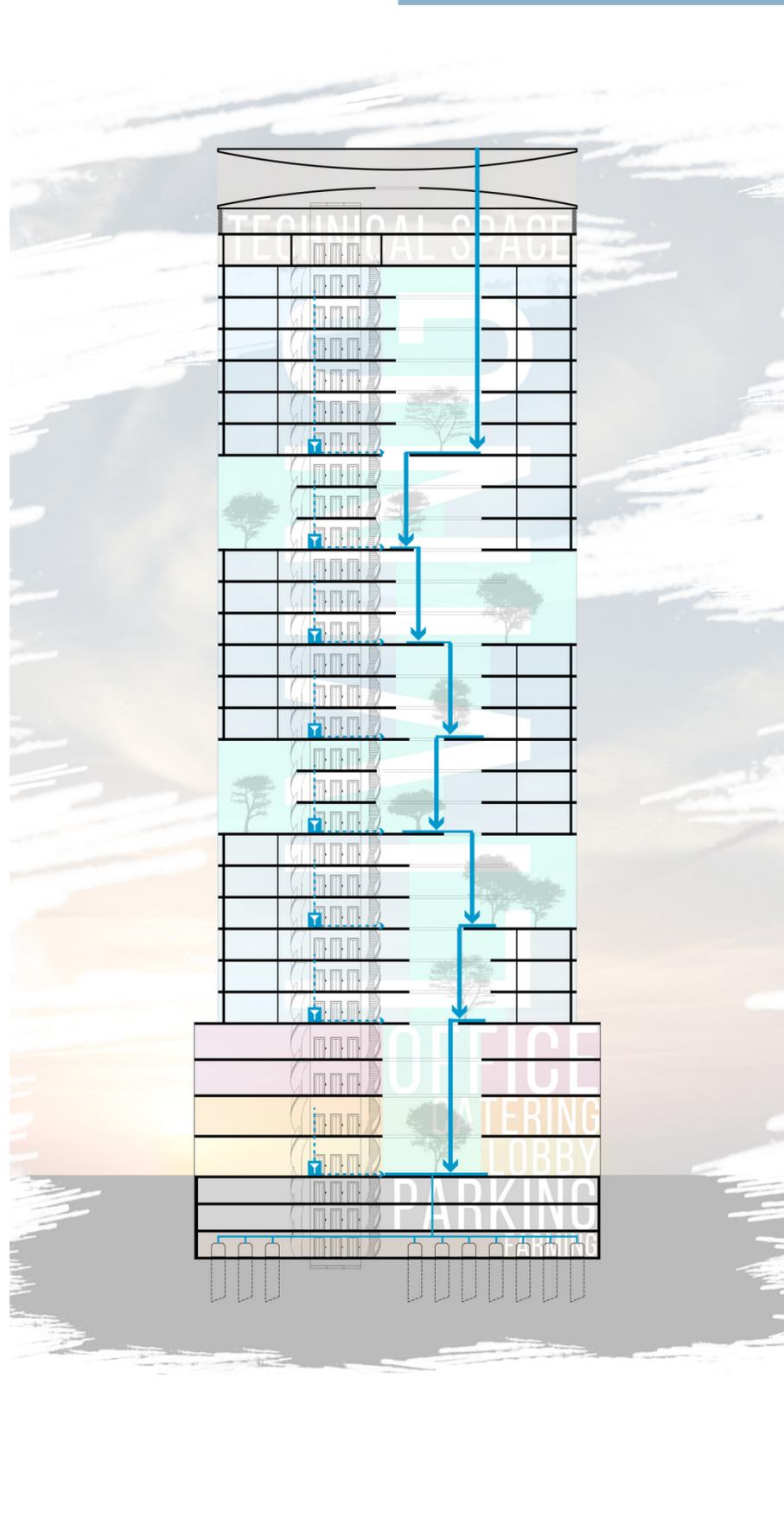


01



# Waterproof

Sustainable Hospitality Challenge 2021  
Hotel Management School Maastricht



# The Problem

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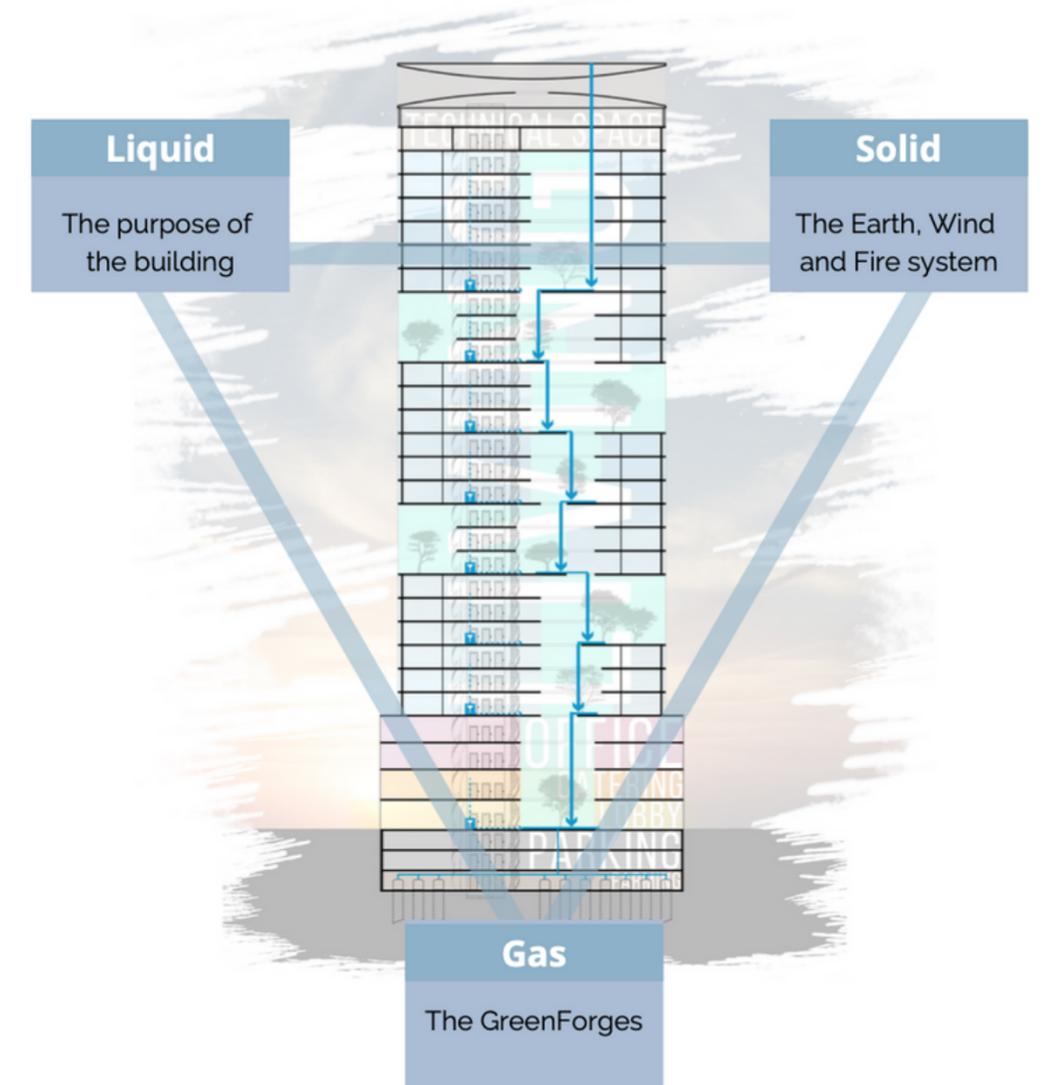
It is a fact that the world will change tremendously by the time of 2050; however, all the predictions made for how the city of the future will look like, are just assumptions. Regardless, some things in this world will always remain the same: the basic human needs for sleep, shelter, water, air and nutrition. Humankind is currently destroying fresh water, even though we cannot live without it. It is undeniable that it is time for a change...

# The Solution

The importance of water functions as the central aspect in our building. By implementing all three phases of water, liquid, solid and gas, the building is not only sustainable from the roof to the underground foundation but also fits the purpose economy perfectly. The solid phase represents the building itself, the liquid phase represents the people floating through the building and the gas phase stands for the underground, non- visible part of the building.

