

Migration of the Garden City

THE LIVING CITY

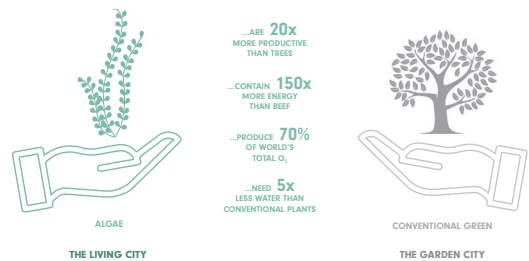
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The Living City is an architectural project, located in Rotterdam South, that has a strong cultural and historical relation with its context. It anticipates on the created and developed Garden Suburbs Vreewijk and Bloemhof and the current problems they are facing relating densification and isolation issues. On the other hand, Rotterdam as a city itself is struggling with large problems, as climate and socially related issues. This is the time in which we can envision a new urban typology, which is an essential task to be done to make our cities survive the upcoming century.

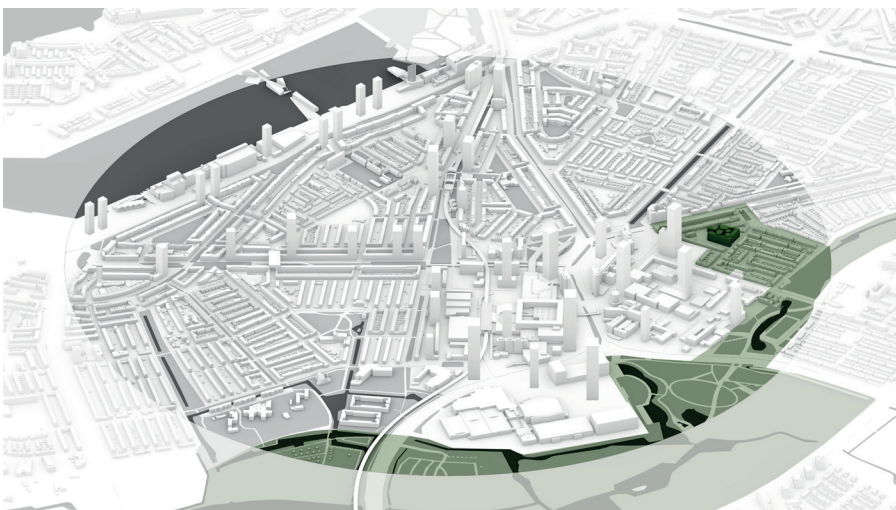
Now more than ever, the design principles of the Garden City and Suburbs are relevant for the renovation of the city typology. They represent the green and socially inclusive society that we desperately need. Within the Collage City vision for Rotterdam, the Living City reacts on the migrated and evolved Garden Suburbs within the site and the expanding high-rise district Zuidplein. Due to the expanding high-rise typologies, the valuable design principles of the Garden Suburbs are in danger. To reactivate its strengths and stimulate the opportunities it has for the city, the Garden Suburb Vreewijk will be turned into the Green City district, in which the Living City will act like a catalyst.

This experimental project implements the created vision of the Collage City in an architectural design. While at the same, the area will be densified in a livable way by reusing the existing buildings. The historical character of the Garden Suburb and the complementing architecture of the Amsterdamse School will be maintained and combined with the contemporary

