of public transports, cycle, pedestrian and car paths, should be ensured in order to facilitate the integration and usage of the area. This aspect is additionally crucial when designing a market, since it could have a big impact on the economy and the success of the market itself.

LAYOUT QUALITY

The quality of the layout, as well as any other aesthetical aspects, should be placed in a leading position in order to meet the expectations and needs of users and they should never be overshadowed or compromised by the desire of achieving the technical aspects as well as the other mentioned aspects.

ECONOMICAL CRITERIA

FLEXIBILITY AND ADAPTABILITY

The economical flexibility of the building is a very important parameter to consider when designing a new function especially in an area that did not host any function for long time. The design of the market, with its use of recycled materials, will take this criteria as a personal challenge. The modularity of the containers will give as a result a high flexibility for the market itself and will ensure the adaptability of the project to future potential functions.

TECHNICAL CRITERIA

SOUND INSULATION

Highly effective sound insulating materials should be applied in the design in order to reduce the sound pressure of the surroundings in the building , to meet the expectations of users and to ensure acoustic comfort. In addition to limiting the penetration of the sounds coming from the outside, it is equally important to ensure a good sound quality inside the building by avoiding possible reverberations or rumbles due to the high utilization of the building.

BUILDING ENVELOPE QUALITY

The building envelope surfaces of the building (glazed facades and walls) are continuously exposed to exterior sun radiations and cold. Therefore it should be well insulated in order to minimize the heat gains and losses due to high solar exposure and cold bridges.

CLEANING AND MAINTENANCE

The cleaning and maintenance of the building must also be taken into account during the design phase. Special areas and facilities for the collection and separation of waste, produced both by users and by the functions carried out inside the building, should be integrated in an efficient, functional and aesthetically appropriate way.

FIRE SAFETY

Fire safety practices are intended to reduce the damages caused by fire. Fire safety measures to prevent the ignition of uncontrolled fire, and to limit the development of a fire after it starts, should be applied in the building in order to ensure public safety.

III.41 | DGNB selected criteria pyramid

DGNB FOCUS HIERARCHY

After the choice of the main criteria to be used in the design was attempted, a pyramid of the criteria themselves it has been developed. The pyramid is used as a graphical mean to highline a hierarchy of importance and priority in the appliance of the picked criteria. At the end of the report, a reflection on the criteria that have been achieved during the design will be performed.

"...urban markets involve kinetic flows of bodies, emotions, goods, sounds, temperatures, smells, finance, psychologies, ideas, discourses, fauna, flora, waste, and, and, and ... co-constritutive relationships (productive, restrictive, and potential) are formed with architecture, institutions, regulations, policy models, and city infrastructure. "

- Evers Clifton, Informal Urban Street Markets, 2015 -

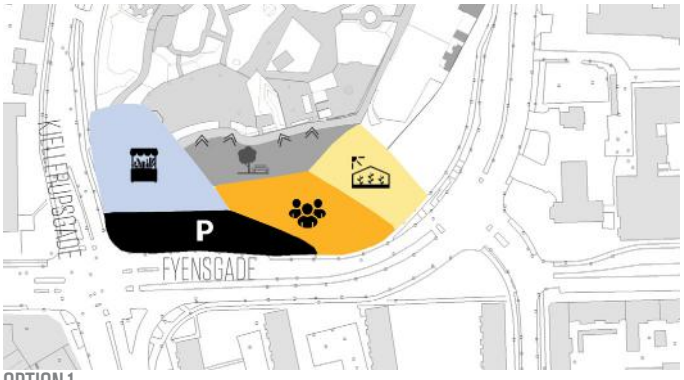
05

CARGO'S DESIGN PROCESS

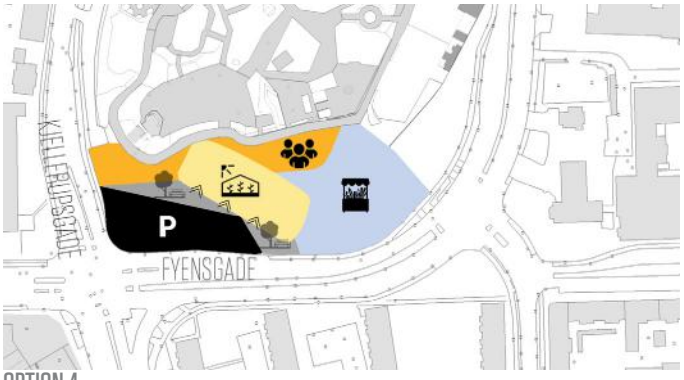
CARGO'S URBAN DISTRIBUTION

The design process started with approaching the placement of the three cargos in the site. This operation was pursued having always in mind that the final layout should invite Aalbornians to the park and make their experience attractive. Moreover, it has always been an aspiration to make the project as permeable as possible in order not to block the view and to keep a low profile of the final footprint. Integrated sustainable principles were also always kept in mind in the testing of the different variations.

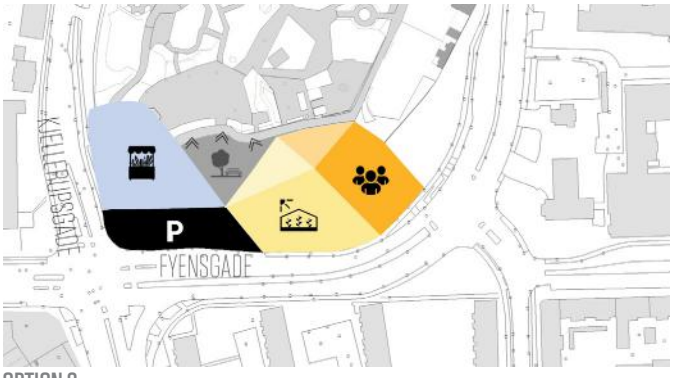
Here five diagrams showing different zoning allocations are presented, followed by a S.W.O.T. analysis pointing out strengths, weaknesses, opportunities and threats of each solution in order to achieve the best design .
The urban distributive solutions have been considering the placement of 5 main elements: the three cargos, the public square and the parking.



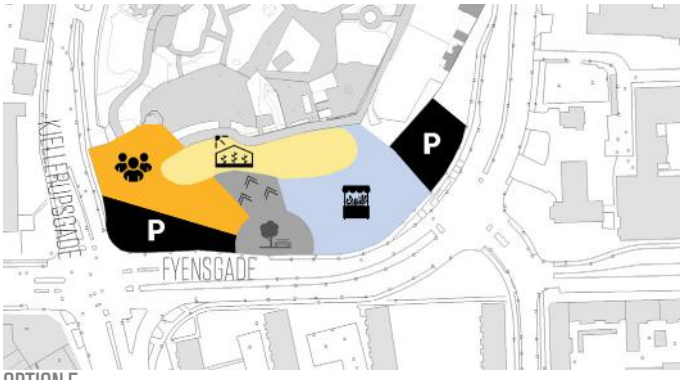
OPTION 1



OPTION 4



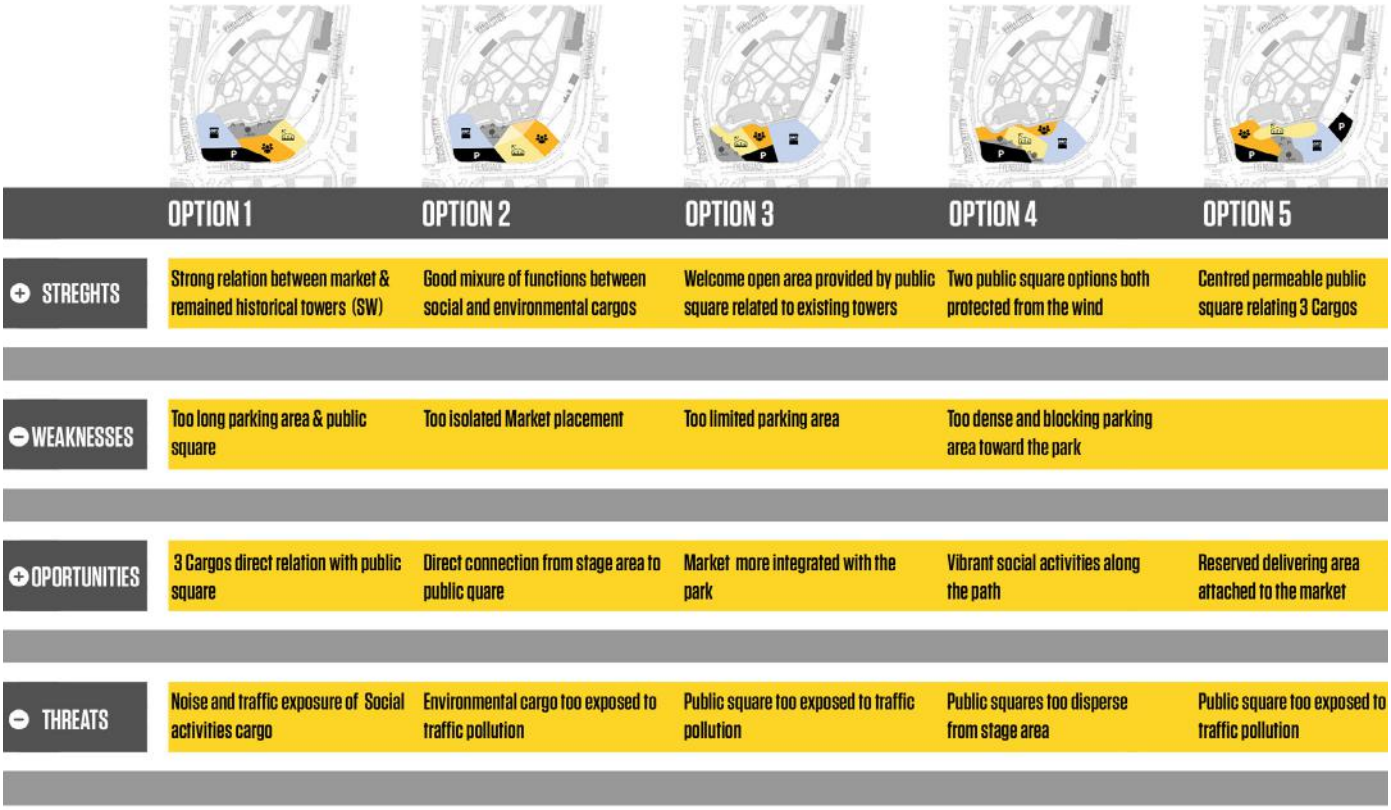
OPTION 2



OPTION 5

OPTION 3

III.42 | Cargo's distribution



III.43 | S.W.O.T. analysis

S.W.O.T. ANALYSIS

The fifth option presented was the most appreciated of the five, not only because it displays two different parking zones in both sides of the plot, allowing users to decide where to park and ensuring urban accessibility, but mostly because it well interpret the desire of inviting people to the park, thanks to the placement of a welcoming open plaza in the middle. In this way the overall design is converging in this central meeting point, around which all the other functions are placed. Cargo 1 to the left, attached to the historical remaining towers, so to emphasize the already existing social feeling. Cargo 2 lifted in a horizontal passage that will allow users to contemplate the view to the park and to grow food taking advantage of the height and, therefore, of the sun exposure. Cargo 3 on the right exploiting the strategic position, close to the main street (Karolinelundsvej) for an easy and accessible delivery of the goods.

After proceeding with the SWOT analysis of the shown distributions, a more detailed development of the functions, involving volumetric studies and urban expression, was developed. This new iteration has been approached having in mind the wishes for site and users, previously declared in the design focus paragraph (page 34) and being inspired by the case studies analyzed (pages 28-31) .
Three volumetric and functional options are therefore presented in the following pages,outlining urban, architectural and sustainable qualities and disadvantages of each.

COMPACT OPTION

URBAN

- ⊖ Urban view obstacle
- ⊕ Same Aesthetic language of 3 cargos

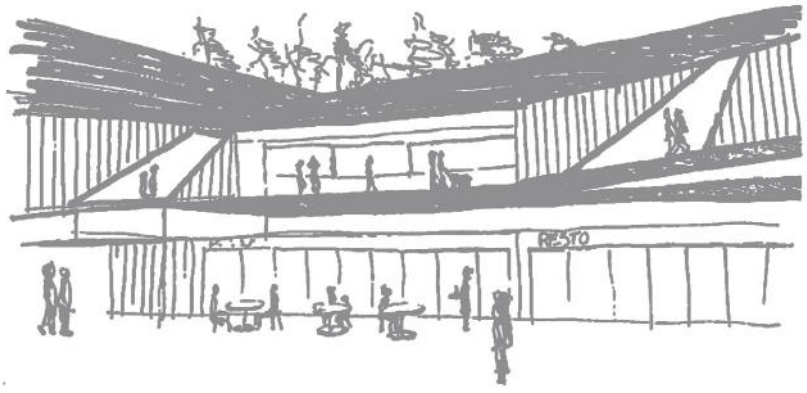
ARCHITECTURE

- ⊖ Heavy and dense expression
- ⊖ Shopping center feeling
- ⊕ Organized layout
- ⊕ Strong expression
- ⊕ Highly connected functions

SUSTAINABILITY

- ⊖ Energy losses due layout configuration
- ⊕ Small footprint
- ⊖ Potential dark architectural spaces

III.45 | Plus and minus aspects

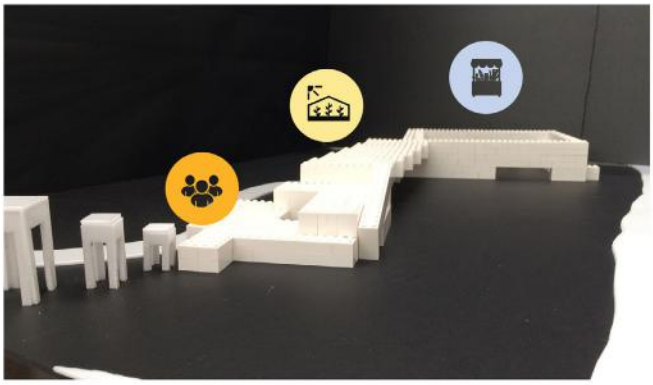


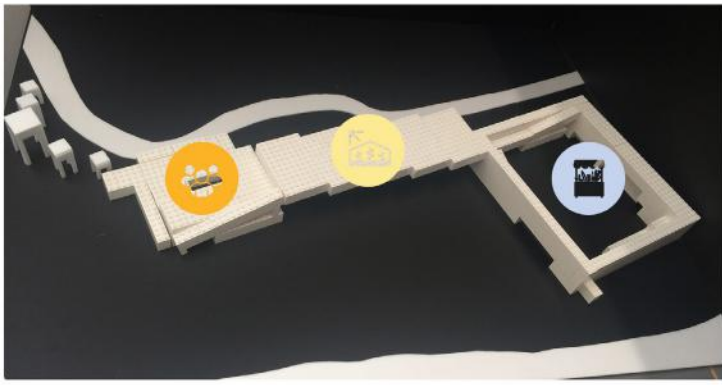
III.44 | Internal courtyard ramp atmosphere

The compact option is volumetrically one of the strongest, yet most heavy of the three options.
It is developed with the intention of creating an unitarian expression that would clearly merge the three different cargos, highlining the primary focus on the market through the design of a slightly different look. The functions will moreover have ensured, in this way, a high level of connection and interaction.
Nonetheless, precisely this compactness that is the basis of the design principle of this proposal however, also results, in certain respects, deleterious. The urban view is indeed obstacled in most directions by the presence of such an heavy construction. The continuous closed ramp that serves (from the internal courtyard) the whole market building, gives to the user a strong "shopping center-feeling".
At last, the presence of such a big courtyard in the middle of the market would generate a high value of heat losses through the envelope, representing therefore a low energy efficient solution.

III.46 | Compact option Master plan

III.47 | Compact option lego models





GUIDING OPTION

URBAN

- ⊕ Integrated with the surroundings
- ⊕ Journey experience
- ⊕ Different 3 cargos aesthetic language
- ⊕ Visual transparency
- ⊕ Permeability

ARCHITECTURE

- ⊕ Strong guiding lines
- ⊕ Clear distribution
- ⊖ Weak articulation of functions
- ⊖ Difficult access up to bridge

SUSTAINABILITY

- ⊖ Potential wind tunnels
- ⊖ Large footprint

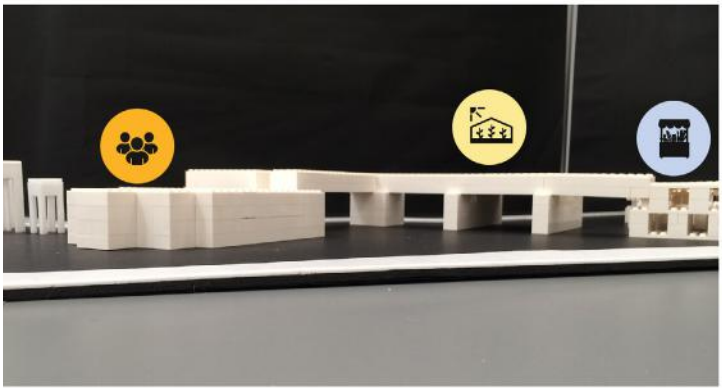
III.49 | Plus and minus aspects

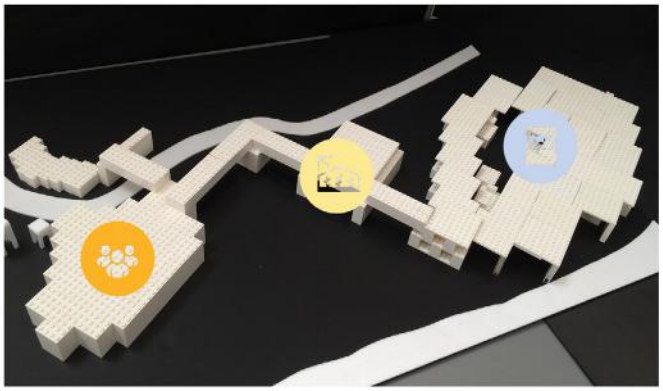
III.48 | Market aisle atmosphere

The guiding option has, as a primary intention, the wish to design a complex able to address the user in its journey through the buildings and the urban areas. In this case a different expression of the three cargos has been researched.
This design choice is in fact supposed to help the urban visitor to immediately recognize the different functions being in this way guided. A great attention towards the integration of the building with the surroundings has been given. This is pursued ensuring visual transparency and permeability of the design.
Even though the urban and architectural aspect greatly benefit from the so outlined configuration, some weak points can be found, for example, in the difficult access to some of the facilities, resulting from a maybe too light connection between the market and the social centre. The large footprint of the market, goes moreover against the principle of "good land use" stated as a goal to be achieved in the DGNB pyramid (III.41). Finally the strong axes, needed to emphasize the guiding feeling, would potentially result in urban wind tunnels.

III.50 | Guiding option Master plan

III.51 | Guiding option lego models





SPREAD OPTION

URBAN

- ⊕ Obstacled view towards the park
- ⊕ Explorative journey
- ⊖ Potential urban dark corners
- ⊕ Surrounding ´ s interpretation

ARCHITECTURE

- ⊕ Hygge feeling
- ⊕ Diverse atmospheres
- ⊕ Easy connection of functions
- ⊕ Surprise effect

SUSTAINABILITY

- ⊖ Potential dark urban spaces
- ⊖ Small courtyards sheltered from the wind

III.53 | Plus and minus aspects

III.52 | Market diverse atmosphere

The final proposed option, consist in the research of a more spread expression, able to transform the previously mentioned idea of a journey, into an interesting experience able to interpret the outlined diversity existing in the site.

For this reason, both at an architectural and urban level, the so called "surprise effect" has always been researched.

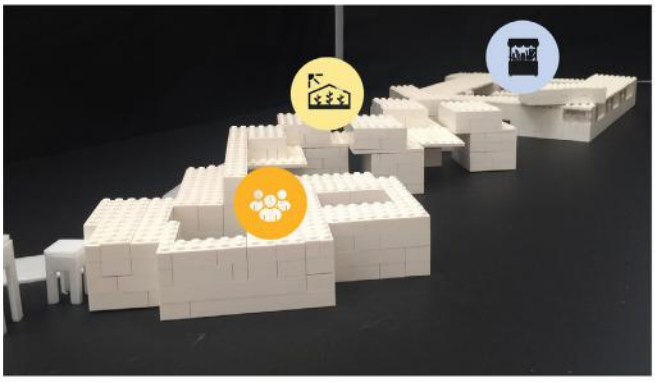
The final layout configuration of the proposed option, also appears to be a good solution for the easy connection of all the functions.