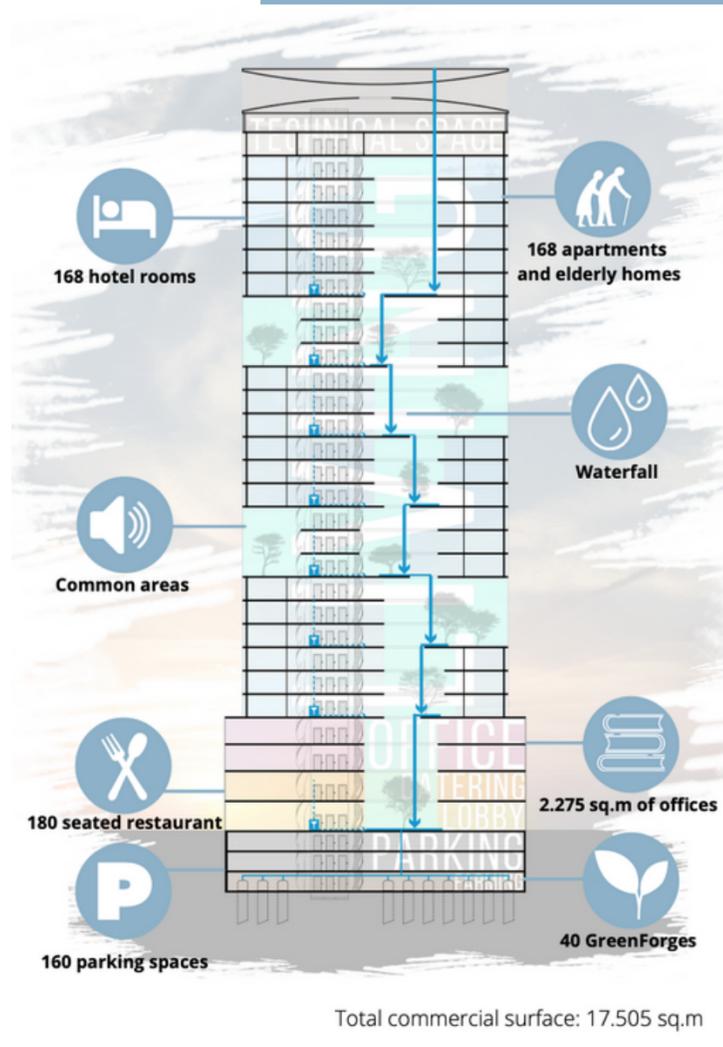
*Our vision is to create a world in which the basic needs of humankind will be fulfilled without neglecting the needs of the earth itself.*

With the architectural design of Ruben van Wijngaarden, the EWF airconditioning concept of Ben Bronsema and the underground farming of GreenForges, the vision came to life in a building that is ready for the future of 2050.

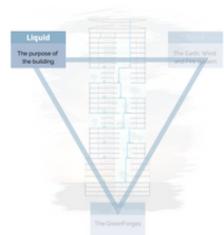
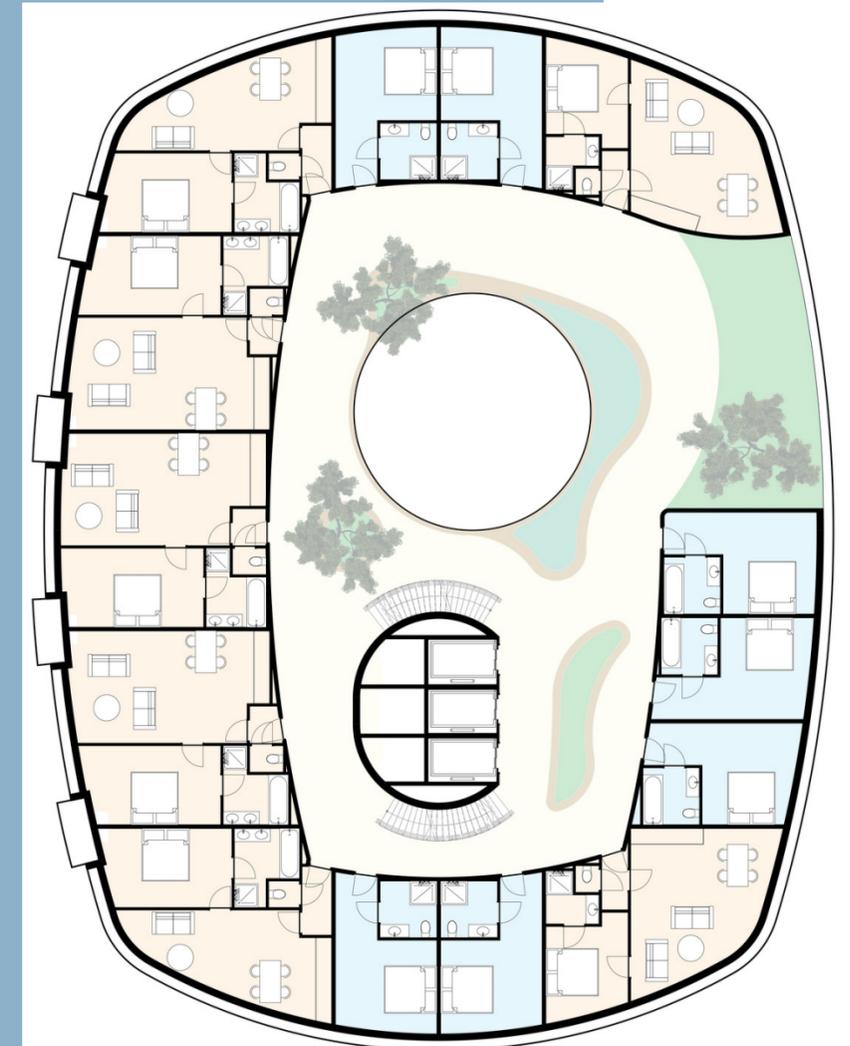


