

30 march '18

# MOR

## PRESS #1

MODULAR  
OFFICE  
RENOVATION

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energy endeavour  
FOUNDATION

## INTRODUCTION

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With a vision to address the sustainable needs of the future, the MOR team representing the Delft Technical University in the Solar Decathlon Europe 2019, proudly brings to you its first project press release. Bringing concrete solutions for the societal and environmental challenges brought by the necessary transition towards sustainable energy, the Modular Office Renovation (MOR) team will showcase its ideas for a net-positive renovation in Szentendre, Hungary in July 2019.

The Delft University of Technology is the largest and oldest Dutch public technical university, located in Delft, the Netherlands, providing technical education for the last 175 years. Known for its high quality of education and research, the university was ranked 3rd for the Architecture and the Built Environment subject and 4th for Civil Engineering subject in 2018<sup>1</sup>. TU Delft being an internationally oriented university is reflected well in the MOR team, since its members are originated from more than 15 different countries. Across the campus, a large pool of talents contributes to the conception and implementation of technological solutions for actual environmental and social challenges, from the local to the global level. The university includes the faculties of Aerospace Engineering, Applied Sciences, Architecture and the Built Environment, Civil Engineering and Geosciences, Electrical Engineering, Mathematics and Computer Science, Industrial Design Engineering, Mechanical, Maritime and Materials engineering, as well as Technology, Policy and Management, most of which will contribute to this project.

The TU Delft is an open academic community which, through its students, scientific personnel and graduates, is represented throughout the academic world and is rooted in its own regional and national, social and economic environment. Currently, there is an abundance of research and development at TU Delft dealing with power generation, storage and novel solar technology. This body of work includes: the Nuon solar powered car project, the Solar boat project, development of cheap thin-film silicon solar cells with high efficiency, and other solar energy systems such as electricity generating windows. In collaboration with the Green Village and The New Makers, the MOR team has an important position in that technological ecosystem, linking these unique solutions together in a working net-positive housing unit.

Footnote 1 : According to the QS World Universities ranking 2018.



## THE TEAM / OVERVIEW

After having secured the third place in 2014, the MOR team from TU Delft is motivated to address a new challenge using the knowledge gained and creating innovative solutions. MOR Team is a collaboration of students, professors, experts and experienced members with regards to energy production, sustainability, circularity, product development, innovation, finances, architecture and the built environment coming together from to transform this vision into reality.

# 8

## DEPARTMENTS INVOLVED

Architectural Engineering  
Civil Engineering  
Management in the Built Environment  
Building physics and Technology

Architecture  
Sustainable Energy Technologies  
Energy Flow and Process Technology  
Strategic Product Design

## THE TEAM OFFICERS

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## THE COMMITTEES

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### Architecture and Design

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 Anna Tsagalou, MSc Building Technology  
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 Aurélie Griveaux, Msc Architecture  
 Ginevra Nazzari, MSc Building Technology  
 Hassan Ahmed, Msc Architecture  
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### Electrical Design

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 Siem van Sluijs, MSc Building Technology

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### Public Relations and Communications

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 Julia Kapinga, MSc Building Technology

### Project Management and Human Resources

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 Momir Nikolic, MSc Building Technology

## THE FACULTY ADVISORS

### DAILY FACULTY ADVISORS

Prof. Andy van den Dobbelsteen Faculty of Architecture, Climate Design and Sustainability  
 Ing. Peter de Jong Faculty of Architecture, Design & Construction Management  
 MSc. Zoheir Haghighi Faculty of Architecture, Architectural Engineering & Technology

### FACULTY ADVISORS

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## THE PROJECT DESCRIPTION

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The alarming number of vacant offices in the Netherlands has a great influence on urban quality. 15% of the Dutch office building stock is vacant, but in the big cities such as Amsterdam (26%) and Rotterdam (27%) these values are nearly double the Dutch average. On the other hand, a new housing crisis in especially the big cities seems on the loom with over 1 million new homes needed by 2040, especially affordable and starters' housing. Moreover, the speed of building renewal ( $\approx 1\%/y$ ) is by far too slow to improve the performance of our built environment in time, given the challenges we are confronted with. Therefore (re)using the available stock is essential.

Therefore, the MOR team is proposing for a net positive renovation of vacant offices to foster sustainable urban densification. We will transform offices into affordable housing and flexible work spaces for starters, a group that is effectively not catered to in city centers. Following that cost-effective renovation which is also net positive with regards to energy, water, air, biomass and material. Our project will give back more to the urban environment than it takes, and will showcase ways of living in a collaborative set up.