Interesting and intriguing small courtyards proposing always different views to the visitor, will also provide pleasant urban spaces, sheltered from the wind.

However, the narrow, short routes and the small courtyards that are created at a urban level, result in being dangerous for the potential generation of dark urban spaces both in terms of safety and in terms of actual light.

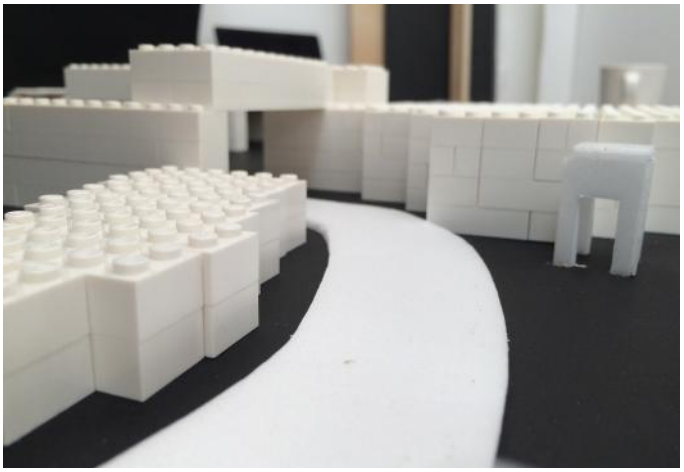
Ill.54 | Spread option Master plan

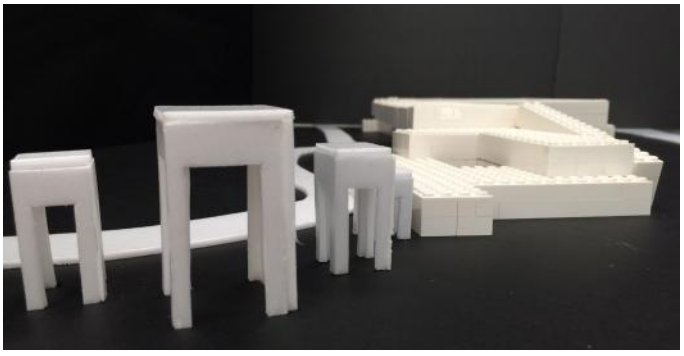
Ill.55 | Spread option lego models

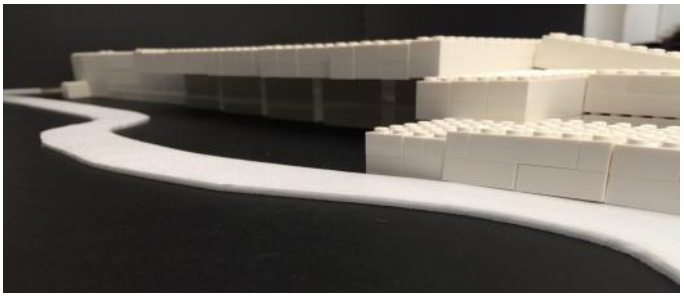


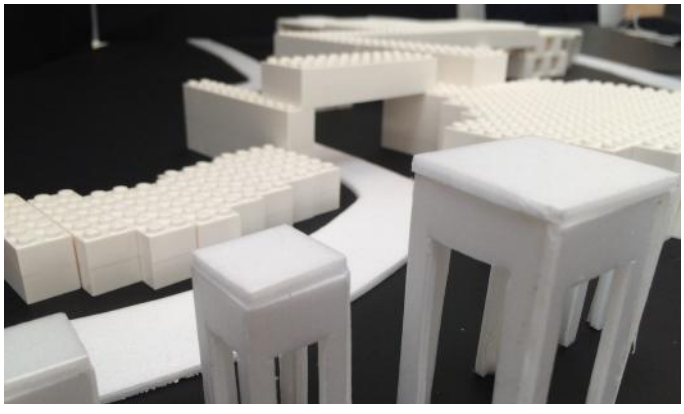
VOLUME STUDIES

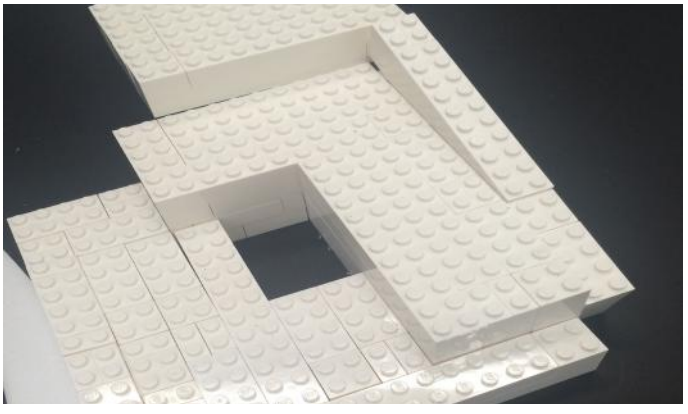
Despite none of the three just mentioned volumetric representations of the Cargos fulfill the aspiration wished, all of them present good qualities that are developed in order to combine all the advantages of each in a potential aggregation that appeals to all.
Lego pieces were the tool used to study the volumes of the building through the whole design process.
Some of the studies are here presented.







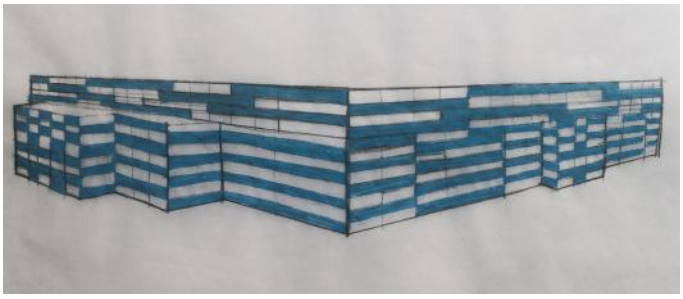




III.56 | Different iterations with lego piece

FAÇADES STUDIES

Having the flexibility always in mind, the facade solution represented in this project one of the biggest issues to be solved. The design of the openings had indeed to answer, as well as possible, the need of a good expression in the repetition and assembling of the module. Before finding a satisfying final solution, different façade expressions have been tested in order to find the perfect dress for the whole complex.
Three main orientations of the windows have therefore been explored.



Ill.57 | Horizontal windows façade sketch

HORIZONTAL WINDOWS

One of the first attempts made was to divide each edge of a container in equal segments and apply an horizontal window on the so configured grid. The result is a longitudinal effect that emphasize the already quite strong horizontal expression. This test resulted in this way not satisfying enough, since the objective of the facade would be to create an interesting, dynamic effect instead.

Ill.58 | Squared window façade sketch

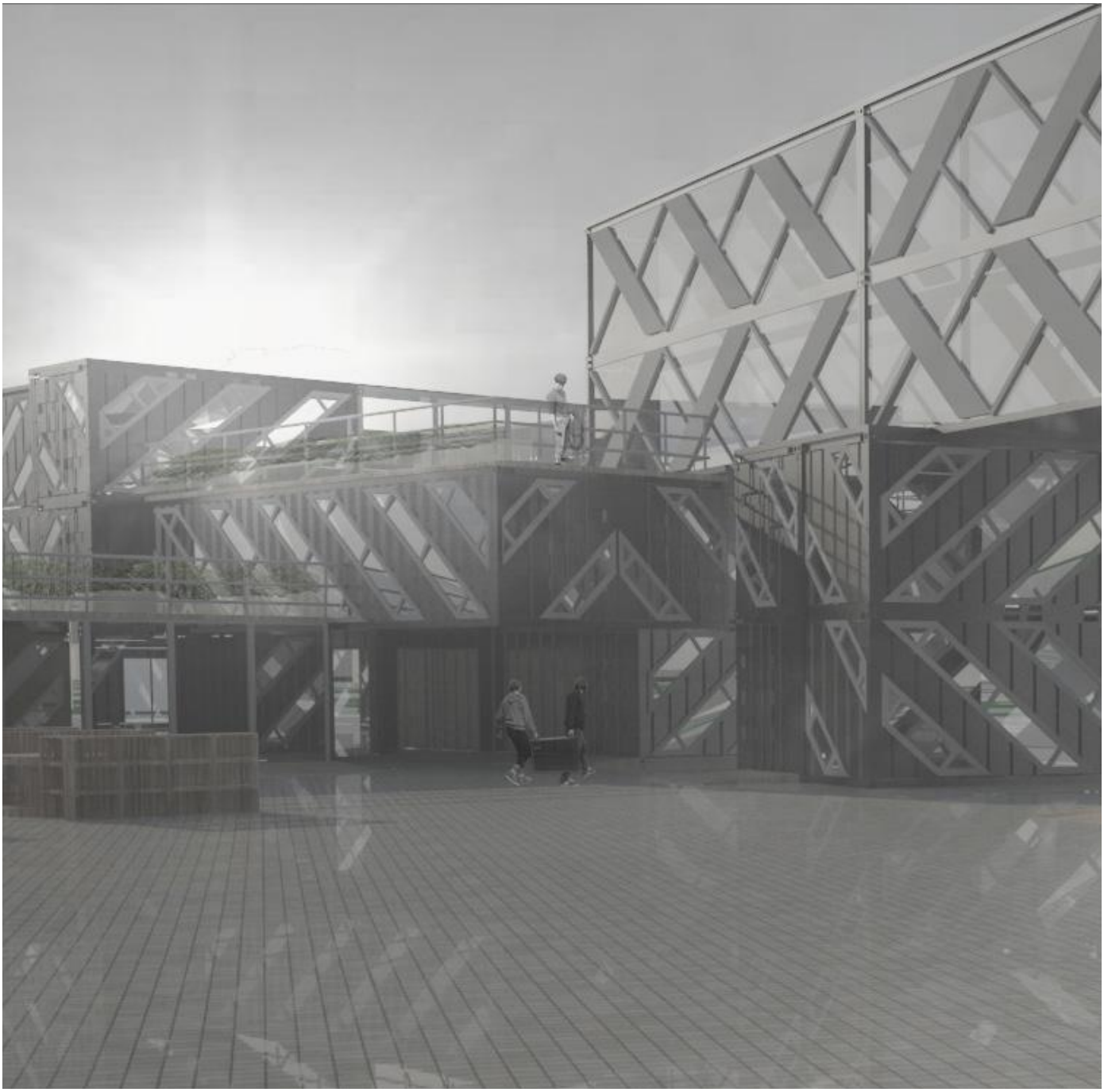
SQUARED WINDOWS

Another try has been made taking advantage of the square shape of the frontal plane of each container. This has been directly substituted with a squared window. The resulting facade is a rhythmic expression that does not help the reading of the whole volume and that does not reflect the variegated internal functions.

Ill.59 | Diagonal windows façade sketch

DIAGONAL WINDOWS

The last study is the one finally applied in the project. It is a combination of the previous two ones (used to express specific internal functions) plus a third new attempt. The diagonal windows, again applied after the design of a grid on the container itself, generate an interesting and dynamic expression that, even if based on a repetitive principle, intensify the special qualities of the design and extrapolate an iconic overall expression from the rhythm.



III.60 | Cargo 1 entrance view from the public square

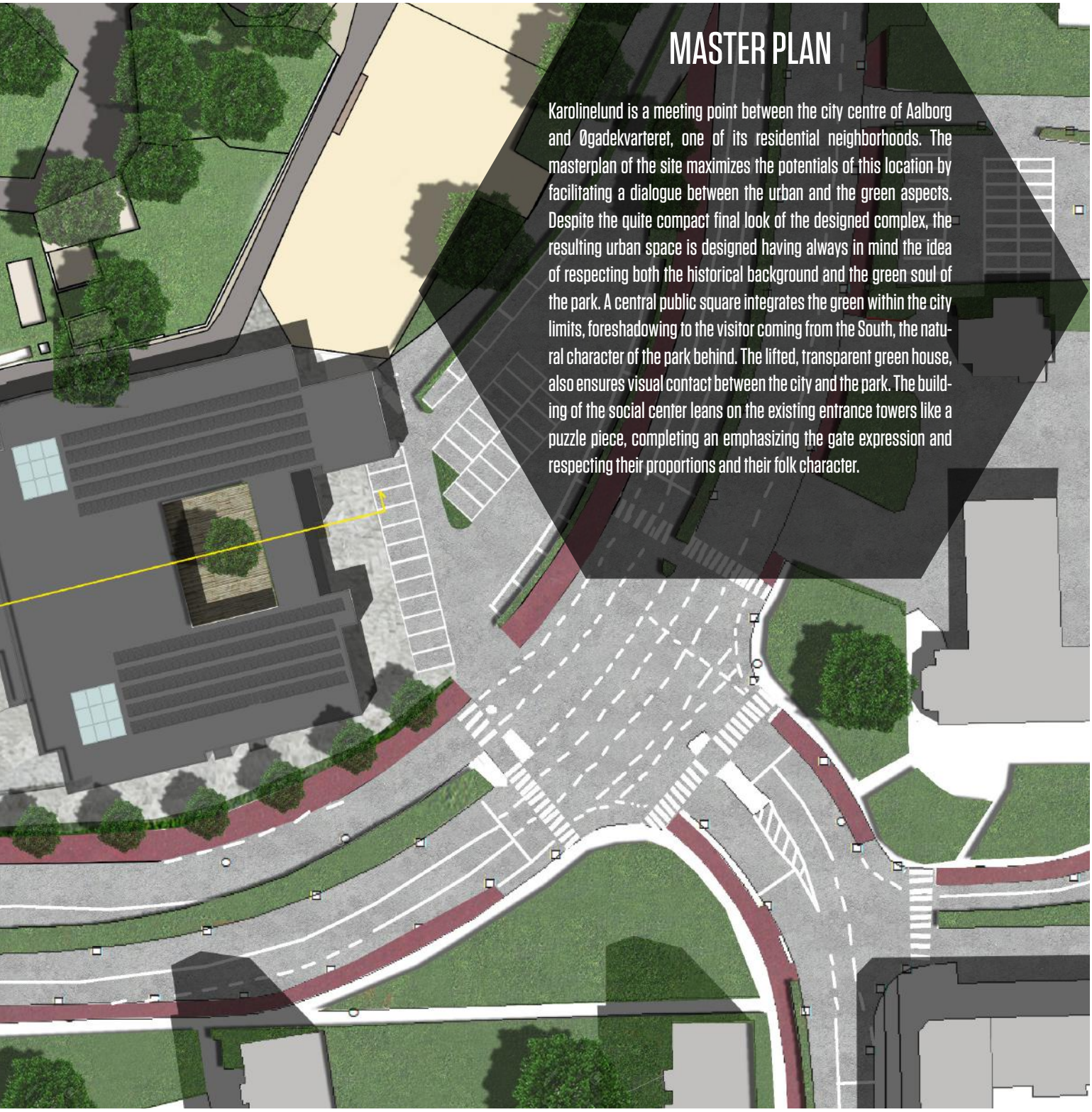
06

PRESENTATION

III.61 | Master Plan

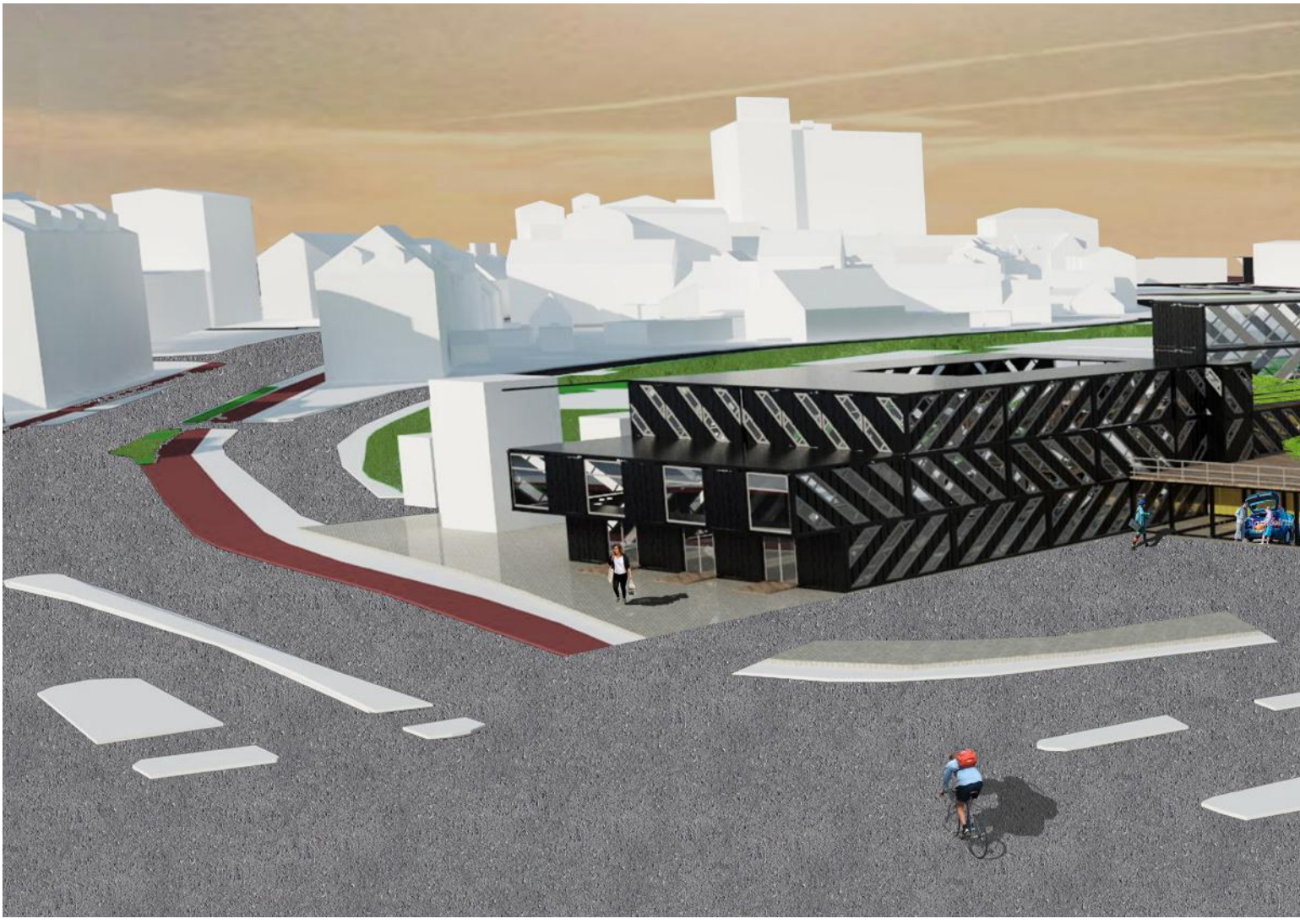
MASTER PLAN

Karolinelund is a meeting point between the city centre of Aalborg and Øgadekvarteret, one of its residential neighborhoods. The masterplan of the site maximizes the potentials of this location by facilitating a dialogue between the urban and the green aspects. Despite the quite compact final look of the designed complex, the resulting urban space is designed having always in mind the idea of respecting both the historical background and the green soul of the park. A central public square integrates the green within the city limits, foreshadowing to the visitor coming from the South, the natural character of the park behind. The lifted, transparent green house, also ensures visual contact between the city and the park. The building of the social center leans on the existing entrance towers like a puzzle piece, completing an emphasizing the gate expression and respecting their proportions and their folk character.