# Liquid

The Waterproof building provides multiple facilities, yet all with the same purpose: connecting people from all generations, with all different purposes in the most sustainable way. But what exactly does the building provide?



All 336 units only provide the most needed features in order to stimulate the inhabitants and guests to make maximum use of the common areas. In addition to the open common areas of the building, the 180 seated restaurant on the ground floor will function as the main meeting point of the building. In this restaurant, both internal and external guests can connect with each other while enjoying their sustainable dishes with crops grown right below their feet in the underground farm. Besides from the hotel rooms, apartments and elderly homes, three floors of the hotel will exist out of office spaces. These office spaces will add an extra value to the building for people working in the city.



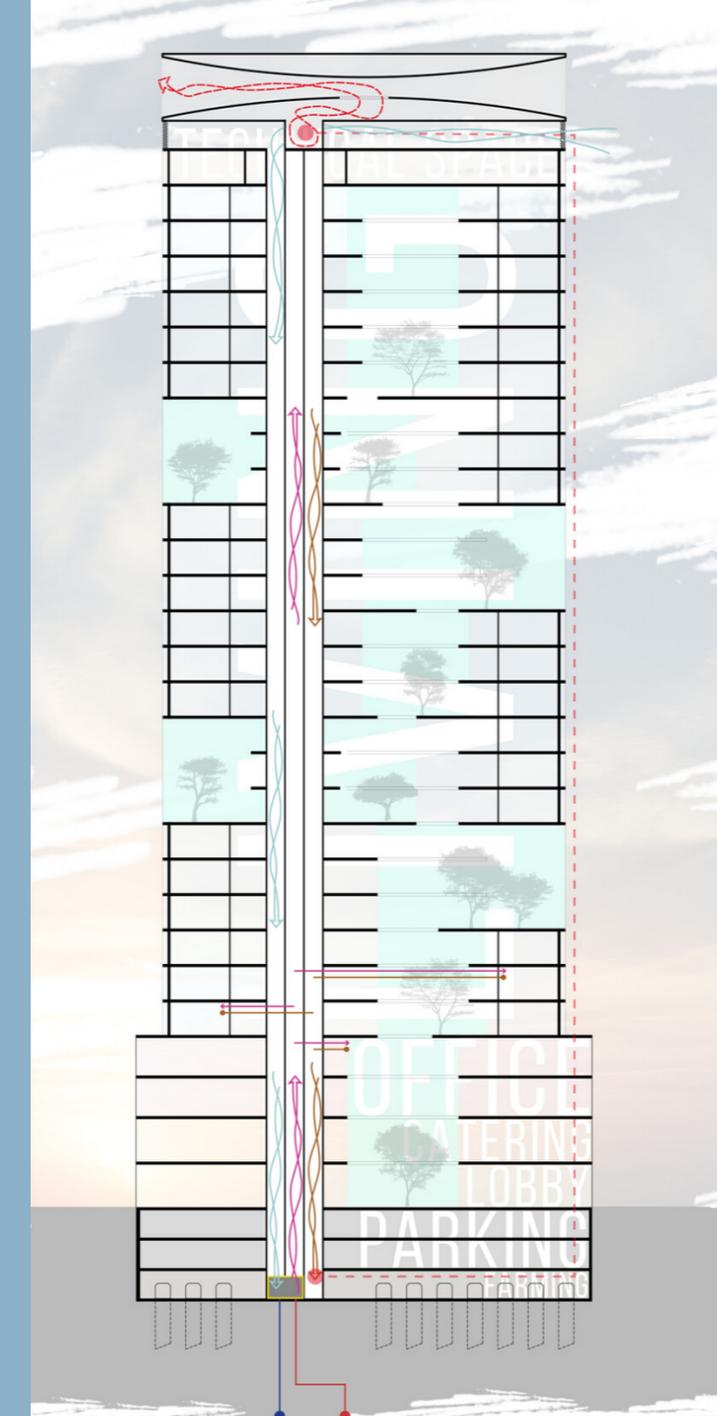
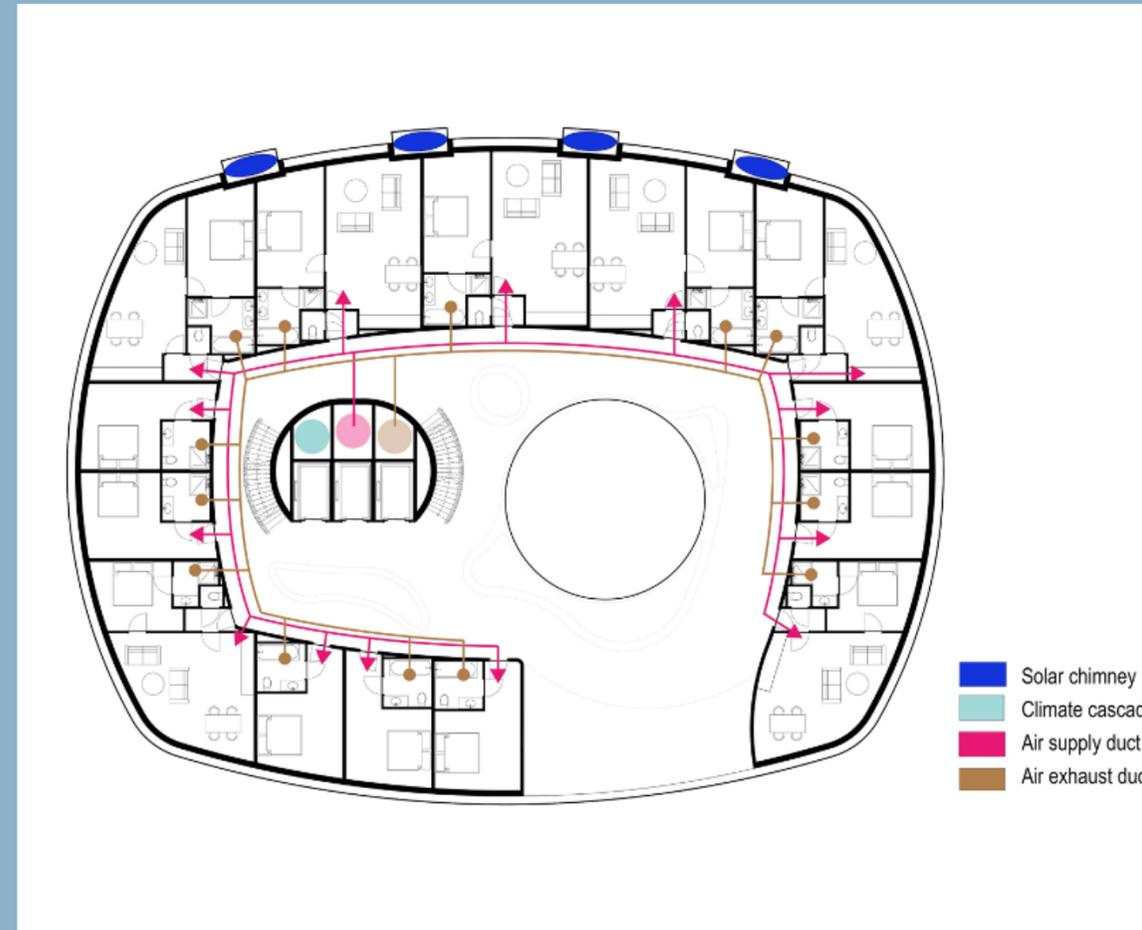
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# Solid Earth, Wind & Fire concept

The Earth, Wind & Fire concept (EWF) is used for natural air conditioning which gives the building a healthy, comfortable and productive indoor climate and ensures an energy-efficient building.

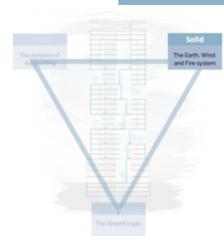
The EWF concept makes use of sunlight, wind and falling water to ventilate and cool down the rooms and to supply warm water.

Three responsive architectural elements shape the EWF concept: a climate cascade, four solar chimneys and a Ventec roof.



Besides the EWF concept, other elements have been applied to make the building more sustainable.

- The building has PV solar panels on the roof and in the solar chimney
- The grey water system provides water to the underground farms of GreenForges
- Rooms go into 'sleep mode' with a lower temperature to save energy
- The hot water from the shower is collected and the heat is extracted and reused



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# EWF- Future ready

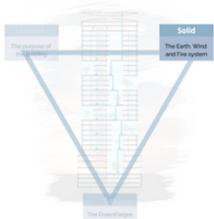
Due to the Earth, Wind and Fire concept, the Waterproof building complies with the current European requirements, laid down for the Netherlands in NZEB (Nearly Zero Energy Building) Performance Indicators. The European requirements are even more strict than the goals of the Paris Climate Agreement for 2050 and therefore the Waterproof building is future ready!