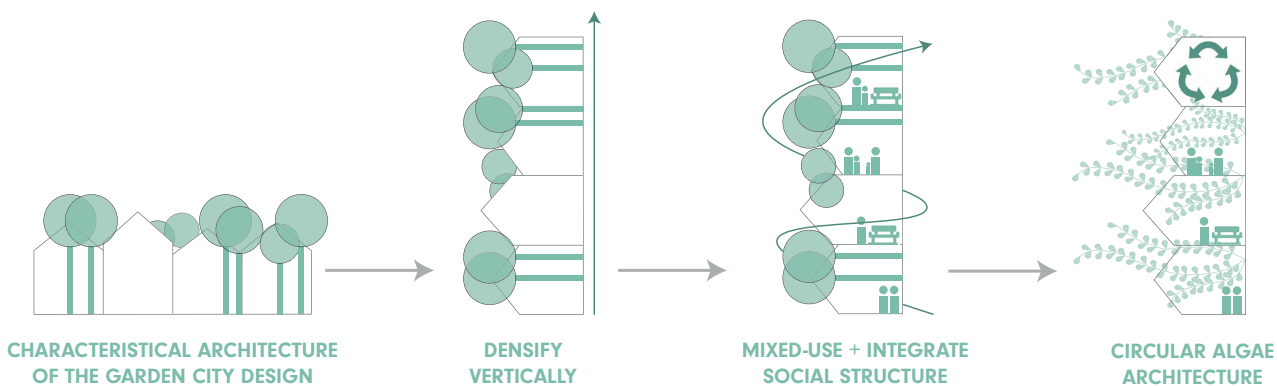


urban typologies. To create a flow in the existing rental housing market, the project provides three types of housing: two classes of social housing and one class of medium rent housing. At the same time, integrated public green will attract the local community, strengthen the social structure and provides new forms of architectural green. Most importantly, the green urban design concept of the Garden City will be translated into a green architectural design by using algae. Algae is a relatively underdeveloped type of greenery within the field of architecture, but has an immense potential to become the pioneer in climate proof and circular building. Through experimental exploring, the algae lab of the Living City tests new sustainable initiatives and products, applicable for architectural design. Eventually, the gained research and knowledge will be applied into the ecological restoration of Rotterdam. This all to set an example in future algae-architecture and exploring this new field of architecture.

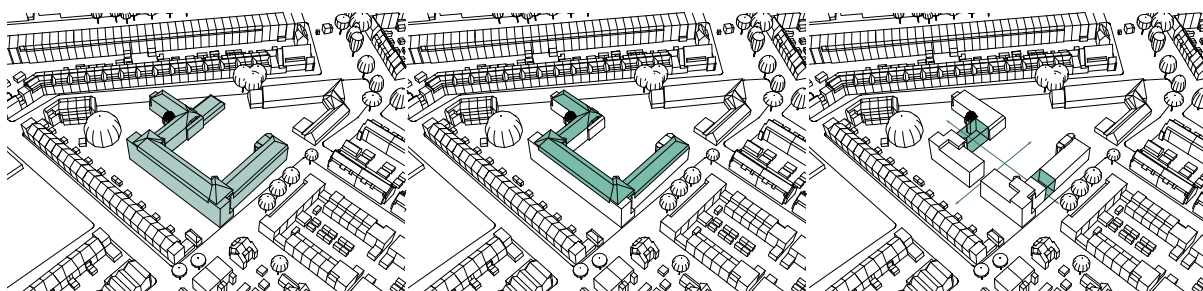
Finally, the three program elements; housing, algae lab and public green, will be composed in zones inside the building and the closed algae labs are unified all program elements and connects them.