URBAN SPACES

A special initial attention has to be given to the designed urban spaces.
The connectivity through the site is ensured and strengthened by the presence of the central public square that works as a meeting point as well as a welcoming area towards the park.
Pedestrian are guided through the plaza, that links the Aalborg's east residential area and its city center. This journey is made interesting by the many different ambiences and facilities distributed around the complex. This aspect ensure a high level of walkability through the site also offering an attractive, flexible and humble space for the interaction of people. The flexibility of the plaza has to be found in the different look that can assume depending on time, day of the week and season, turning, from time to time, in a noisy market place, in a vibrant open air bar or in a quite and pleasant crossing point. The square is configured as a smooth plane, sometimes paved, sometimes green, but always in continuous transformation. Early in the morning and late at night, it is possible to walk around in the empty square, enjoying the sound of the wind passing through the central vegetation. Once a week the square takes instead life, becoming the headquarter of the temporary market, especially in correspondence of the outdoor area adjacent to the Cargo3. During summer days, the bar located within the building of the



III.62 | Aerial visualization

community center, opens its large windows and offers the opportunity to enjoy the square from a new perspective, enjoying, for example, a cool drink, sitting on the outdoor tables.
The urban accessibility to the site is embodied and ensured by the presence of two large parking spaces, adjacent respectively to the social centre and to the market. The separate placement of the two parking spaces facilitates the approach to the site, offering to the visitor the possibility to choose, depending on the activity that needs to carry out, one or the other spot.
Many bike parkings are also available for the user.

THE SOCIAL CENTRE

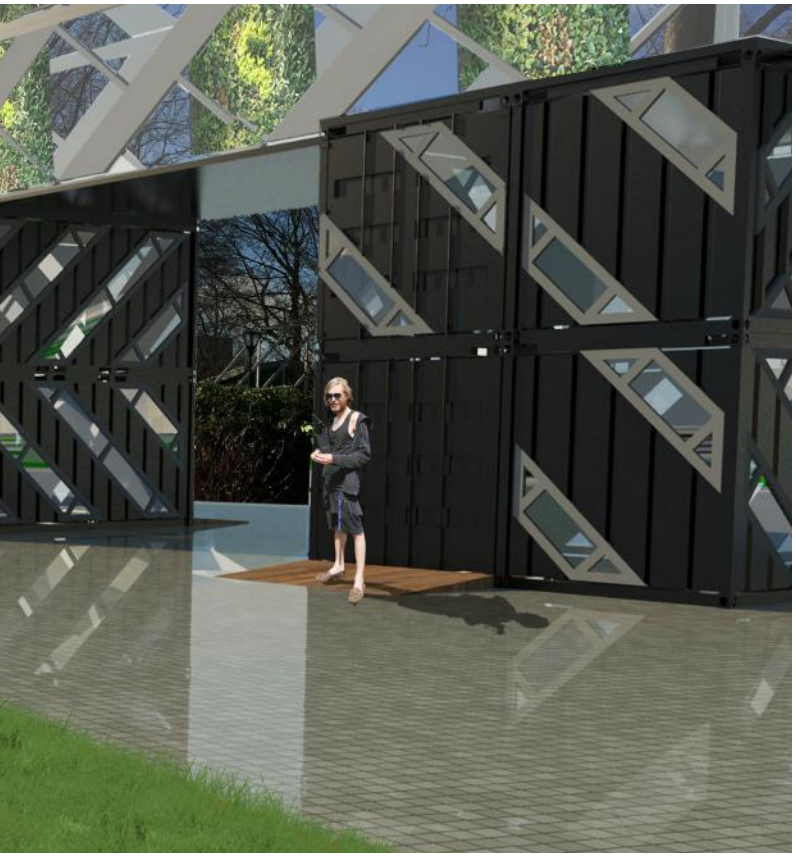
The social centre of the project is the first configured Cargo.
Attached to the preexisting historical towers, it is proposed as a new welcoming area to the park, giving new life to the towers (currently cordoned off and representing the entrance to the park) and suggesting a new alternative portal which is proposed as an entrance to the entire complex. Inside the community center, take place at the same time the administrative functions related to the management of the entire complex and a service of social functions for the users.
While entering the park from the referred historical towers, the visitor is also invited to look right, where Cargo 1 appears. Attached to the first tower, takes place an info point, where is possible to receive information and details about activities, opportunities and events offered by Karolinelund's Cargos, without entering the building. The access to the building is instead divided into two entrances. The first one serves the administrative wing of the building and is therefore reserved to the only staff. Here employees can perform office tasks on the ground floor, while a meeting room is located on a mezzanine overlooking those offices.
The access to the public wing of the building is instead possible in two points. The first one of these is placed near the staff entrance, while the other one is placed on the opposite side of the building, facing the square. In this second part of the building it is possible to take advantage, on the ground floor, of the presence of some workshops (allocated in a double ceiling space) and a bar which is also addressed towards the square.
A large ramp in the middle of the building, provides access to the upper floor where a multifunctional room is offered as a flexible space for conferences, lectures and events. A mezzanine is moreover overlooking the workshops below. From this level the access to a terrace, partly overhanging on the parking lots, is also possible . Here the favorable sun exposure provides a qualitative outdoor space to enjoy the view of the square, surrounded by boxes hosting urban gardens directly related to the adjacent Cargo2.

III.63 | Social Centre east entrance from the public square

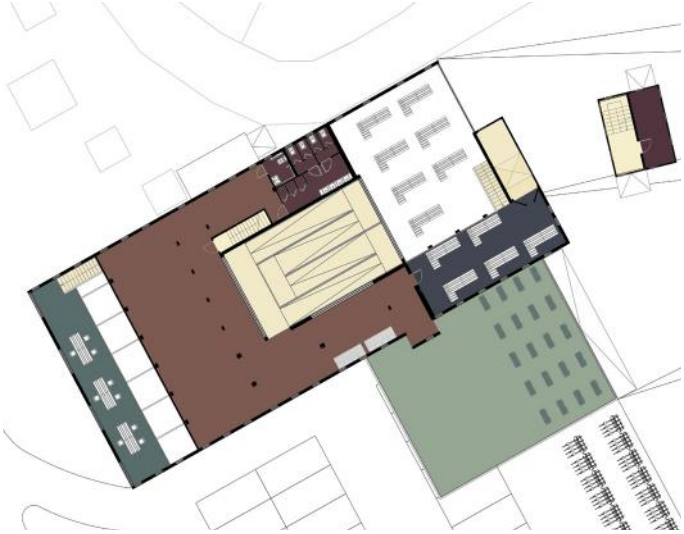
CARGO 2

CARGO 1

CARGO 3

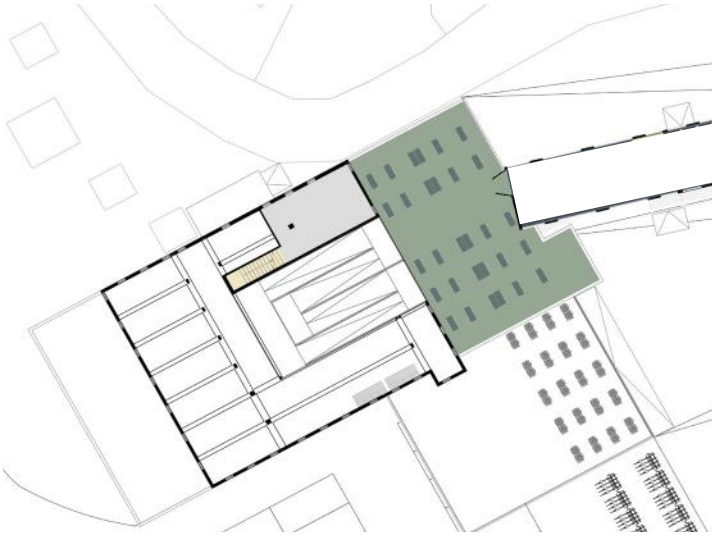


III.64 | Social Centre Ground floor



III.65 | Social Centre First floor

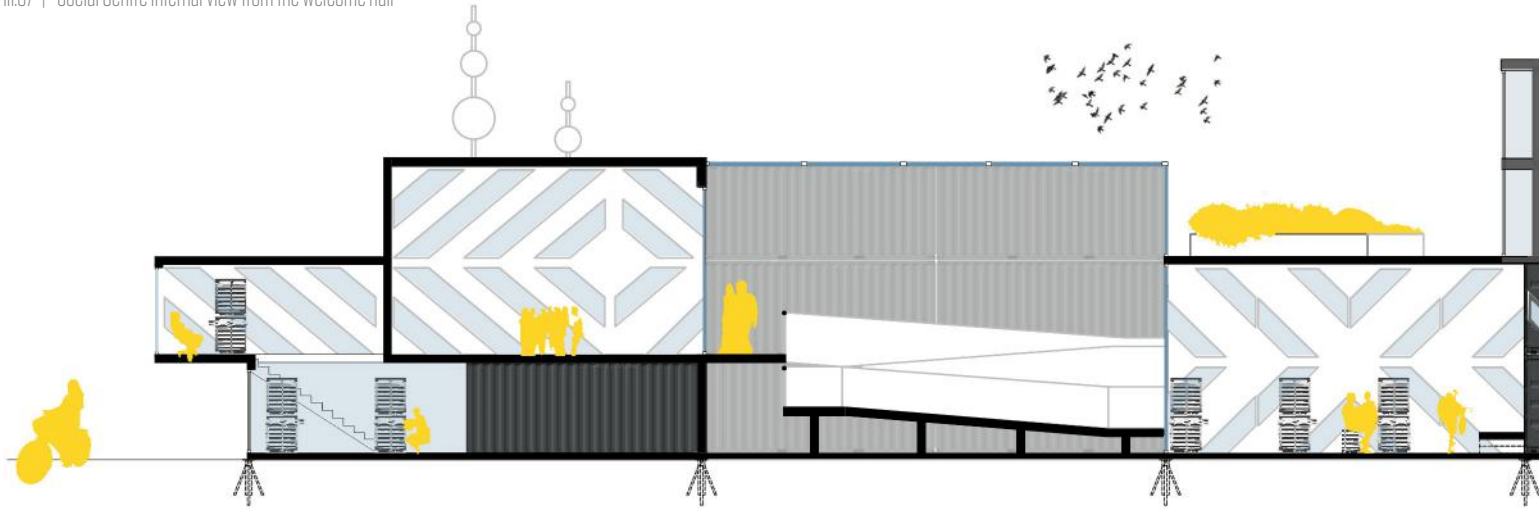
III.73 | Social Centre view from Karolinelund path



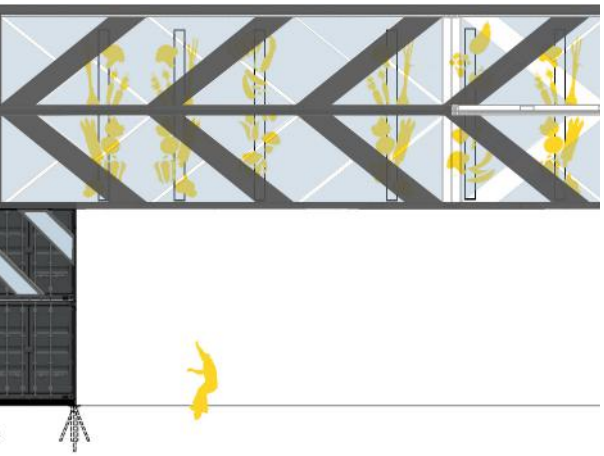
Workshops
Meeting rooms
Offices
Rooftop gardens
Staff hall
Storage
Bar & Kitchen
Access
Welcome hall
Info point
Multifunctional hall
Toilets

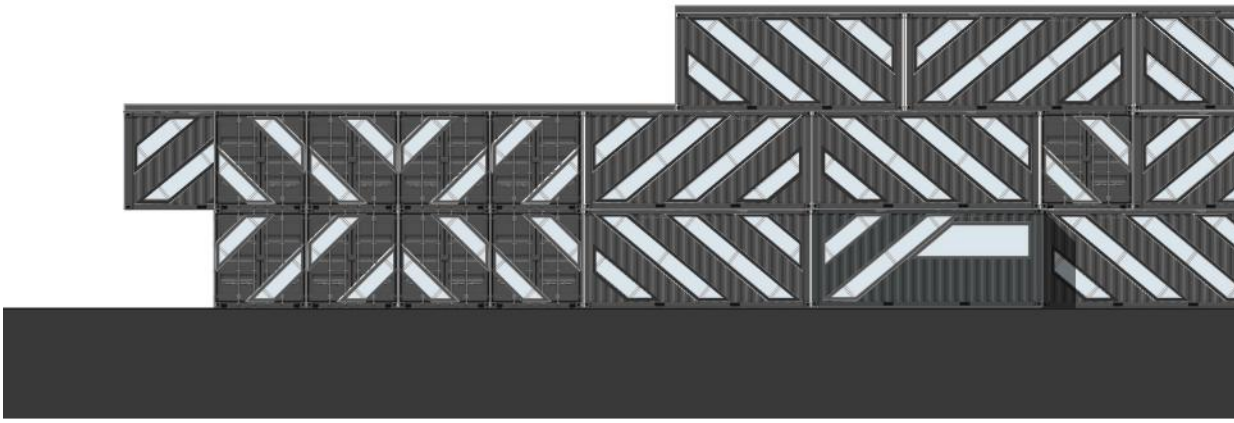
III.66 | Social Centre Second floor

III.67 | Social Centre internal view from the welcome hall

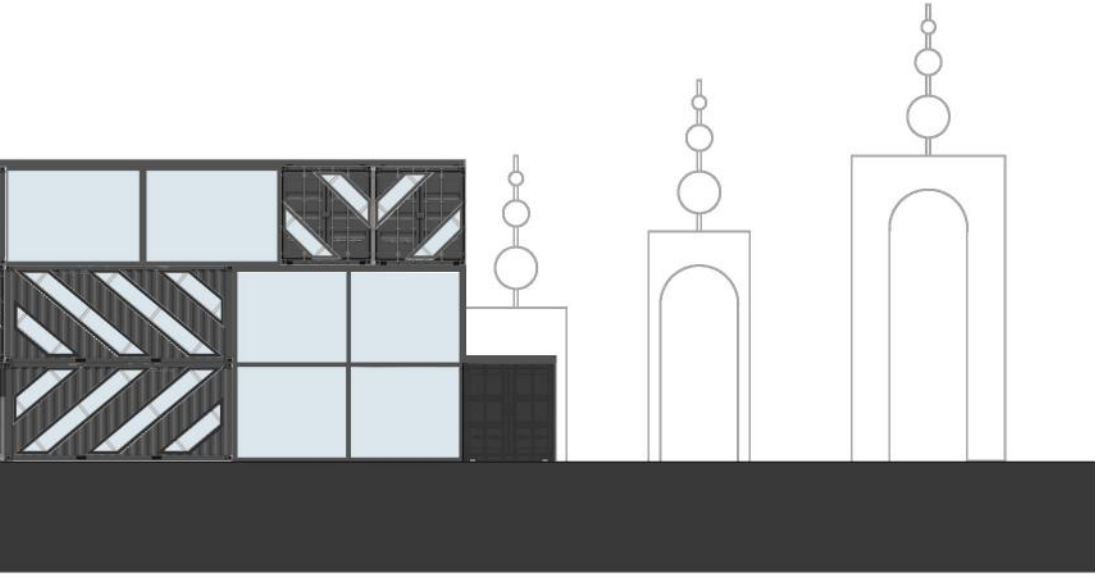


III.68 | Social centre section 1:200

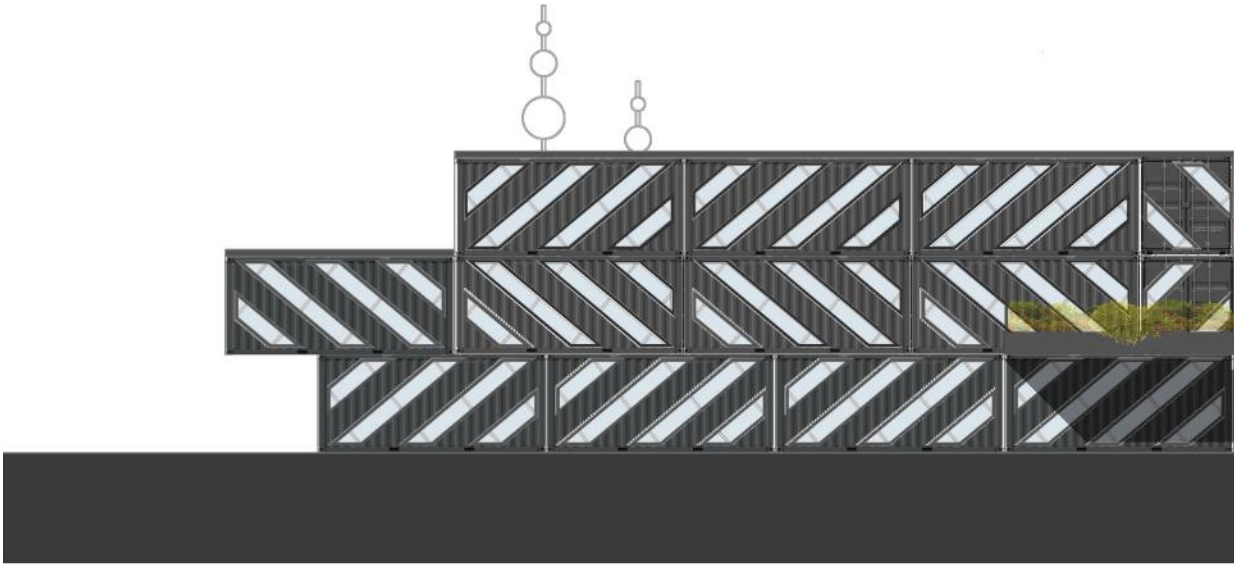




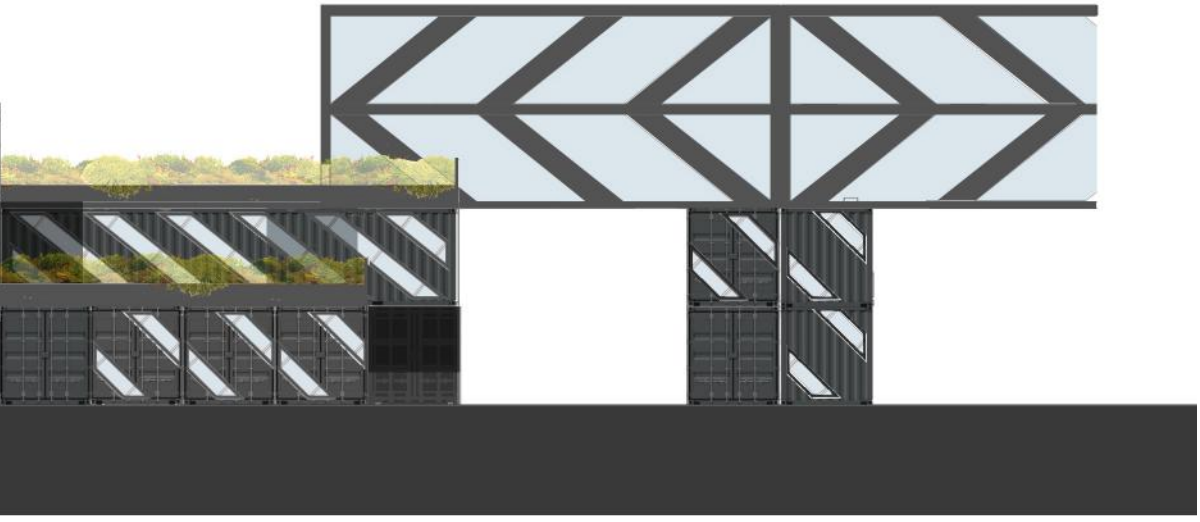
Ill.69 | North elevation social centre 1:200



Ill.70 | East elevation social centre 1:200



III.71 | SOUTH ELEVATION 1:200



III.72 | WEST ELEVATION 1:200

III.73 | Impact Farm in Copenhagen - External view

III.74 | Impact Farm in Copenhagen - Internal view

THE GREEN HOUSE

The green house of the project can be considered as the engine of the sustainable cycle embodied by the complex. This Cargo (named Cargo2 because of the central location) represent the environmental aspect of the sustainable triangle. This is the building that combines the hosting of the function of the urban gardens (already present in the park) and a new production of herbs and greens. The entire growth and production of such vegetables support the sales chain of the close by Market (Cargo3) which, in turn, responds to the electrical need for the running of the green house.

Although the design of Cargo2 has been mainly developed from the point of view of constructive details, accessibility, expression on urban scale and technical spaces necessary to serve the building itself, a solution in terms of "food production methods" is adopted taking inspiration from the example of "First impact farm".