Requirement	Explanation	Realisation building	Check
NZEB 1 – Building Energy demand < 65 kWh.m2	The amount of energy required by a building for heating and cooling, expressed in thermal kWh per m2 of useful area per year.  This indicator is determined by insulation, infiltration, orientation, building shape, percentage of glass, thermal mass and shading, as well as the energy requirement for ventilation.	Energy demand 62,5 kWh.m-2	✓
NZEB 2 – Installations Primary energy use < 50 kWh.m2	The amount of fossil fuel in kWh per m2 of usable area per year that is needed for heating, cooling, ventilation, hot water and storage. NZEB 2 is the total primary energy consumption, minus the amount of renewable energy in, on or near the building.	Primary energy use 12,7 kWh.m-2	✓
NZEB 3 – Energy Renewable energy > 40% (255.251 kWh)	The percentage of renewable energy (in percentage) of the total energy consumption. The following sources are classified as renewable: solar energy, geothermal energy and soil energy.	Renewable energy 275.000 kWh	✓

NZEB Performance Indicators

## Earth, Wind and Fire

The elaborated explanation of the Earth, Wind & Fire concept together with the calculations on which the conclusions are based, can be found via this specific QR code. This document is provided by Ben Bronsema.



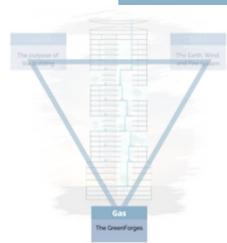
# Gas

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The Waterproof building will provide a solution to future space constraint in collaboration with the Canadian company GreenForges. A new technique, underground farming, is slowly but certainly making its entrance into the agricultural world. It is about giving an unused space a sustainable purpose. There is a unique combination of benefits gained by having an underground farm. The benefits cover economic, sustainable and social issues of the future.

GreenForges provide a wide variety of vegetables, fruits and herbs. In total, GreenForges offers 40 crops that can be grown indoors. These crops can be divided between vegetables, fruits, herbs and mushrooms. Multiple times a year, the range of crops growing under the Waterproof building will be rotated, in order to provide a varied selection of crops to the guests and the habitants.

In order to feed the inhabitants, workers and visitors with the healthiest food, grown sustainably right below their feet, 40 GreenForges will be placed under the building. These GreenForges provide all inhabitants of the building with a variety of fresh crops all year round. Not only will these GreenForges give an extra dimension to the building, but they also tell a story everybody is amazed by.