Location within Collage City vision



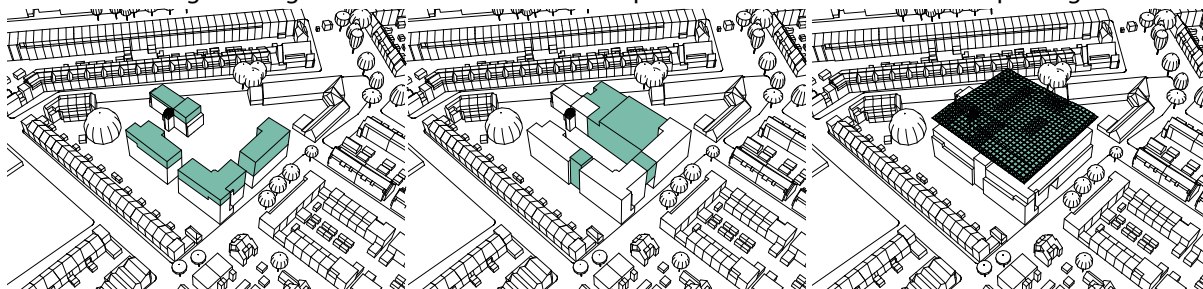
Evolution of the Garden City typology



Existing building

Demolish parts

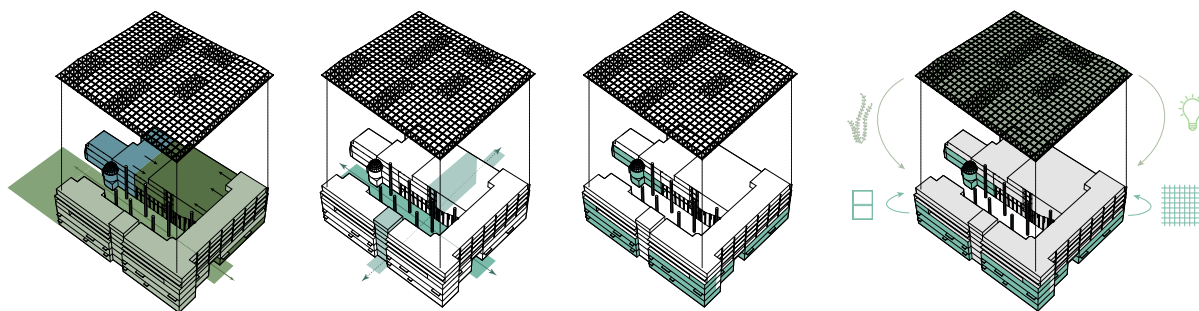
Create passings



Raise the existing

Enclose with additional volume

Cover with big algae canopy



Zoning concept

City typology concept

Parts of the existing structure

Facade concept

The Living City aims to strengthen the character of the existing and what is left from the Garden City design, while at the same time reacting to the future needs of the city and the expanding high-rise districts. The translation of the conceptual urban design into an innovative and circular architectural design is made by using algae. The immense potential of algae is being researched and integrated throughout the building. When building on top of the existing, the Green City district will be densified in a vertical way.

Design Ambitions

To design the evolved typology of the Garden City, the original urban design will be down scaled. As a result, the typology of the Living City will be similar to the one of a city structure. Two streets will cross the building and lead to an inner square. Another element taken from the Garden City design is the community feeling inside the neighborhoods. By creating shared spaces, such as a green rooftop, this feeling is recreated inside the project design.

To attract local visitors inside the building, the design plays with curiosity. Several passings and see-throughs empale the building towards the inner public street. From outside, visitors are stimulated by elements that encourage to further explore the building. One of these elements is the algae-architecture that is integrated throughout the building in different ways. Not only programmatically, but also the construction and materialization of the building expresses the algae-architecture.

Program concept

The original design of the Garden City is divided into several zones. These zones are composed in a radial way. In the middle, there is a central park and around it there are six sections with an arcade, a grand avenue and several street on the outer layer. This concept of zoning is taken into account when designing the Living City. The public campus will take the role of the grand avenue and physically and visually connects the several programmatic elements of the project. The closed algae panels work as visual connectors throughout the whole design. As a result, a great gesture will be made by placing an additional algae canopy structure on top of the building.