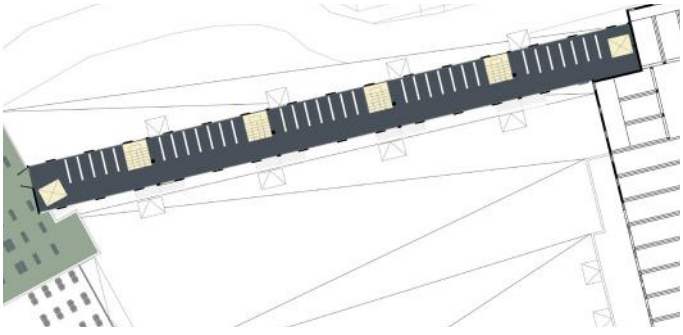
The "First Impact Farm" is an existing green house hosted by the structure of used shipping containers and temporary located in the neighborhood of Nørrebro in Copenhagen. Different kinds of basil, parsley and cilantro are thriving in the building, supported by the internal assembling of a two-storey vertical hydroponic farm. [humanhabitat.dk]

The method suggest to grow plants with the exclusive use of mineral nutrient solutions in water and, therefore, without the presence of any soil.

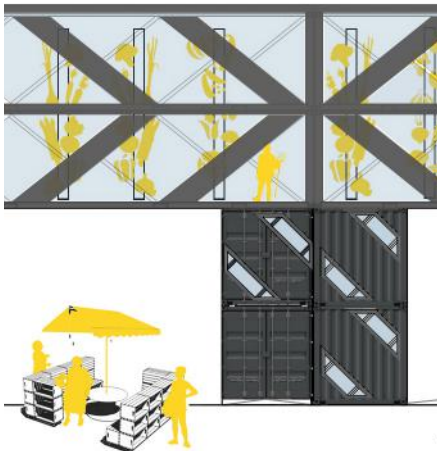
Cargo 2 assumes, from a urban sustainable point of view, the meaning of a social pole of interaction. The commitment of the community to grow their products and see them sold within the same complex, generates a complete sustainability circle that, on one hand implies the production of qualitative food using sustainable farming methods and, on the other hand, strengthens the connections of the same community, weaving a social network based on cohesion, collaboration and diversity.

Cargo 2 consists in a glazed, thin, humble bridge crossing the entire central public square and running alongside with the pedestrian path of the park. In this way the building results aligned to one of the main axes already existing in the site, offering to Karolinelund's visitors a new gate, a new dynamic and transparent portal that interprets the green character of the park . It also represents a visual connection between Cargo 1 and Cargo3. The Green House is lifted from the ground and it stands on 6 cores (each one composed by containers stacked in two levels) that act not only as baring columns but also provide access up to the above levels. Each container's aggregation host 3 main functions: staircase, kiosks and storages that also serve as technical rooms.

The 2 left containers serve as access for the green house while, the bottom right one is occupied by a kiosk that provides an interesting stop in the journey towards the park distributing newspapers, flowers and ice creams for the kids playing on the close by playground. The top right container represents the technical core as well as gardening tools and equipments storage, allowing space for mechanical ventilation aggregates and water distributing pipes and pumps to run. On both ends of Cargo2, the presence of two lifts ensure the accessibility for all.



Ill.75 | Green House floor plan



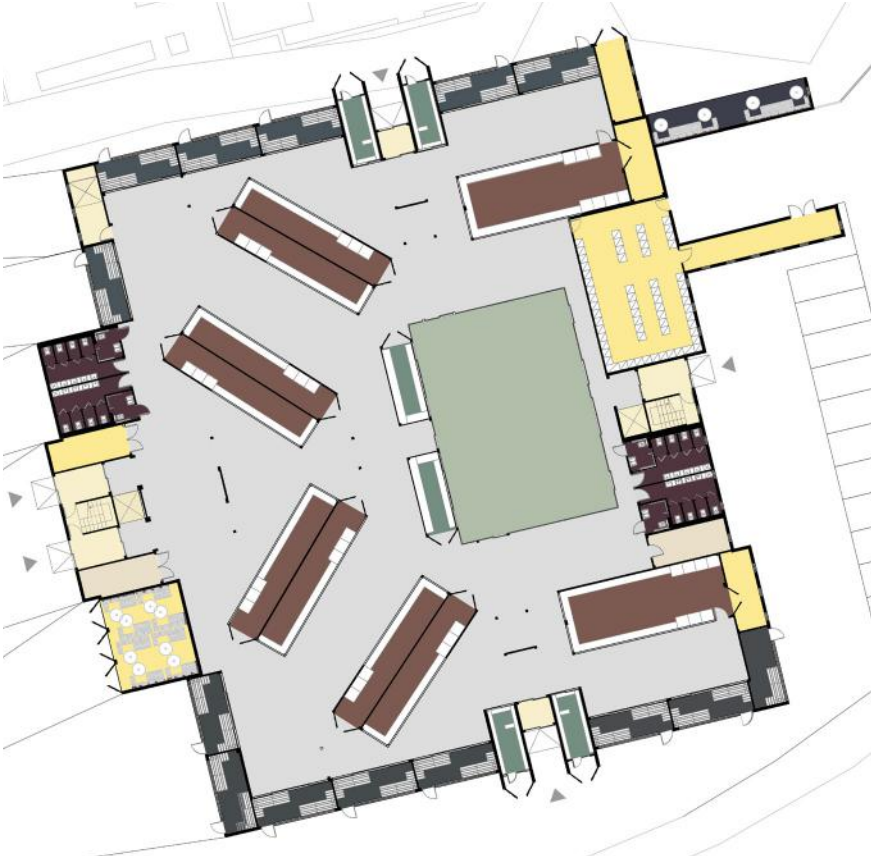
Ill.76 | Green House frontal elevation 1:200

THE MARKET

Cargo 3, as already stated, represent the main focus of the entire design.
The market aims at the same time to act as a meeting and exchanging point for the sale and purchase of local products. Food, drinks and various types of goods, partly produced within the same complex (herbs and vegetables from the green house and craft products from the workshops) are offered to the users, making of the market a new landmark for the purchase of local, ecological and eco-friendly products for citizens and tourists.
The building is shaped as a large area divided into two floors and self-sufficient from an energetic point of view, thanks to the presence of the photovoltaic panels installed on the roof of the building itself. The access to the building is possible on all four sides of it, thus ensuring great flexibility and accessibility to the facility. A central open courtyard addresses the need of light and open spaces within the market.
The arrangement of the functions is designed in such a way so to ensure the relevancy of them depending on the urban spaces to which they are addressed and consistency and coherence regarding the internal path.
On the ground floor are located the sale points. Stalls, kiosks, restaurants and temporary rental spaces offer a wide range of choice to the user and, being displayed around the internal court, configure an interesting and variegated journey to the visitor.
Storages, refrigerators, delivery area and a space for garbage collection are all lined up in front of the parking lots to the east.
On the second level are instead located the food court and a lounge area, from which you can enjoy the newly purchased products or just relax watching the market visitors flow.
The accessibility to all is guaranteed by the presence of elevators for the reaching of the second level and by the design of sufficiently large maneuvering spaces all along the distribution.
Some additional spaces are offered to the adjacent petanque. A space for the storage of the tools, required for both the practice of the sport and the maintenance of the playing field, and an indoor location (acting as a shelter against wind and rain) for possible spectators, are designed.
The architectural expression of the market is deliberately industrial. The ducts for ventilation are visible and run through the entire building at the height of the third level, while the containers used internally as stalls and kiosks are not treated from the aesthetic point of view and give final drive and homogeneity to the expression of the complex.

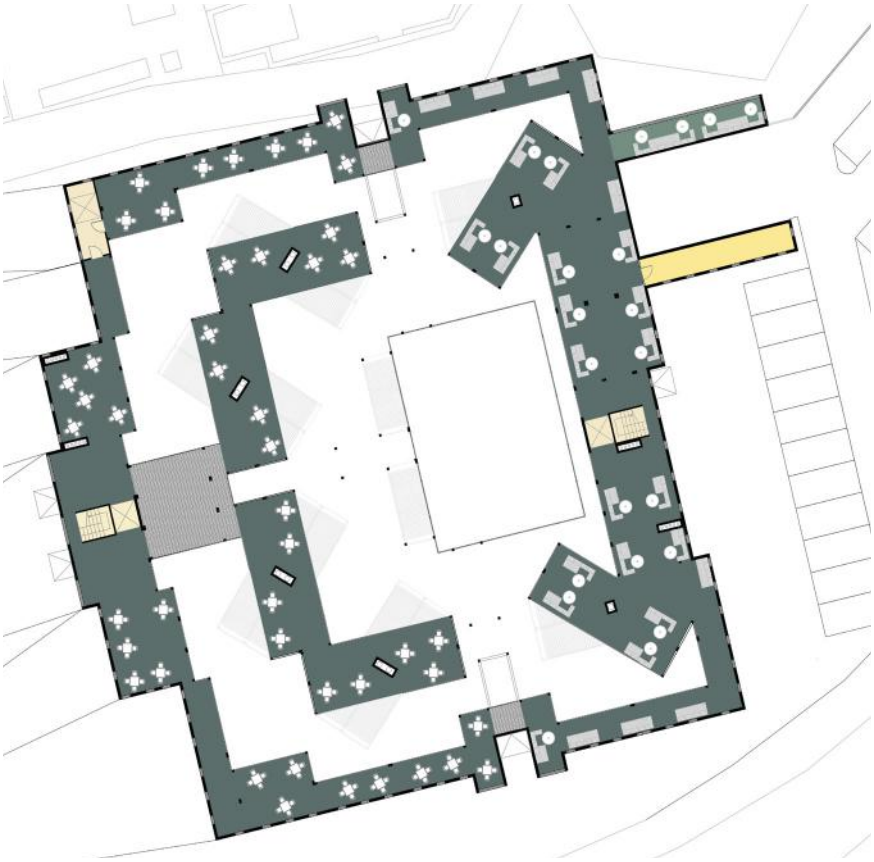
III.77 | Market northern view from Karolinelund path


CARGO 2
CARGO 1
CARGO 3



Ill.78 | Market Ground floor plan

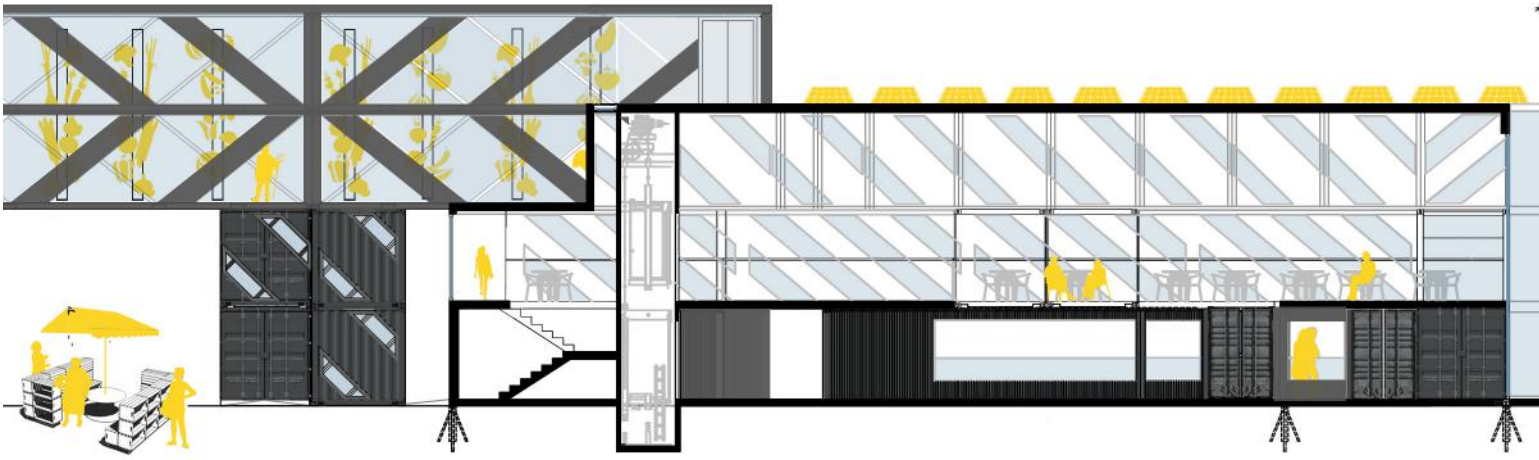
Ill.79 | Market main entrance



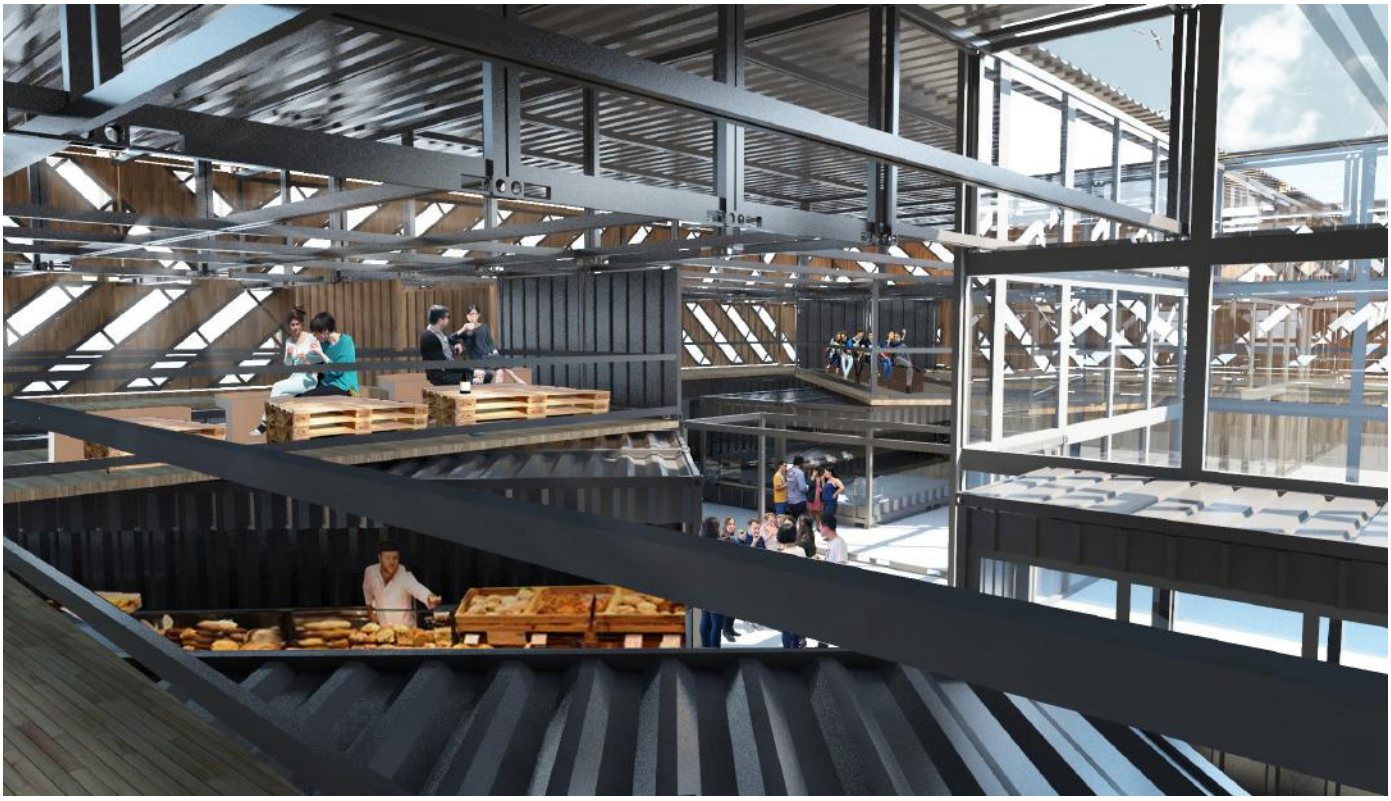
- Petanque recreational area
- Temporary Rental spaces
- Food court mezzanine
- View point
- Kiosks
- Outdoor Courtyard
- Distribution
- Storage
- Access
- Welcome hall
- Permanent Food Stalls
- Toilets