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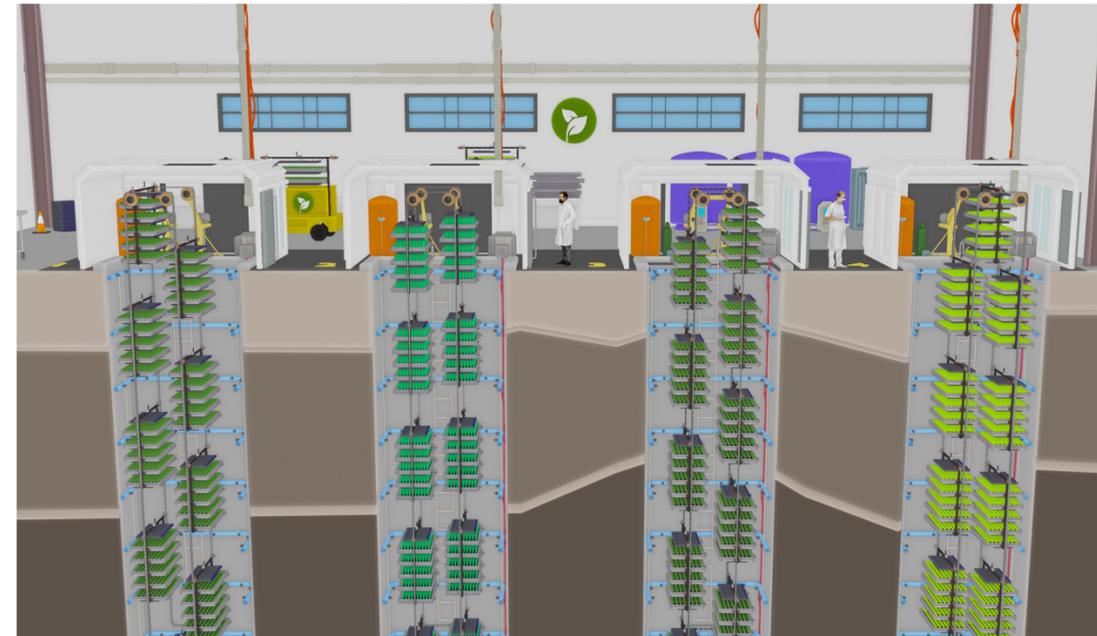
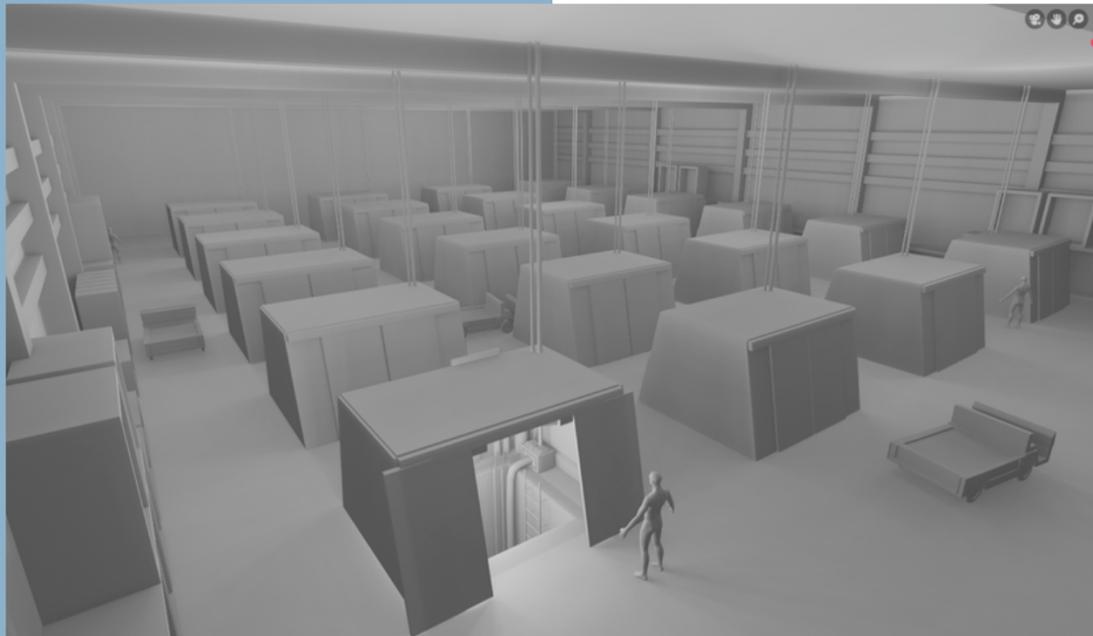
# Demo

## GreenForges

One of the main advantages of GreenForges is that they can be easily installed below buildings and coexist in symbiosis with them. Since our building already needs pile foundation, no new equipment is needed to create the underground space. Drilling machines are used to make holes in the foundation of the building, in which the GreenForges farming machines are placed.



When the crops, grown underground, are ready, they will be pulled to the surface by rotating the machine