Site concept

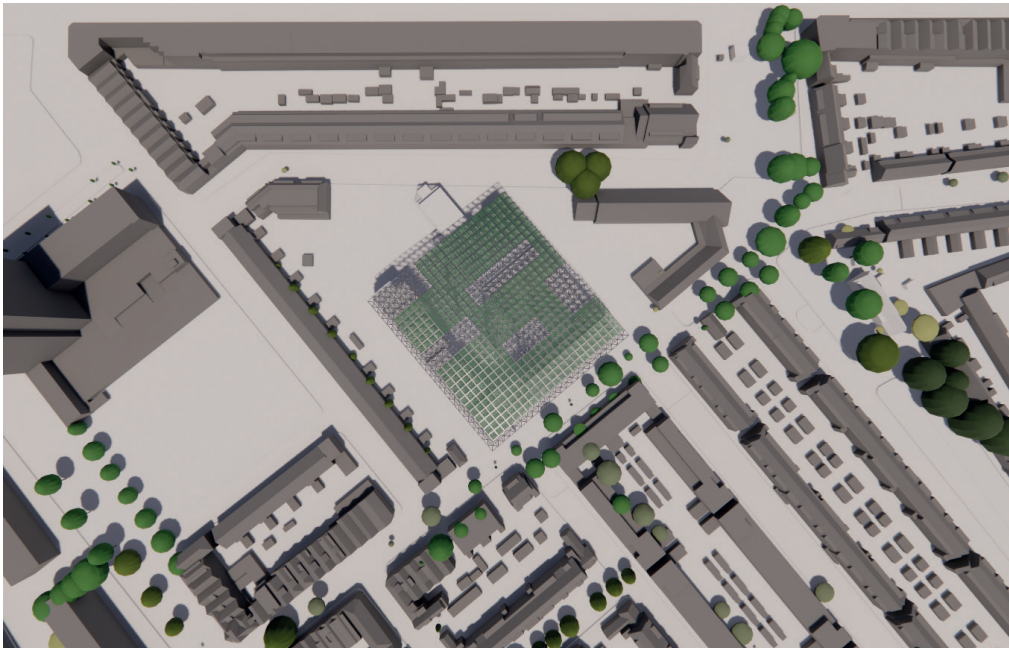
The location of the Living City is right between two contrasting zones: the future high-rise district Zuidplein and protected Garden Suburb Vreewijk. The area around the plot has a low density with a monotonous program of housing. On the plot of the project, there is an old school complex from 1923, that is vacant since 2016. The existing building is designed by the city architect Ad van der Steur and follows the rules of the Amsterdamse School style. The facade has a lot of characteristics from this architectural style, such as the grid that is implemented throughout.

The aim of the project is to celebrate the existing architecture on the site, while increasing the density of the area. By creating two perpendicular axes, there are two main public streets running through the building. In that way, local visitors are attracted and the city typology of the design is emphasized.