III.80 | Market First floor plan

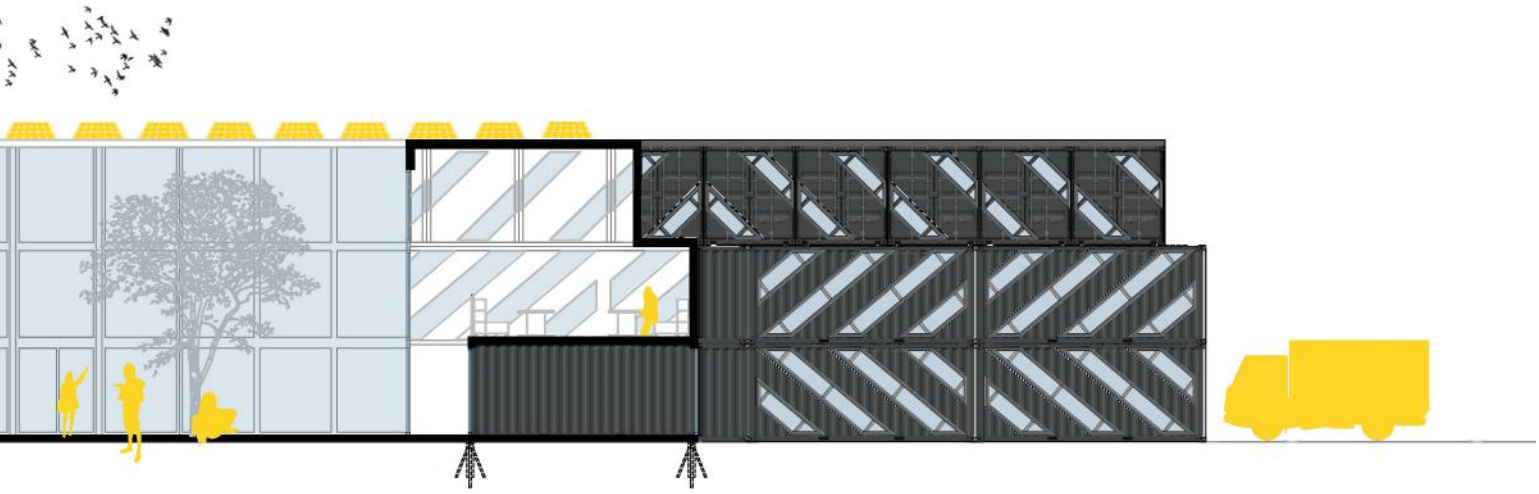
III.81 | Market internal view 1

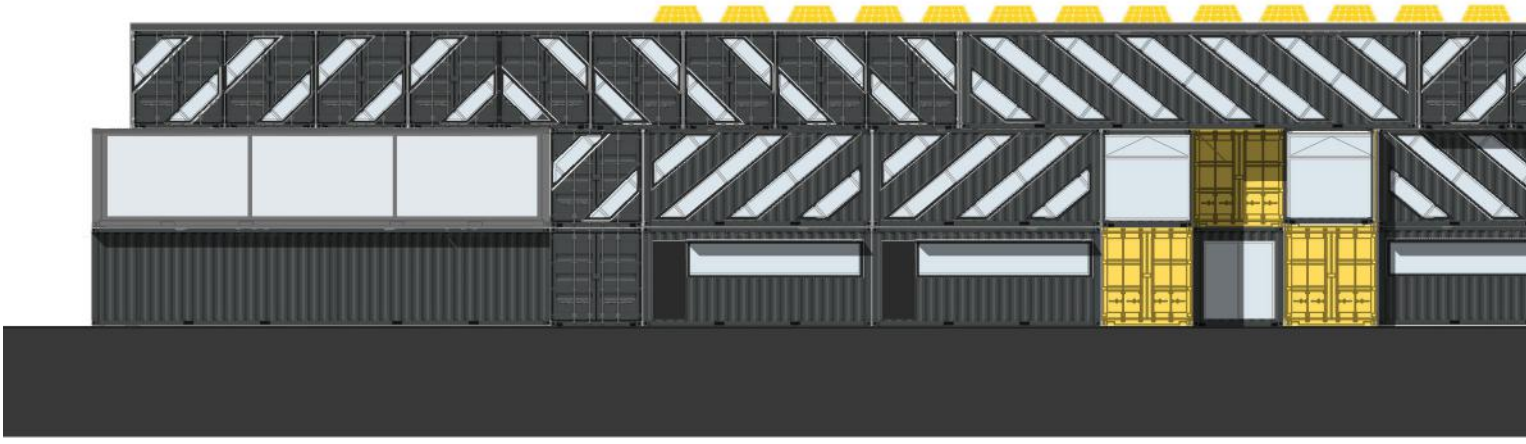


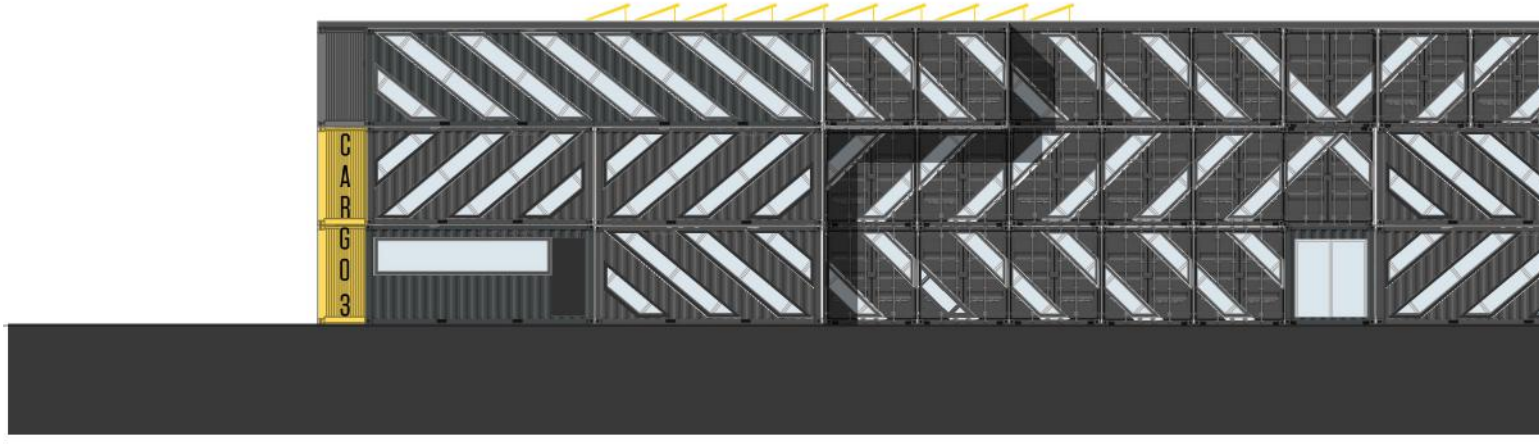
III.82 | Market section 1:200

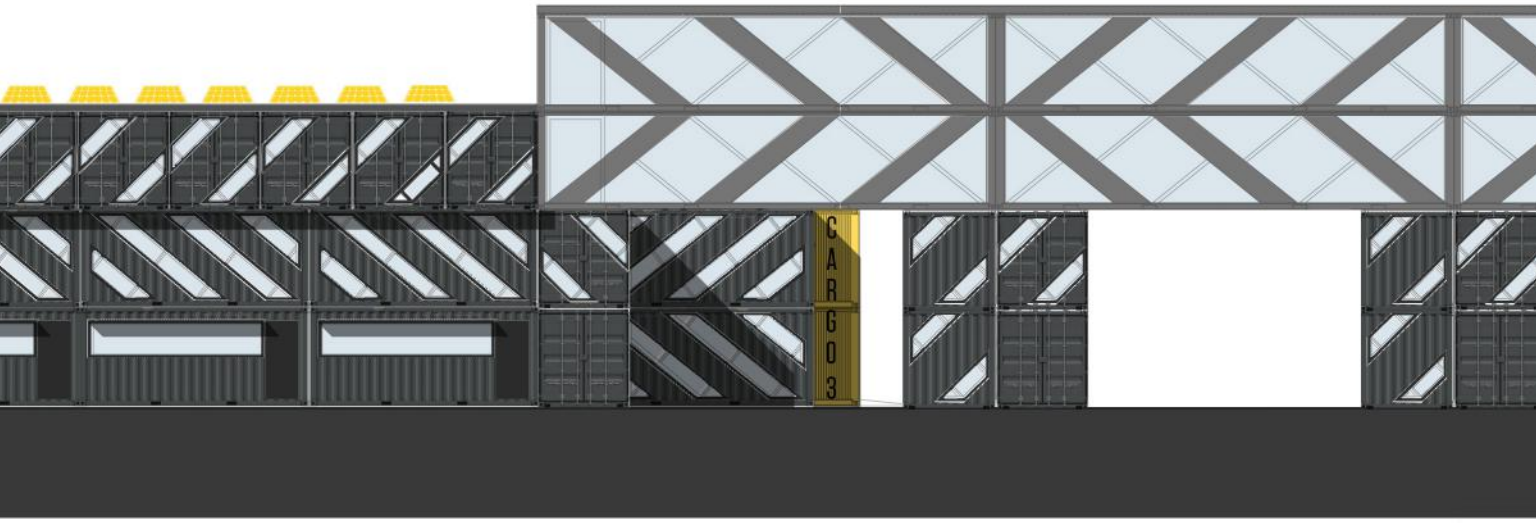


III.83 | Market internal view 2

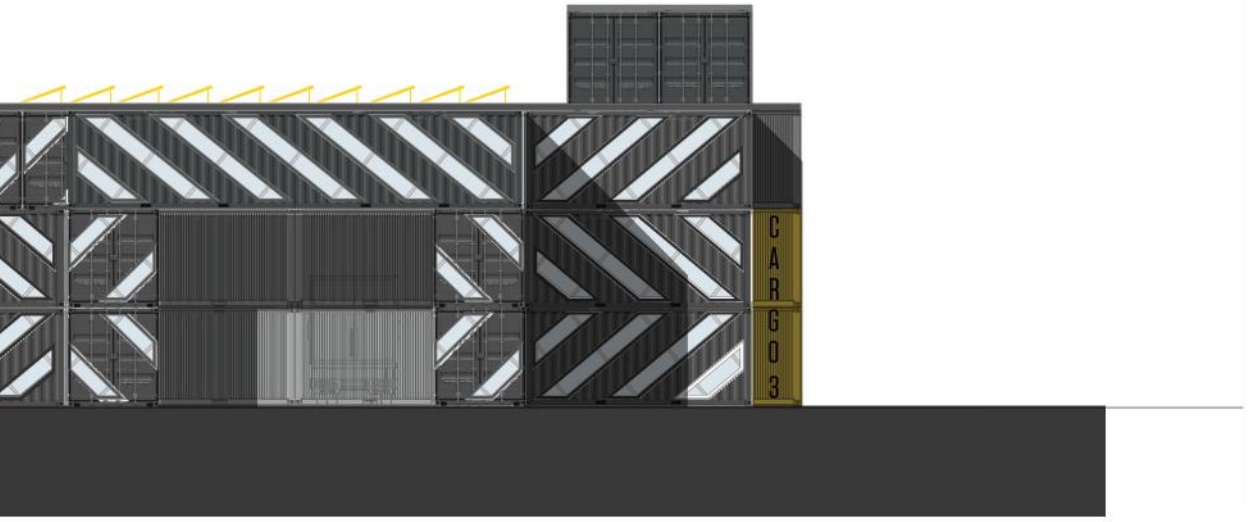




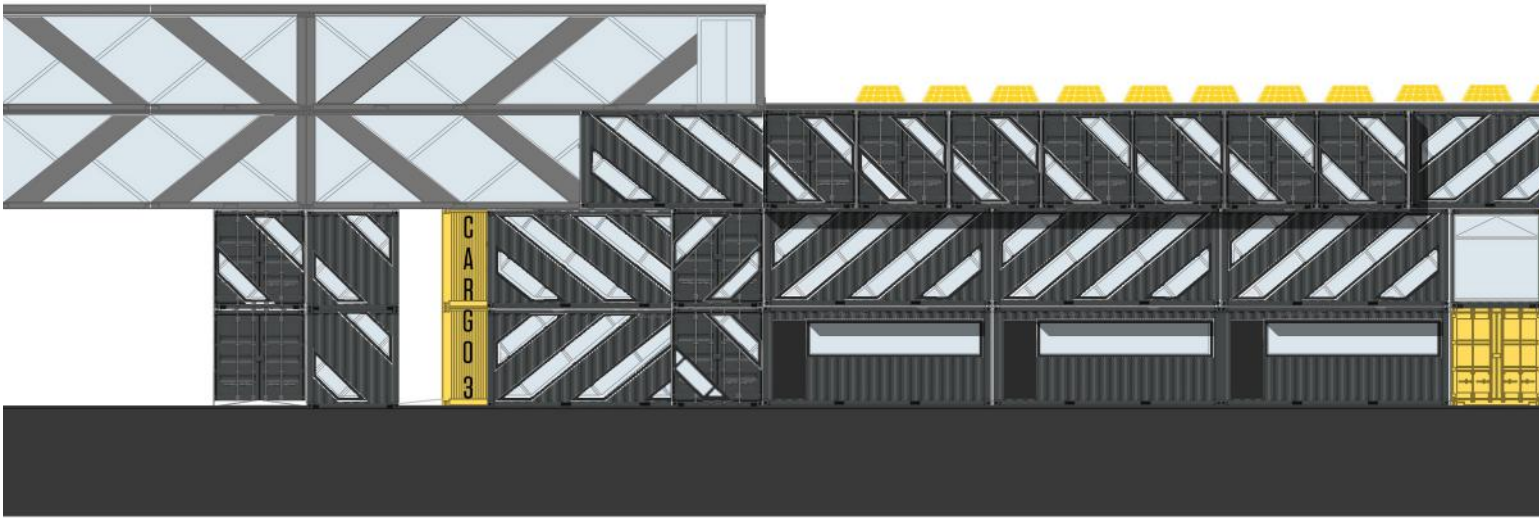

CARGO3

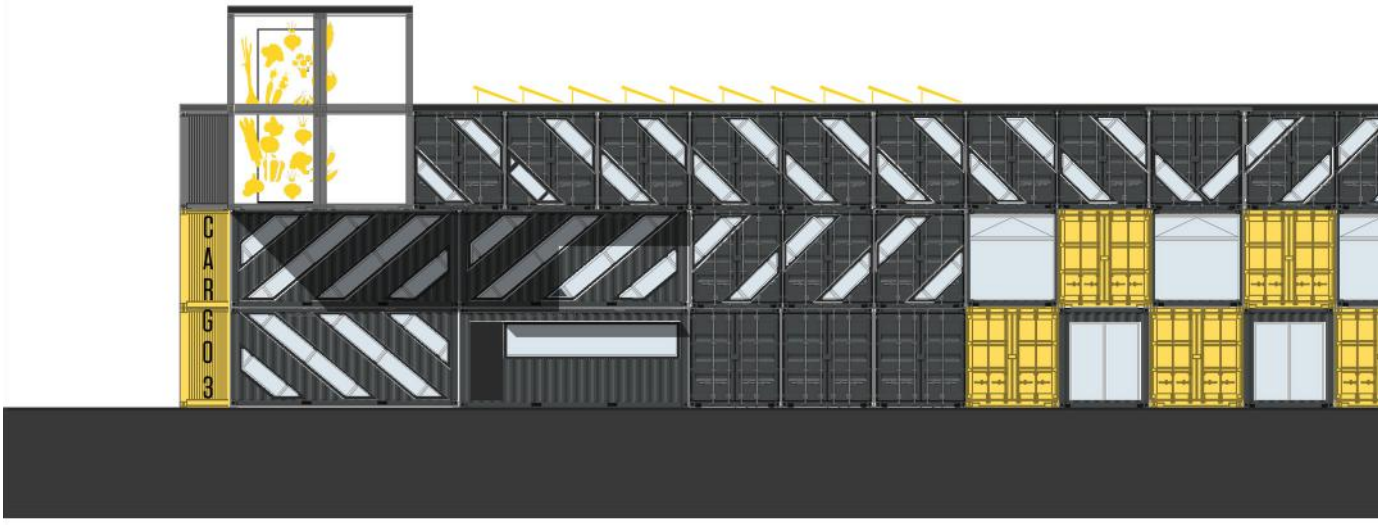


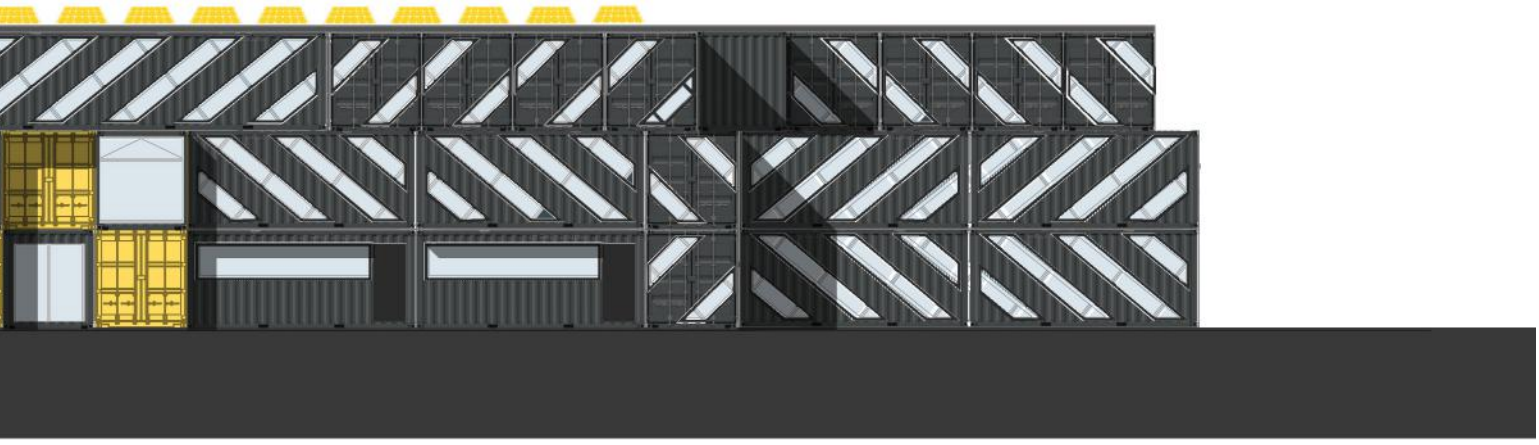
III.84 | North elevation market 1:200



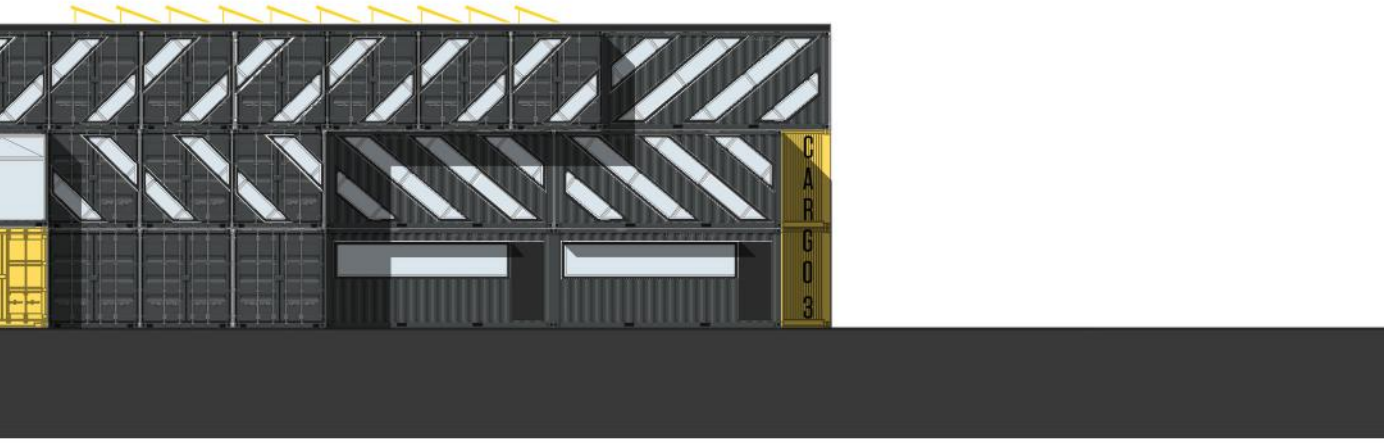
III.85 | East elevation market 1:200


CARGO3


CARGO3



III.86 | South elevation market 1:200



III.87 | West elevation market 1:200

“If the society towards which we are developing is not to be a nightmare of exhaustion, we must use the interlude of the present era to develop a new technology which is based on a circular flow of materials such that the only sources of man’s provisions will be his own waste products. “

- Kenneth E. Boulding, 1970 -

07

BUILDING'S PERFORMANCE

FLEXIBLE

Urban scale
Architectural scale
Furniture scale

RENEWABLE

Materials
Energetic performance
Lca analysis

OPTIMAL

Thermal comfort
Athmorpheric comfort
Daylight
Ventilation

TECHNICAL FRAMEWORK

THERMAL COMFORT	ATMOSPHERIC COMFORT	VISUAL COMFORT
Ideal Temperatures between 16° C and 25°C Overheating Maximum 175h above 26°C Maximum 43h above 27°C	Minimum ventilation rate 3,6 l/s/m2 Maximum CO_2 level 850 ppm	Daylight factor > 2% (in the middle of the compartment)

III.88 | Comfort maximum values

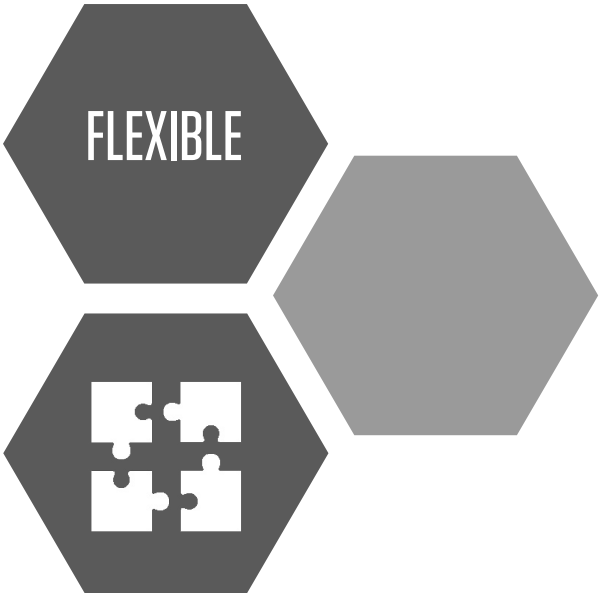
INDOOR ENVIRONMENT

A technical framework based on DS/EN 15251 [Danish standards] and CR1752 [design criteria] is here presented. Since there is not any specific suggestion for market spaces, the technical specifications refer to the guidelines, stated in the two normative, for department stores.
More specifically, regarding the thermal comfort, the maximum number of hours allowed above the design temperature are calculated starting from a statement of the occupied time of the market (3498 hours per year). From there, a percentage of 5% is taken in consideration for the definition of the allowed hours above 26 °C. A further reduction of 25% is then considered for the calculation of the allowed hours above 27 °C.

ENERGY FRAME

For what concerns the energetic performances of the building, this project takes in consideration the requirements from the Building Energy Frame 2020 that recommen a maximum consumption of 20 kWh/m2 per year.
[BR2020]
This should be achieved by reducing as much as possible the energy consumption of the building (for example through a good design of the envelope and through the use of low energy requiring equipments and installations) and producing renewable energies for covering the final energy need.

All the following data presented are referring to this framework.



III.89 | Architectural flexibility diagrams

URBAN SCALE

The main advantage of designing container's architecture is that the shipping containers, being modular and stuckabe, can work as a lego brick that can be assembled and combined in different layout configurations.
Taking advantage of this intrinsic property of the chosen material, each module used in the project, have the possibility of being easily moved and transported in another site to be assembled in a different way, creating a different urban configuration that could even serve different functions. This represent the first level of scale of the entire project flexibility.