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# Partnerships

## GREENFORGES

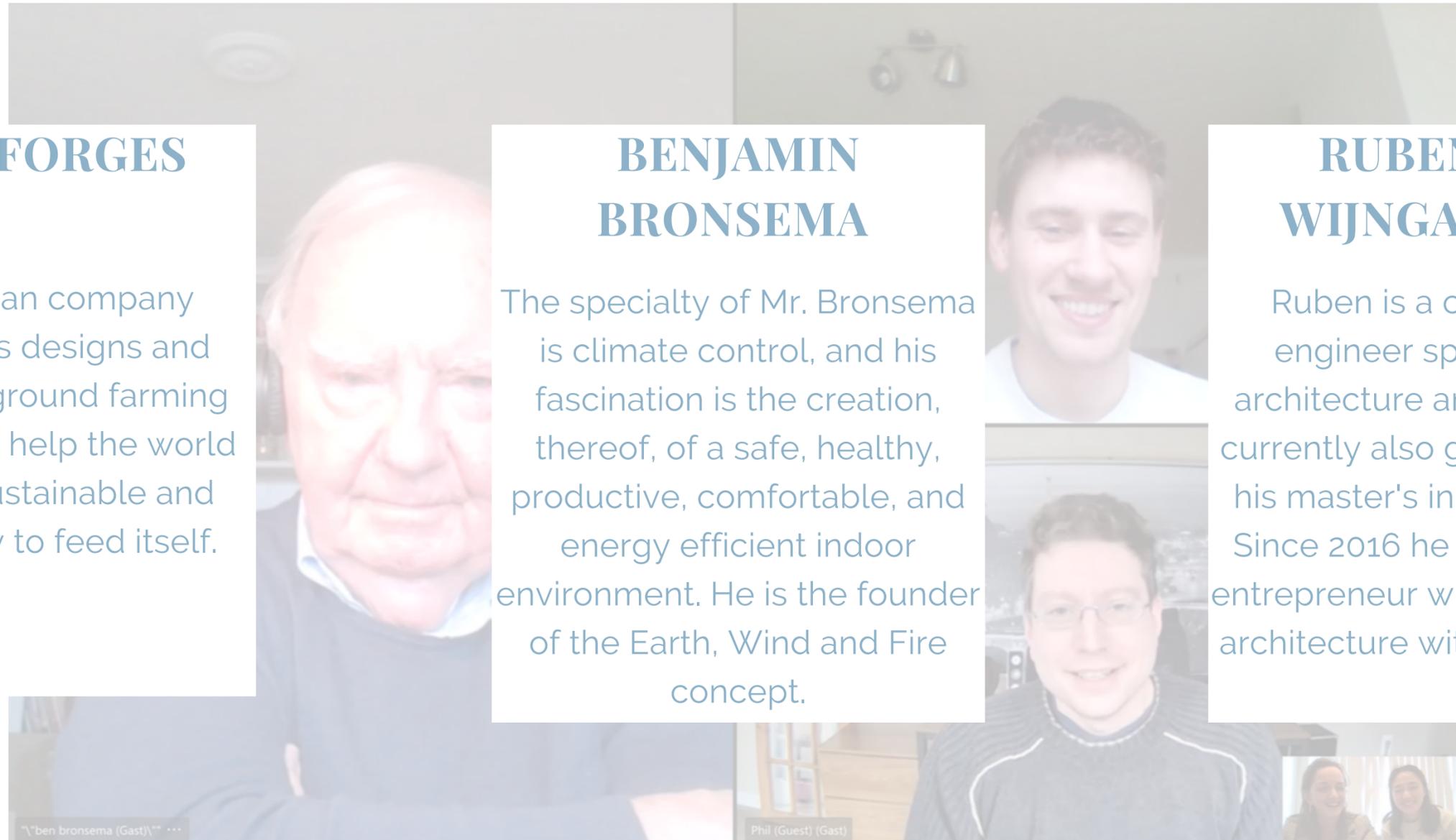
The Canadian company GreenForges designs and builds underground farming technology to help the world develop a sustainable and scalable way to feed itself.

## BENJAMIN BRONSEMA

The specialty of Mr. Bronsema is climate control, and his fascination is the creation, thereof, of a safe, healthy, productive, comfortable, and energy efficient indoor environment. He is the founder of the Earth, Wind and Fire concept.

## RUBEN VAN WIJNGAARDEN

Ruben is a construction engineer specialized in architecture and design, but currently also graduating with his master's in urban design. Since 2016 he is active as an entrepreneur within the field of architecture with RVW Works.



# Why to invest?

## GREENFORGES

### Payback period: 2 years

Investment costs €3.113.861

Annual production value: €2.868.289

Annual operating costs: €1.363.702

Annual Gross Profit: €1.504.587

#### SIDENOTES:

CALCULATIONS ARE BASED ON 40 GREENFORGES.

NUMBERS HAVE BEEN CONVERTED FROM CANADIAN DOLLARS TO EUROS.

ANNUAL PRODUCTION VALUE IS BASED ON RETAIL PRICES.

## THE WATERPROOF BUILDING

### The building has a commercial surface of 17.505 sq.m.

Hotel rooms: 4.200 sq.m

Apartments and elderly homes: 10.080 sq.m

Offices: 2.725 sq.m

Restaurant: 500 sq.m

168 hotel rooms to book to guests.

168 apartments and elderly homes to rent out .

Offices to rent out to companies.

180 seated restaurant with the possibility to welcome external guests.

The building meets all the Paris Proof and NZEB requirements for a sustainable future of 2050.

## EARTH, WIND & FIRE CONCEPT

### EWF Concept makes the building meet all the Paris Proof and NZEB requirements for a sustainable future of 2050.

System has already been implemented in the Four Elements Hotel and will be implemented in the Education Building Erasmus University and "Huis van Stad en Regio Dordrecht".

Water from greywater system is used for watering the crops in the GreenForges.

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# THE TEAM

The faces behind Waterproof



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