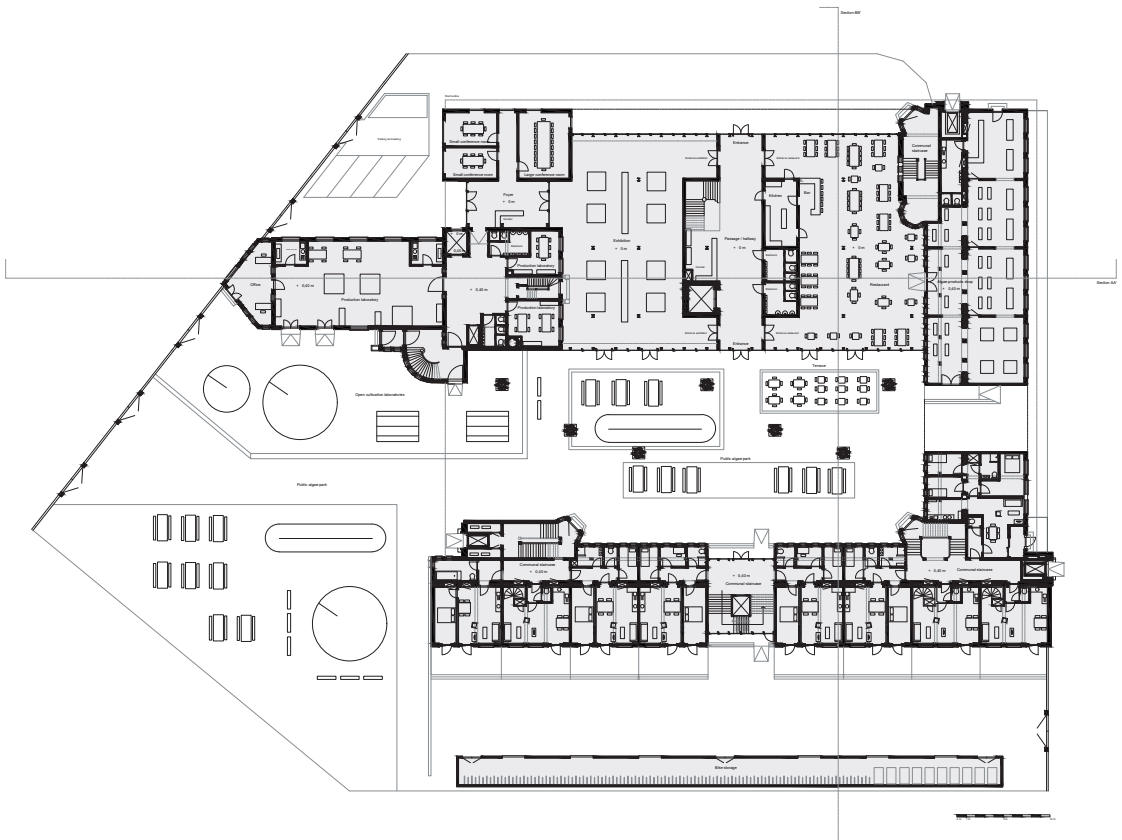
Concept definition

The concept of the final massing can be explained in six mass shaping steps. Within these steps, the design, site and program ambitions are defining elements of the final shape.

At first, the existing building is analyzed by a value assessment and the most important elements of the architecture, the facade design and the spatial interior qualities, are kept. The unoriginal parts, the roof and the parts that are in bad state are removed. To create a city typology and encourage curiosity, two streets are created through the building, which both lead towards an inner square. After that, the existing parts are raised, in order to increase the density of the area and to fit the program. Next, a volume is added to enclose the inner square, which emphasizes the community feeling. The program is composed inside the building according to the zoning concept. At last, the visual connector, the closed algae labs, are placed on top in a large roof construction. This structure will be visible from outside and stimulates the curiosity and on top of that, it leads the way of the extreme algae-architecture.



Top view rooftop



Ground floor plan

The final design of the Living City is the realisation of all the conceptual ambitions. It represents the Garden Suburb as an icon in the city. The algae-canopy is the main feature of the design and forms the eyecatcher. The vacant school complex is brought back to life with 55 housing units inside and on top of the old classrooms. Inbetween, the additional raised volume creates a neutral canvas that lets the algae-architecture and the Amsterdamse School style speak for itself. The zoning concept and the two perpendicular streets create a city structure within the building itself. It is a true community building, not only symbolic but also programmatic. Never before was housing combined with an algae research institute. The mix of public and private program in one complex creates a living and vibrant environment, that is open to all. Inside the project, all possible visual connections are made. When walking through the corridors of the housing, a view into the restaurant is established. From the algae institute, the foyer creates a connection towards the public exhibition, workshop and multipurpose hall. The open outdoor lab is exposed to the public by physically connecting it with the public algae park.

Routing

The routing of the Living City can be divided into three, according to the different users: the residential route, the visitors route and the route of the researcher. Just like the zoning of the program, the routes are divided into zones as well. Each route has their own entrance and vertical circulation zones.

There are four staircases inside the residential part of the building. The elevators have separate entrances since the ground floor of the building is 40 centimeters higher than its outdoor surroundings. The two largest staircases lead to the shared rooftops.