ARCHITECTURAL SCALE

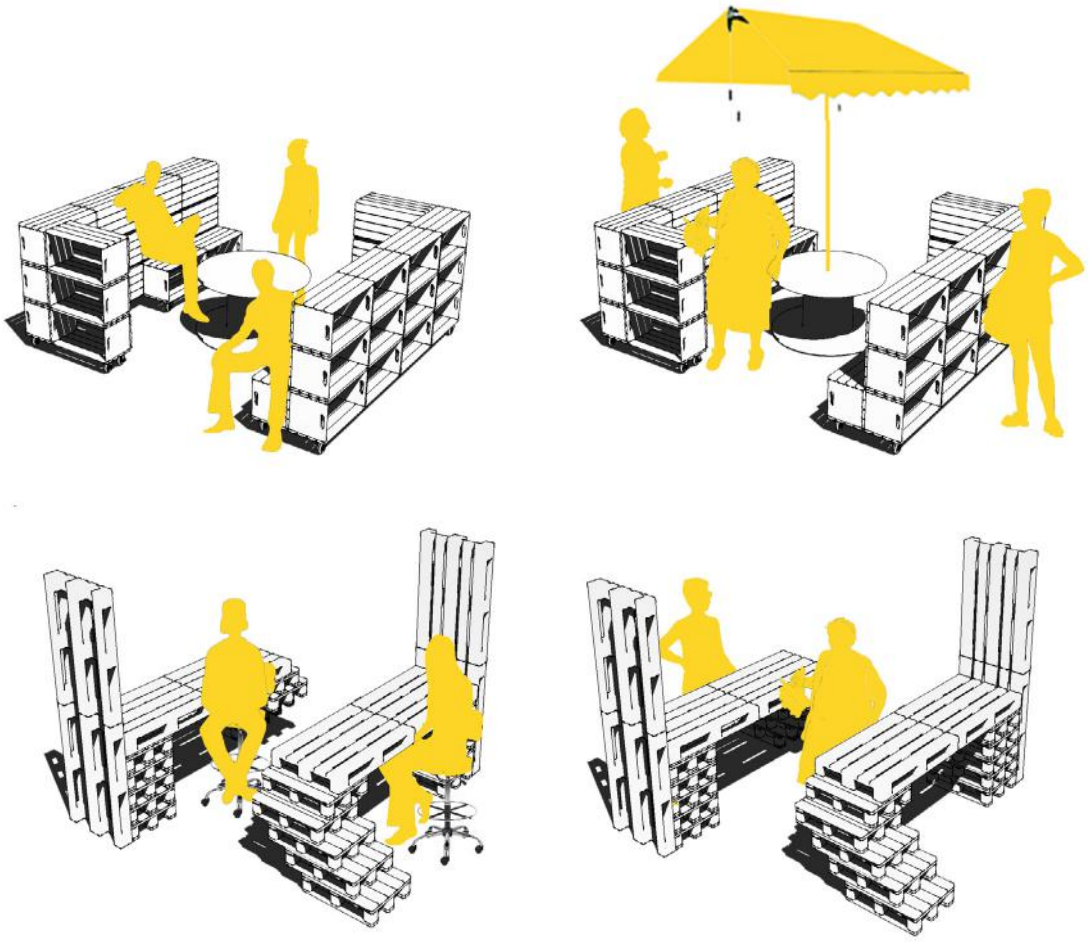
The next scale of flexibility is represented by the architectural one. In this sense, three different kind of independent modules are designed.

1 | SIMPLE CONTAINER

this module is represented by a simple naked container and is used in the project to host technical functions, like storages, technical rooms and garbage spaces, that don't need any insulation or installation.

2 | INSULATED CONTAINER WITH ELECTRICITY

this container is developed as an insulated shell that hosts electrical cables into the construction layers and carries a solar panel on the roof for the energy production. It is then possible to take advantage of lighting and equipment installations, having the possibility of using the module for functions as kiosks and stalls.



III.90 | Furniture flexibility diagrams

3 | INSULATED CONTAINER WITH ELECTRICITY AND WATER

very similar to the previous one, this module have the additional advantage of being provided with water piping, having in this way the possibility to host functions as kitchens and toilets.

FURNITURE SCALE

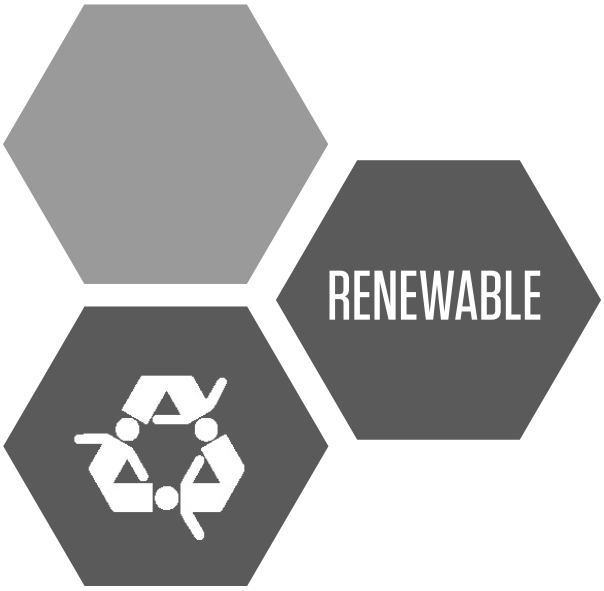
The third level of flexibility is embodied by the furniture scale. In this case the object of the design is not the container anymore but all those modular, spared materials being part of the "transport of goods chain" such as pallets and fruit boxes. Two different kind of furniture, each one with two possible uses, have been designed.

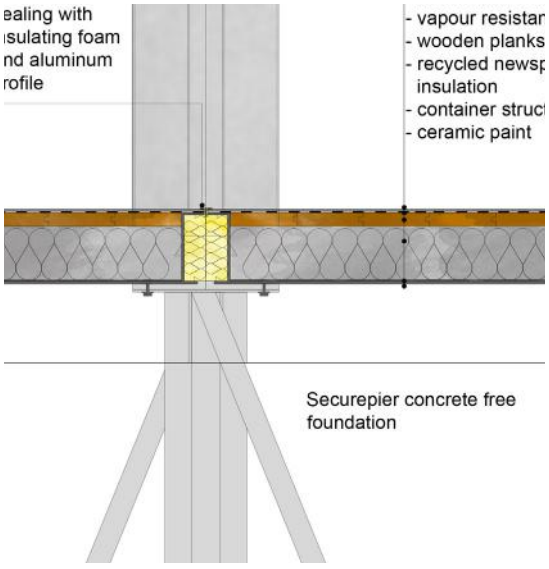
1 | FRUIT BOXES

this configuration offers two movable options, one providing a space for relaxing and eating outside, for example in front of the bar, and one usable for the sale of goods in the temporary market hosted once a week in the square in front of the market.

2 | PALLETS

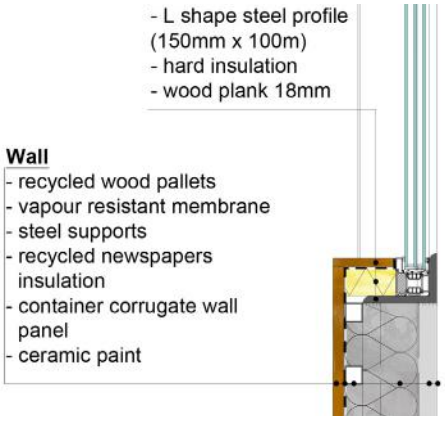
the proposed assembling lends itself to serve either as a working space, for example in the offices and in the workshops of the community centre , or as a different kind of sale space in the temporal renting spaces situated along the market perimeter.





III.92 | Floor constructive detail

III.91 | Containers and Pallets



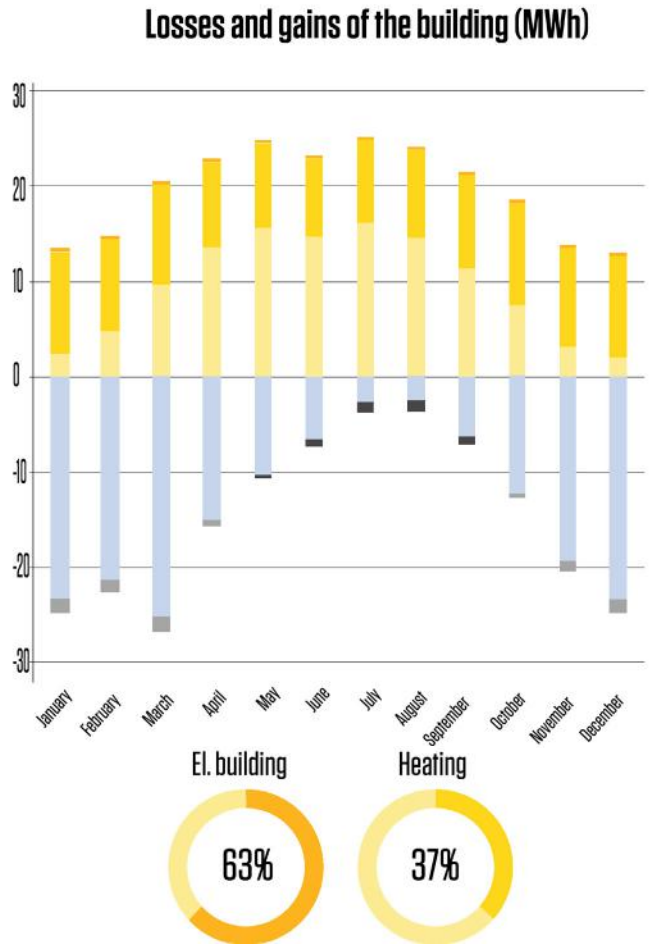
III.93| Wall constructive detail

MATERIALS

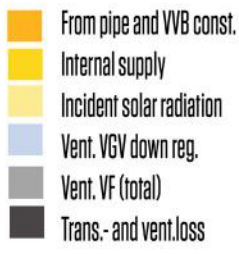
Karolinelund's Cargos provides an interesting journey through the Sustainability by being built almost entirely from reused shipping containers, wooden pallets and newspapers. These materials are adapted, re-shaped and assembled in different ways and they clearly state the reusable and flexible character of the building itself. The concept "From container to content" is therefore developed through the use of these materials that, in this way, not only represent a low cost and environmental friendly solution, but also become a hallmark, a declaration themselves of the renewable status of the building.

Starting from the construction details, the shipping container, treated with the use of a ceramic paint to avoid the problems related to the damaging of the steel due to humidity, represent the external shell of the construction. The kind of insulation used for floors and walls, is made of recycled newspapers. This insulation, beside having the advantage of being a recycled material, has nearly the same insulating properties of the more polluting but very performing polyurethane foam. Also the typology of foundations chosen takes into account the principles of environmental respect and flexibility. A technology called: Securepier concrete free foundation is in fact chosen as a footing for the building. This is "a low impact and environmentally friendly system installed via steel tubular piles driven into the ground to the required depth by a simple jack hammer and proprietary driving tool." [SECUREPIER FOUNDATION BROCHURE]

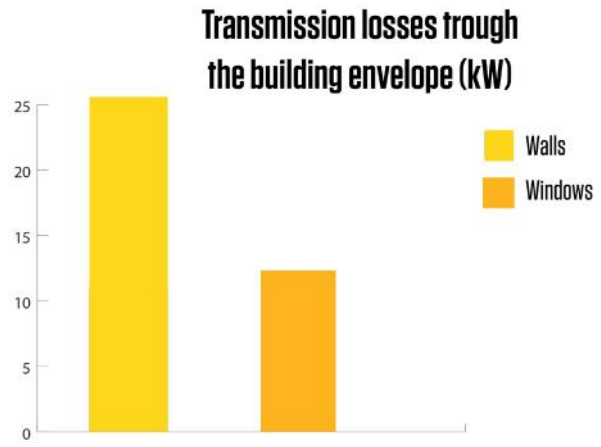
Triple glazed windows filled with krypton are then used in all the openings of the building, ensuring a low U-value of the windows themselves. All the construction layers chosen have as a purpose the optimization of the envelope and the minimizing of heat losses and cold bridges.



III.94 | Energy consumption of the building



III.95 | Losses and gains of the building



III.96 | Losses through the envelope

ENERGETIC PERFORMANCE

The Be15 software has been used as a tool to verify that the proposed design fulfill the requirements from "BR2020". The calculation is made on the only building of the market since it is the main design focus. The result shows that the building , with a total energy consumption of 7,3 kWh/m2 per year (Annex 1) perfectly fit in the 2020 energy frame. The transmission losses through the building envelope have been minimized thanks to a good choice of construction layers and the use of a heat recovery system for the ventilation. (III.96) shows that the transmissions losses through the building envelope happens mostly in proximity of the external walls even though the amount of glazed surface in the building is quite high. This is due to the quite big surface and relatively high U-value of the market's roof in which the choiche of construction layers has been the result of a balance between aesthetics, concept coherence and the necessity of the possibility of pv's placement.

(III. 95) shows that heat losses (mainly due to the high need of the market for mechanical ventilation) are balanced out, beside that from the solar radiation, from the high amount of equipments and lighting present in the market. This shows from one hand the positive contribution of the equipments in terms of heat gains but from the other hand the high energy requirement of the just mentioned, confirmed by (III. 94) where it's possible to see that the most relevant percentage of energy consumption is exactly related to equipments and lightings.

The energy requirement of the building is covered by the installation of photovoltaic panels on the roof.

For more details about Pv's calculations (Annex 2)

LCA ANALYSIS

In order to have one more verification and prove that the Market building is actually performing in accordance to all the sustainable principle already mentioned, a "Cradle to grave " LCA analysis was attempted. The LCA is a tool used for estimating the total environmental impact of a building throughout its lifecycle:
from material production, construction and refurbishment, operation and maintenance to demolition, removal and disposal. [Jérome Le Dréau, IDSA 2015]
The main objective of this analysis is to make claim about the building's environmental performances. For this reason, a simplified quick tool for an approximate estimation of the carbon footprint of the building has been used. [Linkcycle 2016]
The LCA calculations here presented are not part of the integrated process of designing and did not go through iterative passages but are rather used as a final additional check.
The following table (ill. 97) provides a more detailed explanation of the processes behind such calculation.

The values acquired can be found respectively at the following references:
- emission factors for the production of each material [winnipeg.ca]
- transport emissions [key2green.dk]
- electricity emission [key2green.dk]
- emission factors for the disposal of materials [Doka G. 2013]

Cradle to Gate Inventory

Material	Quantity (in kg)	Emission Fac	Incoming Transport (in k	Transport Emissions (per kg*km)	Total Emissions
containers	649	0	5	2,3	11,5
pallets	778	0	7	2,3	16,1
linoleum	11	2,25	53	2,3	146,65
glass	11250	0,85	132	2,3	9866,1
alluminium frames	3876	2,01	132	2,3	8094,36
newspaper insulation	182100	0	35	2,3	80,5
fiber wood insulation	14018	1,86	35	2,3	26153,98
foundations	781	1,91	20372	3	62607,71
					106976,9

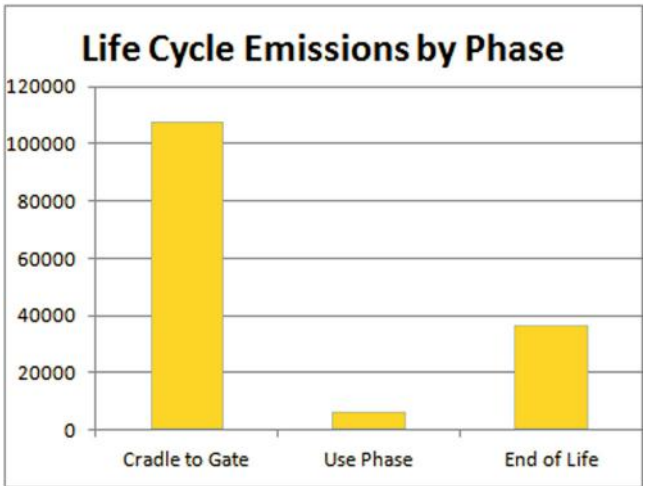
Use Phase Inventory

Assumptions (i.e. Operating 6 hours per day, for 5 years)	Electricity usage (kWh)	Emission Factor (CO2 per kWh)	Total Emissions
(10h per day x 5 days per week x 5 years) 14400 - electricity	93205	0	0
(10h per day x 5 days per week x 5 years) 14400 - heating	54648	0,12	6557,76
			6557,76

End of Life Inventory

Material	Quantity (in kg)	Emission Fac	Outgoing Transport (km)	Transport Emissions (kg*km)	Total Emissions
containers	649	0,27	5	2,3	186,73
pallets	778	0,32	7	2,3	265,06
linoleum	11	0,1	125	2,3	288,6
glass	11250	0,8	165	2,3	9379,5
alluminium frames	3876	0,27	264	2,3	1653,72
newspaper insulation	182100	0,1	263	2,3	18814,9
fiber wood insulation	14018	0,32	263	2,3	5090,66
foundations	781	0,27	264	2,3	818,07
					0
					36497,24

Ill.97| LCA datas



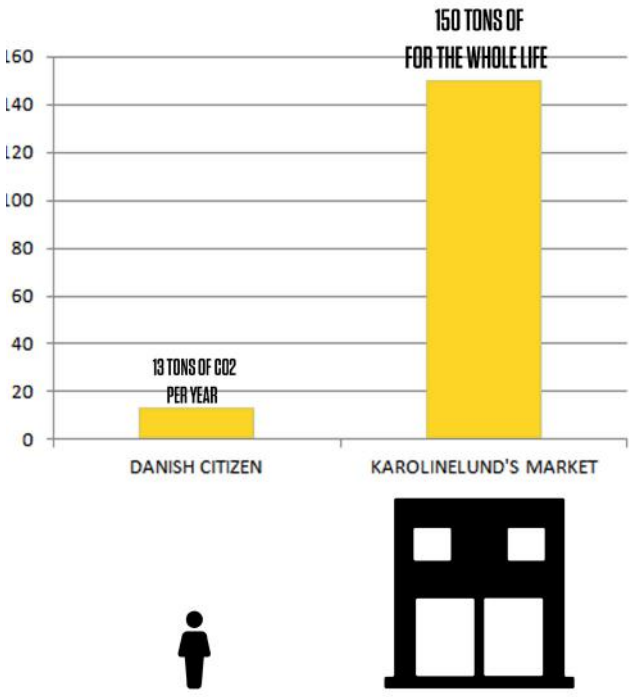
Ill.98 | Emissions of each phase (Kg of C02)

	Emissions from each phase
Cradle to Gate	106976,9
Use Phase	6557,76
End of Life	36497,24
TOTAL	150031,9

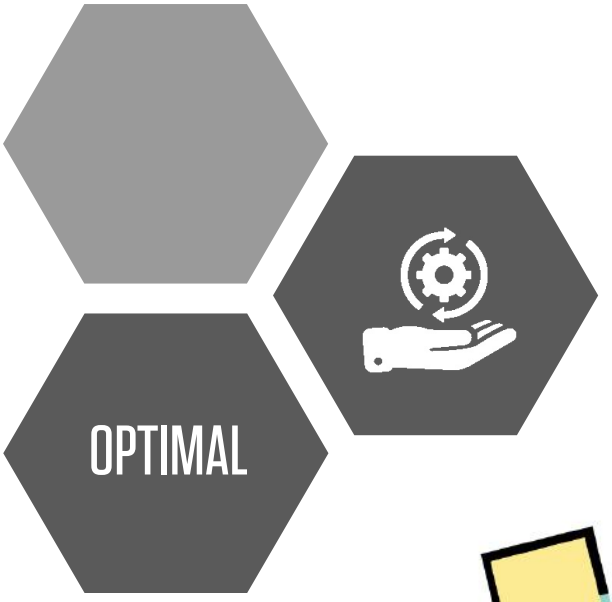
Ill.99 | Total emission (Kg of C02)

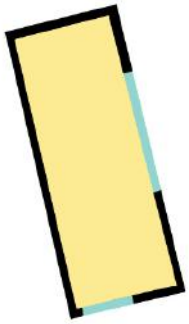
INTERPRETATION OF THE RESULTS

A critical reading of the results is here presented.
It is possible to notice that the largest impact in terms of Co2 emissions of the building, comes from the construction phase (ill.98). This is mainly due to the choice of the foundations that, coming from New Zeeland, have a big impact in terms of transport emissions.
For what concern the interpretation of the final results, there are two different ways of studying the global impact of building:
• Comparison of LCA results with existing benchmarks
• Normalization (calculating the magnitude of the category indicator results) and weighting (assignment and calculation of different impact categories and resources reflecting the relative importance).
[Jérome Le Dréau, IDSA 2015]
In this project it has been chosen the method of the comparison. A parallel confrontation between the carbon impact of the building (from cradle to grave) and the annual Co2 emission of a Danish citizen [Focus Denmark-2016] is therefore performed.
From the final results (ill. 99 and 100) it appears quite evident the relatively low impact of the Market building that with its 3036 m2 and for its whole life cycle produces only around 11 times more C02 than a single person can produce in one year.