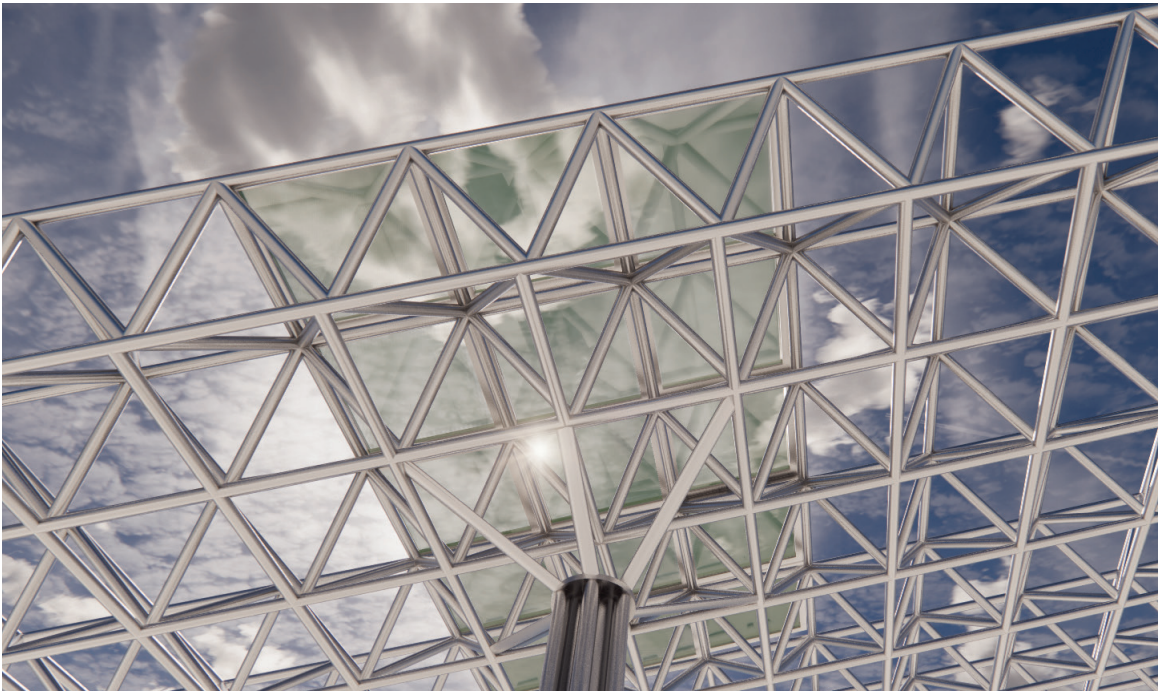
The public route has two main axes and is connected visually to the vertical circulation zones of the residential and research parts. The indoor-outdoor connection is strong due to the transparent facades. The main entrance is highlighted through pushing back the facade.

The research facility has separate entrances on the North side of which five are located in the outdoor lab.

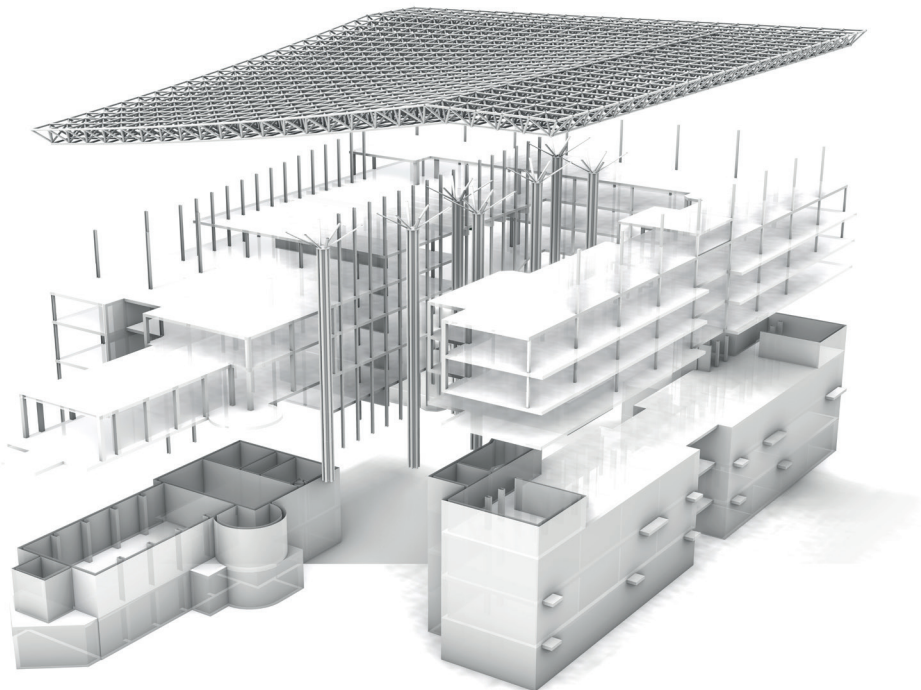
Experience

The Living City provides a unique living and relax experience as it is nowhere else done before. The algae park that runs through the building gives an insight in the design elements that are used. It explains the visitors of the park how the building system works and brings them in connection with algae-architecture in the built environment. Relaxing at the algae-ponds in the park or sitting under the algae-space frame, these experiences make this building one of a kind. The public program that is provided aims to attract a wide range of visitors and sets an example in sustainable living.

Moreover, the housing is a one of a kind project where all the benefits of the algae-architecture are experienced. Living in a green and healthy building with a strong social structure is the main goal of the residential part of the project. The shared green spaces aim to bring the residents in touch with each other resulting in a social network inside the complex. The ambition to provide big green spaces for all residents inside city centers is one of the main features of the housing complex.



Algae panel roof structure



Construction model axo

The materialisation of the project is an answer to the materials of the existing building. Where the construction of the old school complex is made from heavy stones, the contrasting additional parts are made from steel and aim to have a light impression. The algae-canopy structure on top appears to be very light as well due to the open steel space frame. Since the canopy structure is supported by a lot of columns, these columns are all very thin. This also strenghtens the impression of a light structure.

The facade of the existing is designed according to the grid of the structure and the windows are composed inside this grid. Taken from the existing facade are the measurements of the windows and the overall grid. To emphasise this grid design, the facades of the additional parts are covered with ceramic tiles. These tiles are 40,8 by 20 centimeters, which is the smallest measurement of the grid on the facade of the building. The lines that the grouting of the tiles make reflect on the bigger grid of the design. The tiles are white and have a glossy layer to make them reflect the green light that the algae-panels create. The parts of the facade where the new addition touches the old existing walls, are made of glass. Here, the contrast between old and new is made even bigger.

Moreover, the raised volume is set back to let the other two main elements of the building speak. It aims to be a neutral inbetween layer, which relates to the existing but also answers to the algae-canopy. Towards the outside, the facade of the housing units of the additional volume appears open and clear. The facade is opened up with large sliding doors and is relatively light compared to the existing building. Towards the inner public square, the facade of the new corresponds generally with the facade of the old.

Relatively underdeveloped is bioplastic made from algae. To become a pioneer in algae-architecture, the Living City aims to use this plastic in the design as much as technically possible. Therefore, interior elements such as dividing elements and tabletops, but also exterior elements as balcony fences are made of algae bioplastic.

Structure concept

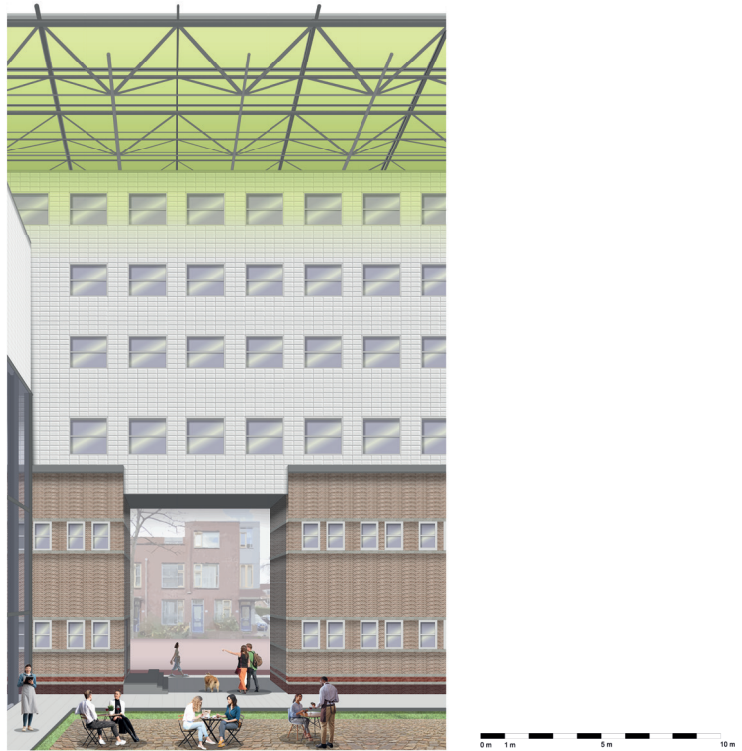
The main concept of the structure is emphasizing the old by creating a contrast in material and at the same time immitating the existing grid. The old and heavy stone structure of the existing building is divided into a grid of 7,35 meters with a smaller grid inside of 2,45 meters. The additional parts create a contrast by using a light steel structure and glass facades. On the other hand, it complies in using the same grid of the existing building and therefore strengthens its original architectural style. The separate algae-canopy structure consists of a steel space frame with algae-panels on top and is placed six meters above the highest rooftop of the building. Same as the additional volume, it uses the grid of the existing building.