Ill.100 | Interpretation of the results



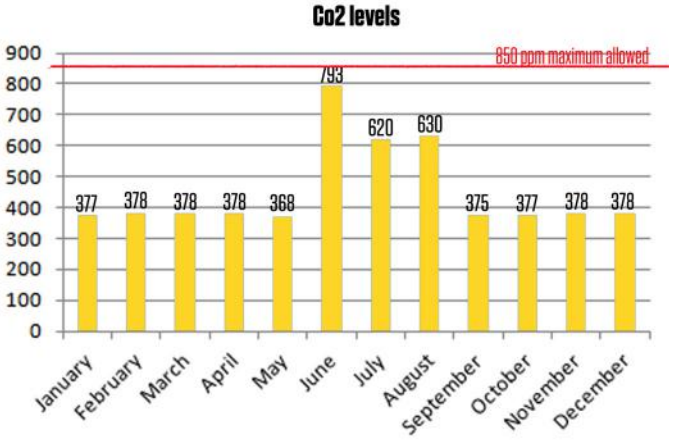


III.101 | Single Kiosk Bsim model

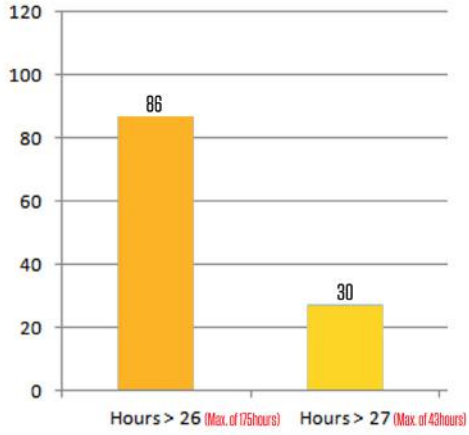
INDOOR CLIMATE KIOSK

To document the thermal and atmospheric comfort in the building, the software BSim has been used. The strategy that has been followed as a design process for the project, involves a preliminary analysis and optimization of a simple free standing container (embodied in the project by a kiosk) through several iterative calculations (Annex 3). This approach it proved to be efficient when it came to the analysis of a bigger scale building (embodied by the market). The optimization of one module involved in fact the optimization of the same module repeated. After a series of iterations, the construction layers and the windows position and orientation has been decided. The result is a kiosk oriented 14º North and with two openings on the East and South facade. The people load is set at 2 persons, represented by an hypothetical seller and a client.

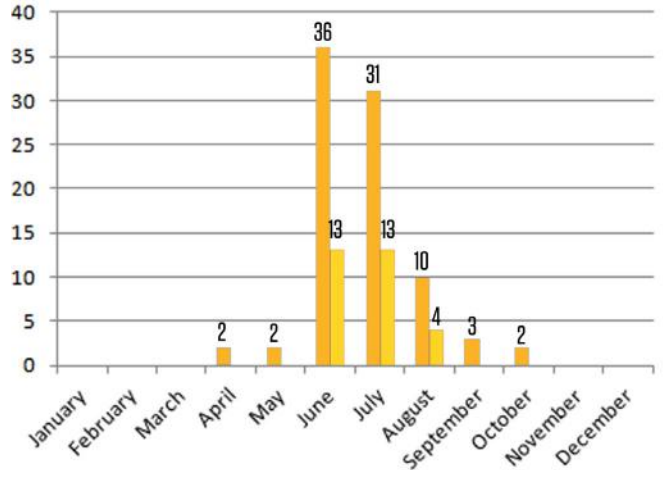
The graphs show a good situation both in terms of thermal and atmospheric comfort, with a slight overheating during summer with consequent raising of CO2 levels in the same period.



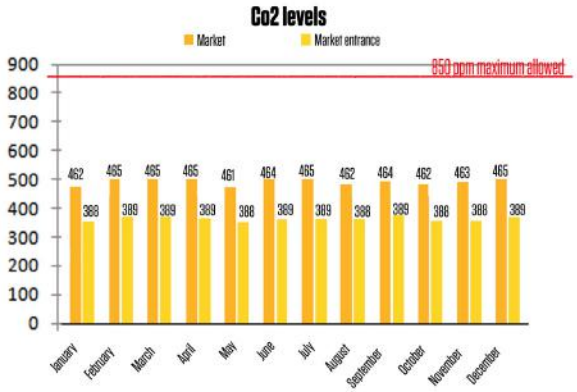
III.102 | Kiosk monthly CO2 levels



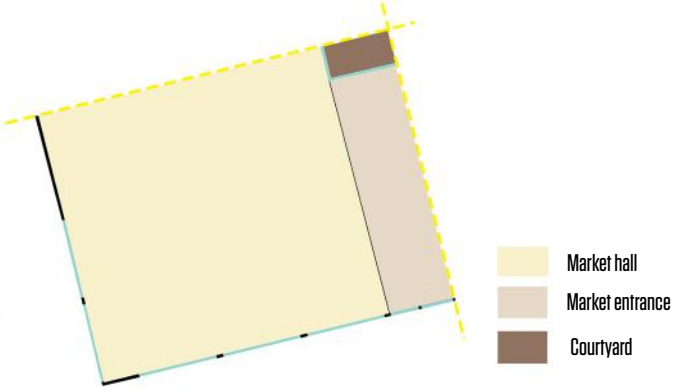
III.103 | Kiosk yearly hours above 26°C and 27°C



III.104 | Kiosk monthly hours above 26°C and 27°C



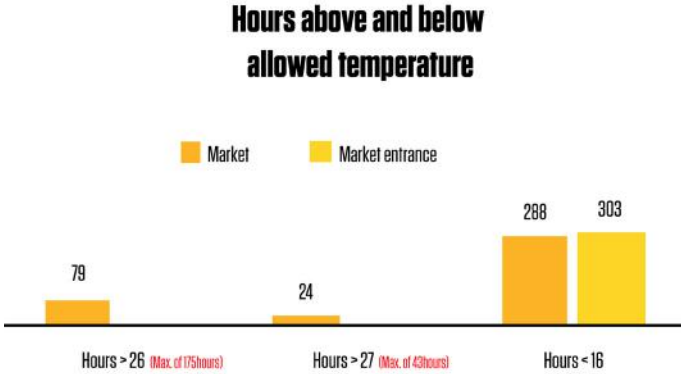
III.105 | Market selected section montly CO2 Levels



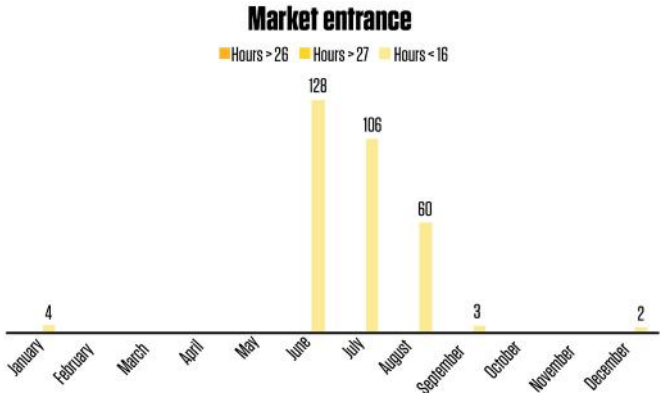
III.106 | Chosen section of the Market Bsim model

INDOOR CLIMATE MARKET

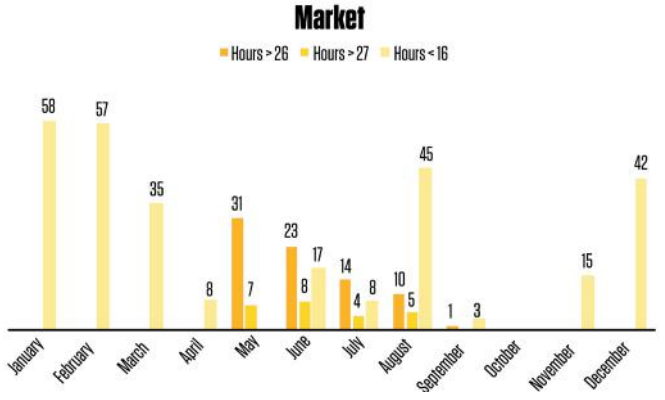
The calculations for the measurement of the indoor climate in the market has been made on a representative section of the market oriented South and including one of the entrances and part of the internal open courtyard. This section is considered to be the worst case in terms of problems related to overheating because of the high amount of openings facing South. The simulation, ran separately for the market hall and for the entrance, shows a really good situation in terms of indoor climate for what concern the market entrance, with some pick of hours below 16 ºC during summer. Also the market hall present some high values of cold hours, but instead distributed along the whole year. These are only concentrated during the night and are due to the schedule settings of the Heating system that switches off automatically during the night and is completely not running during Summer. However this is chosen as a strategy for reducing the energy consumption and those results are consequently chosen to be neglectable. The overheating is instead almost completely avoided thanks to a well balanced design of natural and mechanical ventilation systems.



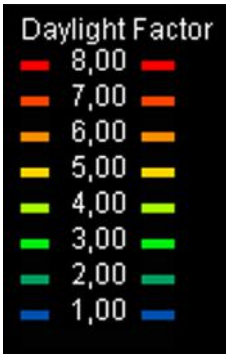
III.107 | Market hall and Market entrance yearly hours above 26°C and 27C

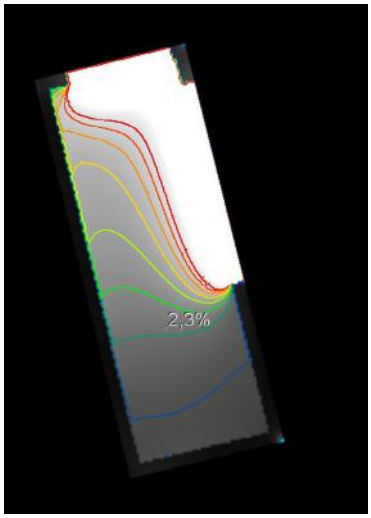


III.108 | Market entrance montly hours above 26°C and 27°C

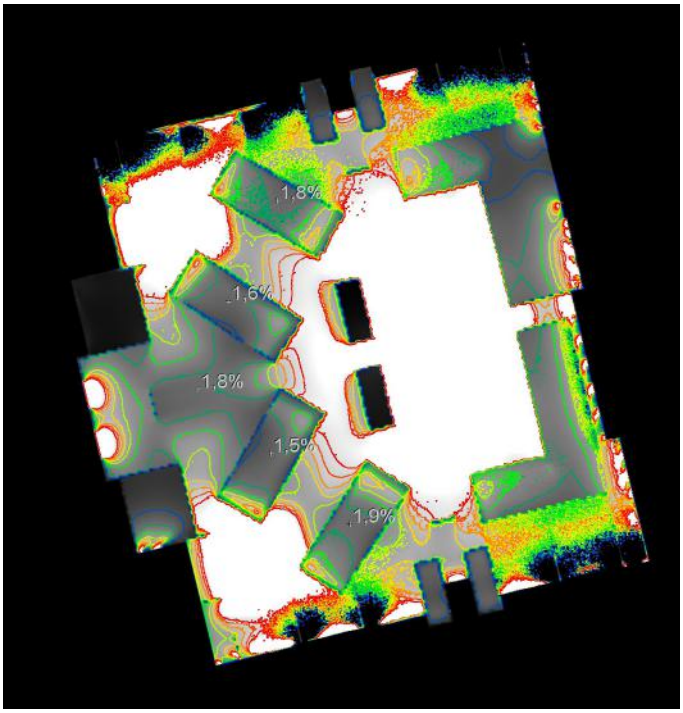


III.109 | Market hall monthly hours above 26°C and 27°C





Ill.110 | Kiosk daylight diagram



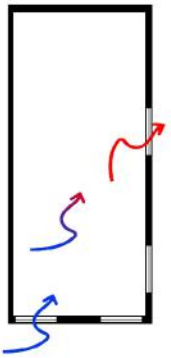
Ill.111 | Market daylight diagram

DAYLIGHT KIOSK

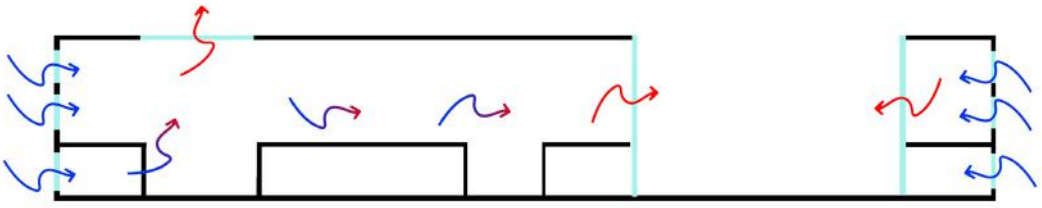
The process of designing of the window's dimension and position with consequent daylight analysis, was an active iteration running throughout the whole design period. Different design proposals, driven by energy calculations, aesthetic reasons or layout configurations, have always passed through a daylight analysis to ensure a constant quality of visual comfort. Also this process passed through the " from single unit to bigger scale" approach (Annex 4). The daylight of the final kiosk with two openings proved to be more than satisfying, showing a result of more than 2% of daylight in the middle of the room. This will ensure a good working place to the seller and a minimizing of the energy used for lighting during light seasons.

DAYLIGHT MARKET

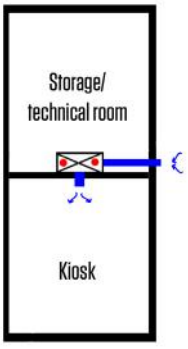
The daylight analysis in the market also shows a really good amount of natural light distributed in the whole market. This is also due to the presence of the internal open courtyard and of the two big skylights on the roof. The dark corners in the market are concentrated in technical spaces, toilets and storages and can therefore be neglected. The distributive passages and the entrances are the ones where the daylight is mostly concentrated and this will create a good psychological impact on the approaching clients that, entering the building, will be able to enjoy the presence of natural light coming from every direction in the main visual axes. The stalls, being located in the very centre of the building, are instead slightly lacking of daylight. This is anyway considered a good compromise since the seller will anyway need to take advantage of artificial light to better sell their products.



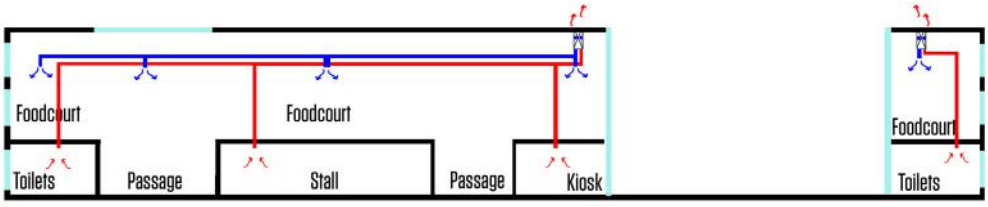
III.112 | Kiosk natural ventilation plan diagram



III.114 | Market natural ventilation section diagram



III.113 | Kiosk mechanical ventilation section diagram



III.115 | Market mechanical ventilation section diagram

VENTING AND VENTILATION KIOSK

With an orientation of 14º North and the positioning of the windows in the South-West and South-East facades, the kiosk will fully take advantage, during summer, of the wind that averagely strikes exactly from the South-West direction (see wind analysis, page 21). The orientation will therefore drive the wind directly through the kiosk and out from the South-East openings, allowing to efficiently cross ventilate. For what concern the mechanical ventilation, needed during heating seasons when the users will not be able to open the windows, a horizontal decentralized aggregate called AM 300 V from AIR MASTER (with a capacity of 240 m3/h) will be placed on the above storage with the inlet on the kiosk' ceiling and the outlet out from the storage's facade. This will ensure the satisfaction of the minimum air change rate needed (190,8 m3/h).
[AIR MASTER, 2016]

VENTING AND VENTILATION MARKET

From the point of view of the natural ventilation, after several calculations to set the ventilation need (Annex 5) the market has been designed so that it takes advantage of a combination between cross and stack ventilation. This happens thanks to the wind flow passing through the building allowed by the presence of openings both in the floor, on each of the facades and on the internal courtyard facades. The need for mechanical ventilation is instead satisfied by the placement of 6 decentralized aggregates, called DV 1000 H from Air master (with a capacity of 1100 m3/h) on strategic points of the market ceiling. [AIR MASTER, 2016]
The pipes are all placed at the same height and they never cross each other The external outlet are placed on the roof so that the exhaust air will not interfere with the outdoor space, while the external inlet of each aggregate is placed in the corresponding facade. This will ensure that cleaned and exhausted air will not mix. (Annex 6)

A conclusive summary is made on the achievements of the project, explaining how the design fulfils the initial vision. Some reflections on potential improvements to carry into the project are then stated.

08

EPILOGUE

CONCLUSIONS

The initial challenge taken by the two students was to design something useful that could really prove to be respectful towards the environment. The project turned out to be an intense but rewarding journey along the semester.

In the vision stated at the beginning of this report (page 9), is emphasized the will to design a new platform where social, environmental and economic sustainability could find full expression in an holistically designed project that could provide to the visitors a way of experiencing the sustainability at 360º within the perimeter of Karolinelund in Aalborg.

The journey of the designers started with a deep focus on the users, letting them know about the existence of the soon coming Karolinelund's Cargos.
Some public presentations of the project have been therefore carried out directly in the park during the semester, allowing the designers to collect suggestions and inputs directly from the park's users.
It is possible to say in this sense, that the peculiarity of this project has to be found, beside the special qualities that will be soon explained, in the extreme tangibility of it.
Karolinelund's Cargos design, faces indeed the reality, approaching local people's need, and suggesting a real option for the retraining of the area.

A list of design criteria, based on some of the DGNB principles (page 46) defines more specifically the main objectives of the project.
This conclusion is based therefore on some considerations regarding the achieved results, presented as an explanation of the way in which every criteria has been applied in the project. The achieved results are here presented.

THERMAL, VISUAL AND ATHMOSPHERIC COMFORT

The values of the indoor climate have been set up as of primary importance in the designing of the building. Karolinelund's Cargos represent a more than satisfying example of how a good carrying out of the integrated design process can be successful and can result, as in this case, in a building with overall good qualities. Excellent values of indoor temperature are guaranteed in the building throughout the whole year thanks to a good balance between the use of passive strategies and mechanical supports. Windows and openings also followed an iterative design process resulting in the achievement of high level of daylight in the complex. Finally a good sizing of mechanical and natural ventilation's systems brings the levels of Co2 in the building to quite low values.

BUILDING ENVELOPE QUALITY

The careful choice of the constructive materials adopted in the project, results in a well performing building envelope with consequent good energetic performances of the whole building. The Zero energy balance is thoroughly considered with a ZEB approach to environmental sustainability. The reduction of the energy consumption is holistically designed, considering all the aspects relevant to the context. Moreover, through the use of passive and active strategies (the last one consisting in the installation of photovoltaic panels) the complex achieves the low-energy building class 2020, consuming a total of 7,3kWh/m2 per year.

LCA

The achievement already mentioned are strengthened by an additional confirmation given by the pursuing of an LCA analysis that shows a low impact of the building in terms of carbon footprint of the building itself. This is one more time due to the choice of low environmental impacting construction materials.

FLEXIBILITY AND ADAPTABILITY

This is one of the main focus of the whole design, achieved at different levels first of all by the choice of the main material: the container, which is modular and therefore flexible and adaptable by itself. Starting from this point, the flexibility was carried out by designing those modules in order to be movable and potentially reused in a different final location, also thanks to the choice of dry joints in the construction.

PUBLIC ACCESS

The location of car and bicycle parking in two different spots, allow the visitors to choose the most comfortable way to access the complex. The light and permeable configuration of the buildings ensure, moreover, a free walkability of the all site from the point of view of the pedestrian paths, also connecting both visually and physically the city with Karolinelund's park.