Climate design

The main element of the climate design is the steel frame canopy with algae panels. The panels are closed bioreactors that produce algae biomass. The biomass is transported to the technical rooms of the research institute. Here, the heat is taken from the biomass, which is used to heat up the building. The biomass is further transported and burned to produce energy. Moreover, the canopy structure is used to create shade on the rooftops. As a result, the housing units on the top floors are less heated in the summer. Also, the algae-panels have a sound insulation effect and create a sound buffer for the housing.

The open algae raceway ponds are used to clean air and water. In total, the algae ponds can reduce 6 ton/year of CO₂ in the air.

The complete building aims to be self sufficient and circular. It is independent from other sources and provides enough heat, energy, clean air and water to sustain itself. This futuristic system is an innovative way in sustainable architecture that aims for a futureproof circular city.



Facade fragment



3D view public park

Reflection

This project of the Living City foresees in combining the different scales of architectural thinking. It starts with analysis and defining the problems on the bigger scale of the city and the migration in the world, but also addresses the neighbourhood, building and detail levels. All these elements are integrated into a convincing and relevant project which explores and expands the knowledge about designing for a dense urban area development by coming up with innovative and future proof solutions. The narrative of the project contributes to position the design in the broader context of dynamic city.

The relevance of the project is determined by the ever changing needs of the city whereby the cultural and historical relation with the context is maintained. The principles of the Garden City concept are decisive for the design of the new Living City. This subject is re-wired to the context of the Vreewijk, by taking the original concept of the garden suburb of Vreewijk and making it future proof, responding to the changing needs of the city design. The project anticipates on the changing needs of the city, trying to come up with an innovative but realistic design concept to address these climate and social related problems. Here, algae are introduced as a relatively new architectural means to anticipate on the increasing demand for a climate proof city with circular buildings.

Global relevance

The research of the project starts with the topic of the migration of the Garden City design. This concept model migrated all over the world and reshaped into different forms. Even now, this concept is evolving and migrating. The Living City is a new evolution in the process of this migration. It implements the algae design theme into the Garden City evolution and aims to set an example to all evolutions and renovations of the Garden City design over the world. It shows the potential that algae have in the field of architecture and the relevance to our world wide problems, such as social and climate issues.

Ethics

The main ethical issue that can be address in the design are the materials that are used. To create the enormous algae-panel canopy, there is a lot of material needed. The space frame structure made from steel with a surface of more than 3000 m², seems unethical due to the large amount of material needed. However, the Living City compensates by using a vacant existing building and saving a large amount of new material and waste material.

Furthermore, the project aims to create a flow in the housing market by adding three classes of social housing which are currently underrepresented. The city of Rotterdam offers mainly expensive rental housing when it comes to the inner city areas. This creates a gap between the poor and the rich when speaking of living areas. The Living City establishes this injustice by offering social housing close to the inner city areas.

Conclusion

The Living City aims to be a pioneer in algae-architectural designs. It experiments with new technological innovation and sets an example for designs relating the integration of algae in the built environment. Algae have a huge potential for the future sustainable design for our cities. It is important to gain more knowledge on the integration into architectural designs. This could be the answer to the world wide problems in the cities.