DESIGN FOR ALL

All Karolinelund's cargos accesses, lifted from the ground, are provided with ramps for the accessibility of all. Also the vertical connections between different levels, in all the three buildings, are equipped with lifts or with ramps for an easy access at all levels.

QUALITY OF OUTDOOR SPACES

The central public square is configured as a flexible space for the interaction and

the gathering of people. This is possible thanks to the presence of movable furnitures and green areas available for the user.

LAND USE
The temporary character of Karolinelund's Cargos together with the choice of low land impactful foundations, ensure a good land use. After disassembling the building in fact, the marks of the passage of the complex on the site will be barely visible.

LAYOUT QUALITY
The internal layout of the complex offers to the visitor a double experience. From one hand he will be clearly guided and addressed within the different functions of the building, while from the other hand, the internal open athmosphere and the set of different functions and activities, will bring him towards an explorative journey through the sustainability.

CLEANING AND MAINTENANCE
The cleaning and maintenance of the building is also taken into account since the beginning of the design process. Special areas and facilities for the collection and separation of waste are provided in strategic positions both in the Market and in the social centre. Areas for the storage of the tools needed for the cleaning and the carying out of all the different activities are also provided in all the complex, aesthetically designed in an integrated way with the rest of the building, ensuring a final unitary expression.

REFLECTIONS

The combination between high academic requirements and limited time frame available proved, as expected, to be crucial for some of the aspects of the project. As for the conclusions, the DGNB pyramid presented at page 49, is here taken up and analytically re-read to highlight the aspects of the project that could, having more time, be deepened, better developed or completely changed.

DRINKING AND WASTE WATER
One of the aspects that, even if set as one of the main goals, has not been developed at all, was the design of a tank for the collection of the rain water. the collected water could have then be purified and reused for toilet's flushing and watering the plants of the green house, activating a circular sustainable mechanism also in this sense.

QUALITY OF OUTDOOR SPACES
Even though half achieved, for the reasons mentioned in the conclusions, this point could have been further developed designing the outdoor spaces more in detail, providing for example benches and shelters from wind and rain. Also some more attention in the design of the area close to the petanque could have brought extra qualities to the project and the surroundings.

FIRE SAFETY
Some of the materials used in the project are highly flammable. For this reason a more detailed care about fire safety solutions could have been exploited.

SOUND INSULATION
Also in this case, a different choice of materials and internal layout could have brought extra value to the project, especially in the market where the high turnout of people could result in noisy internal spaces.

Extra points that could have been further developed are:
- indoor climate documentation for greenhouse and social centre
- Energy consumption documentation for greenhouse and social centre
- Better internal layout and distribution of the greenhouse
- Suggestion of an alternative design solution of the complex to be placed in another location for the reinforcement of the concept of urban flexibility

Ill.116 | DGNB criterias achieved in yellow

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09

ANNEXES

ANNEX 1
BE15 RESULTS

Energy frame BR 2015

Without supplement	Supplement for special conditions	Total energy frame
41,3	0,0	41,3
Total energy requirement		19,2

Energy frame Buildings 2020

Without supplement	Supplement for special conditions	Total energy frame
25,0	0,0	25,0
Total energy requirement		7,3

Contribution to energy requirement

Heat	18,0
El. for operation of bulding	1,9
Excessive in rooms	0,0

Net requirement

Room heating	14,3
Domestic hot water	5,3
Cooling	0,0

Selected electricity requirements

Lighting	7,4
Heating of rooms	2,1
Heating of DHW	0,0
Heat pump	0,0
Ventilators	2,3
Pumps	0,1
Cooling	0,0
Total el. consumption	30,7

Heat loss from installations

Room heating	3,7
Domestic hot water	0,0

Output from special sources

Solar heat	0,0
Heat pump	0,0
Solar cells	52,3
Wind mills	0,0

ANNEX 2
PV'S CALCULATION

Zero energy building with solar cells

The following calculations show the energy consumption that the solar cells need to cover in order for the market to achieve the requirements for a nearly a zero-energy building.

Contribute to energy requirement

Heat: $18kWh/m^2 * 0{,}6 = 10{,}8\ kWh/m^2\ year$
El. For operation of building: $1{,}9kWh/m^2 * 1{,}8 = 3{,}42\ kWh/m^2\ year$

Total energy frame in Br2020: $10{,}8\ + 3{,}42 =\ 14{,}22kWh/m^2\ year$

NetZEB

Energy frame calculated for one whole year of the whole building:

$$\frac{14{,}22kWh}{m^2 year} * 3036m^2 = 43171kWh\ /year$$ PE (Primary energy)

Lightning and appliances:

$$93205\ kWh/\text{year}$$

Converting from FE to PE.

$$93205 * 1{,}8 = 167769kWh$$ PE (Primary energy)

Sum of total el. Consumptions
$43171kWh/year + 167769kWh/year = 210940kWh$ /year

Calculation of the solar cells peak performance need to cover the energy consumption. The calculation is based on the sheet "PVdimensioneringsguide-nomogram", presented in the lecture 5 in the ZEB course.

$$C * D * E * 1.8 = production\ (kWh)$$

A = total amount of module areal – m^2
B = Assessment of module efficiency (%) (18% - highly efficient monokristalline)
C = Installed effect = $\frac{A*B}{100}$ -The solar cells performance in full sun (number of modules times the rated load) (kW_{peak})
D = Assessment of system factor (Freestanding / building integrated) – system factor takes into account the temperature influence, difference in the individual modules performance, losses in cable and inverter and so on. (0,8 – freestanding)
E = radiation kWh/m^2 – scheme (Annual solar energy on a slope in Denmark. Values may vary geographically and from year to year.) (1097 kWh/m^2 horizontal positioned, south , 15 degrees)

$$A = \frac{100 * 210940kwh/year}{E * B * D * 1{,}8}$$

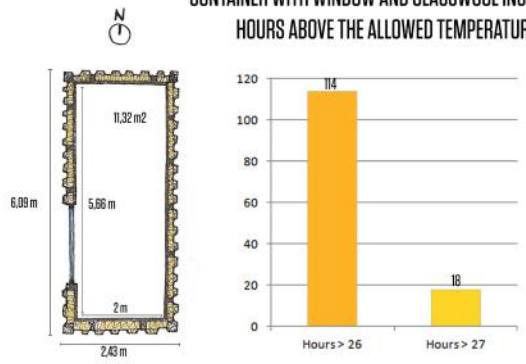
$$\frac{100 * 210940kwh/year}{1097kwh/m^2 * 18 * 0{,}8 * 1{,}8} = 741{,}8m^2$$

Calculation of Peak power

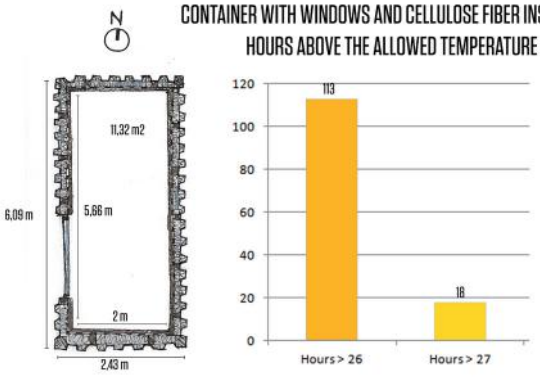
$$\frac{741{,}8 * 18\%}{100} = 133{,}5kWpeak$$

ANNEX 3
EXTRA BSIM ANALYSIS

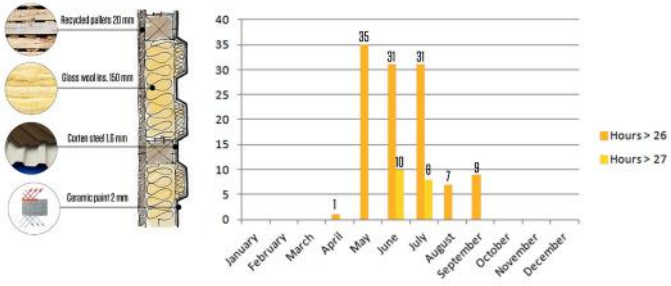
CONTAINER WITH WINDOW AND GLASSWOOL INSULATION
HOURS ABOVE THE ALLOWED TEMPERATURE



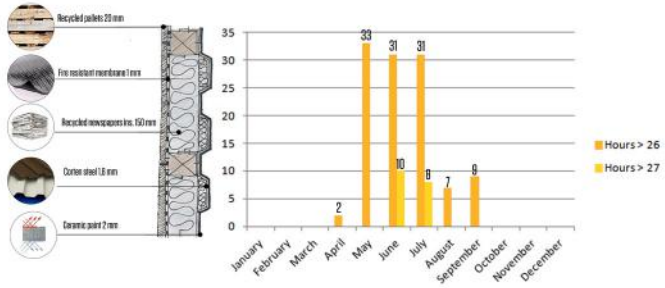
CONTAINER WITH WINDOWS AND CELLULOSE FIBER INSULATION
HOURS ABOVE THE ALLOWED TEMPERATURE



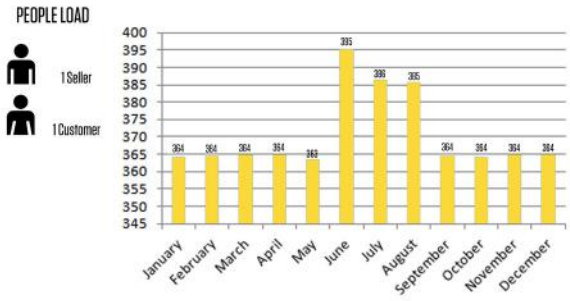
CONTAINER WITH WINDOW AND GLASSWOOL INSULATION
HOURS ABOVE THE ALLOWED TEMPERATURE



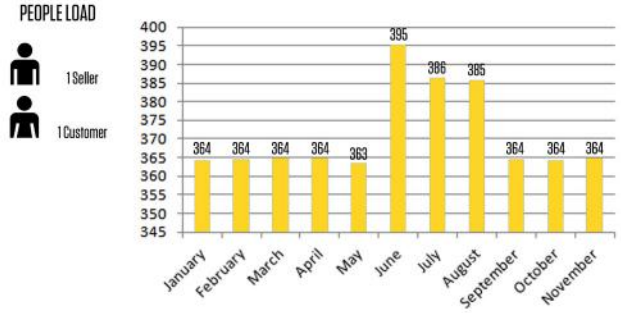
CONTAINER WITH WINDOWS AND CELLULOSE FIBER INSULATION
HOURS ABOVE THE ALLOWED TEMPERATURE



CONTAINER WITH WINDOW AND GLASSWOOL INSULATION
CO2 (PPM)



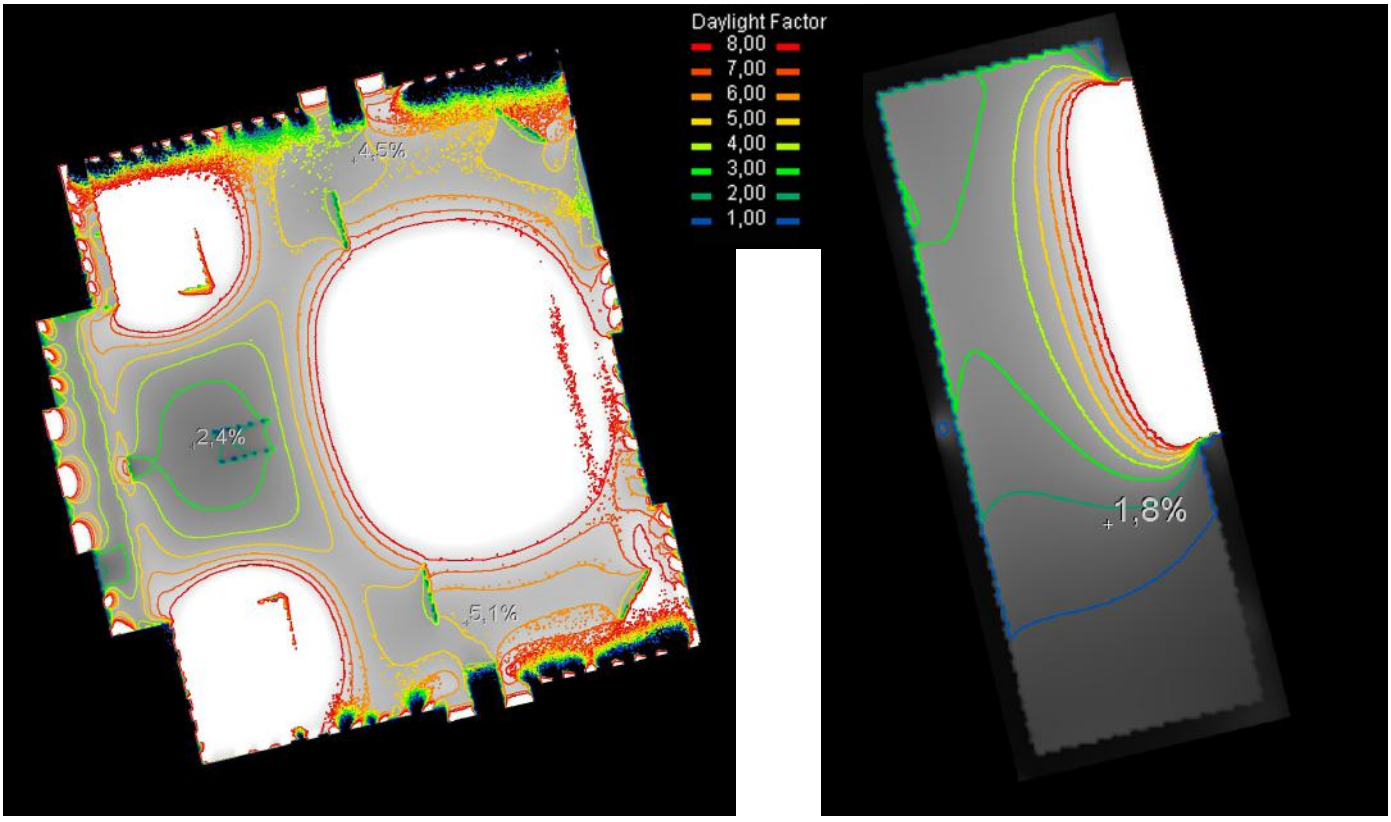
CONTAINER WITH WINDOWS AND CELLULOSE FIBER INSULATION
CO2 (PPM)



ANNEX 4
EXTRA DAYLIGHT ANALYSIS

MARKET FIRST FLOOR

KIOSK WITH ONE WINDOW



ANNEX 5
MECHANICAL AND NATURAL VENTILATION HAND CALCULATIONS

Rooms	Area (m2)	Height (m)	Volume (m3)	Persons (No.)	Material (Olf)	Olf (Olf/pers)	Background pollution (Olf/m2)
Market	3036	7,8	23680,8	220	607,2	2	0,2

Olf

(Olf/m2)	Discontent (decipol)	Ventilation rate (l/s)	Air Flow rate (m3/s)	Air change (h^-1)	AFR (l/s pr. m2)
0,2	1,4	7757,04	7,76	1,18	2,56

CO2

Rooms	Area (m2)	Height (m)	Volume (m3)	Persons (No.)	Activity niveau (met/pers)	CO2 caused by pers. (l/h/pers.)
Market	3036	7,8	23680,8	220	1,1	24

Added CO2 (l/h/m2)	Added CO2 (m3/h)	Concentration diff. (PPM)	Air quality (m3/m3)	nV (m3/h)	Air change (n=h^-1)	AFR (l/s. pr m2)
5280	5,28	550	0,0009	9600	0,41	0,8

THERMAL BUOYANCY AND WIND INDUCED AFR

Windward	0,2
Leeward	0,2
Roof	-0,4

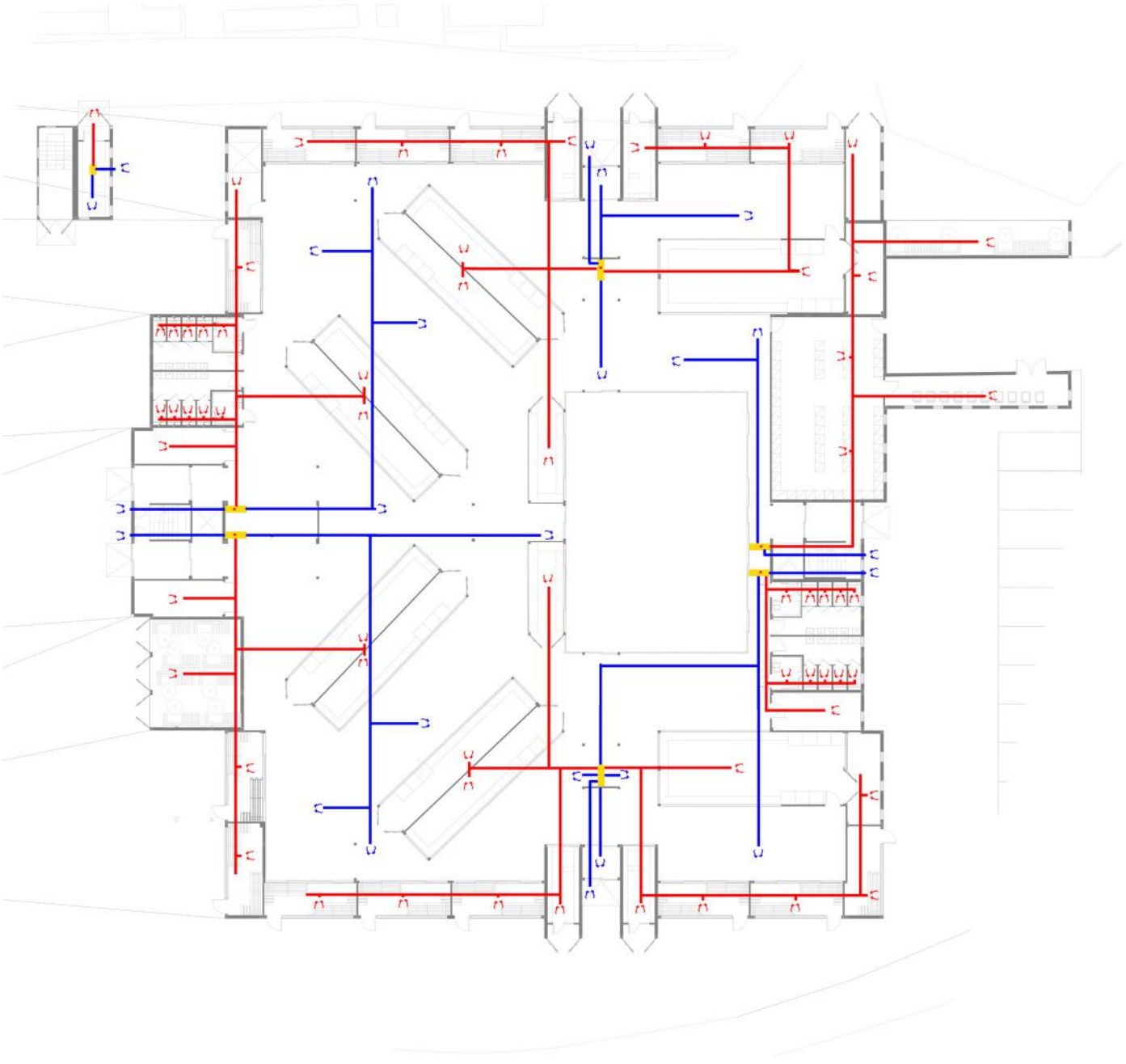
Windfactor	0,57
Vmeteo	5,8 m/s
Vref	3,306 m/s

Location of neutral plan, Ho	7,02
Outdoor temperature	12°C
Zone temperature	22°C
Discharge coefficient	0,65
Air density	1,25 kg/m3

Facade	Area (m2)	Eff. Area (m2)	Height (m)	Thermal Buoyancy (pa)	Wind induced, AFR (m3/s)
South	2,74	1,781	4,7	0,966	3,947
West	4,11	2,672	4,7	0,966	5,920
North	2,74	1,781	4,7	0,966	3,947
North	16,,56	10,56	7,8	-0,324	-13,814

ANNEX 6

PIPE ROUTING OF THE MECHANICAL VENTILATION OF THE MARKET



ANNEX 7
STRUCTURAL PRINCIPLE