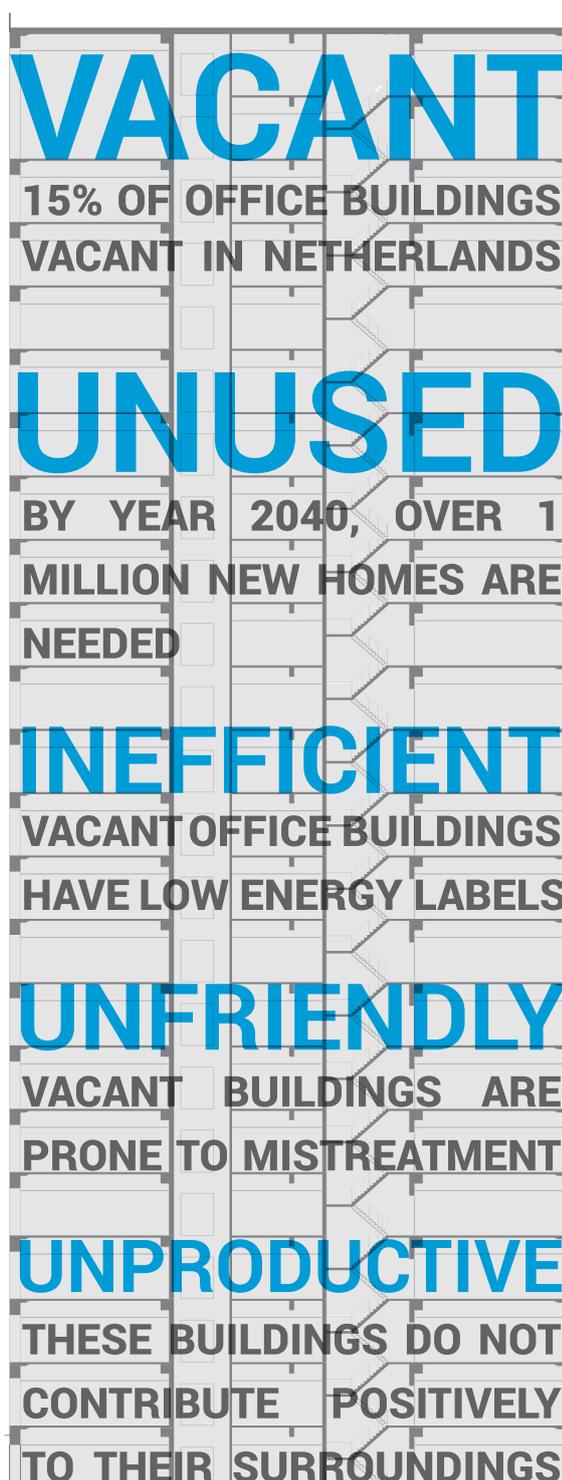
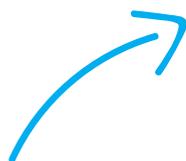
With an aim to achieve these results, the MOR team has set a list of project goals:

- 01 Develop a solution for retrofitting of vacant office building into a net-positive housing.
- 02 Make the solution modular and industrialized so as to achieve cost-effectiveness with a high market potential to make our sustainable renovation strategy applicable on a larger scale.
- 03 Raise awareness of the professionals, general public and inspire the public authorities about the necessity for energy renovation, specifically of vacant building stock with an effective working prototype.
- 04 Provide affordable accommodation and workspaces for the starters, who are in need of housing in proximity of their workspaces in large cities.
- 05 Stimulate sustainable urban densification by vacancy renovation into mixed-use space.
- 06 Achieve net-positivity in dense urban environments with the smart combination of circular concepts such as urban farming, passive ventilation, grey water recycling, materials reuse and power-generating facade.

In accordance with some predictions that the office market will recuperate and office space will again be needed, the team decided to opt for an Industrialized, Flexible and Demountable design which prepares the building for this transition back to its original function. However, it is also possible that a change in the housing stock, tenants living styles, or particular urban conditions may force the typology of housing to change, to which it could be easily adapted with our concept.

Finally, modularity and prefabrication are nowadays necessary to achieve the circular economy principles, since they allow for the use of large-scale closed loops solutions for the reuse of materials, and focus on the more intensive use of specific products. Also, due to the offsite production, utilizing these principles leads to the reduction of waste during all phases of the project.

THE MAIN PROBLEMS  
OF VACANT BUILDINGS



## HOUSE DESCRIPTION & RELEVANT ITEMS

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To propose a design which could be easily replicated on existing office buildings, we identified a typology that is common among the building stock from the 70s all over the world. A high rise with 22 levels located in Rotterdam serves as a case study to address the complexities of the net positive renovation. These living systems will be integrated together, creating cohesive living and working environments.

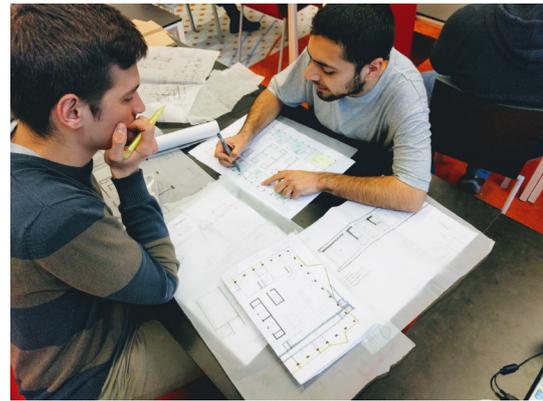
To start off, our team analyzed the performance of the existing vacant office building. The proposal will then reduce its energy, water, ventilation, biomass and materials demand to a minimum. What remains will be supplied by passive measures; only where such measures do not suffice, active systems will be used. In the meanwhile we generate electricity, clean the water and air and recycle biomass and materials to make the structure net positive. By such, MOR will not be less bad, but good for the people and the environment.

To ensure that the totality of the existing structure is addressed during the renovation, the building was split into three major constituents; the core, the floor space, and the facade. All three elements were evaluated for their ability to meet the demands of the new housing function and the accompanying programme.

The core of the building currently contains all the vertical communication and building services. Considering the fact that the building was designed to meet the function of an office building which have more intensive circulation, after conversion to a residential one, the total number of elevators can be reduced, and the leftover space can be allocated to new functions such as additional ventilation, producing food which could thrive in such conditions (e.g. white asparagus, sprouts, oyster mushrooms). Additionally the core space will be used to accommodate certain communal functions such as laundry rooms or storage spaces.

### **Energy: PV and electricity generator**

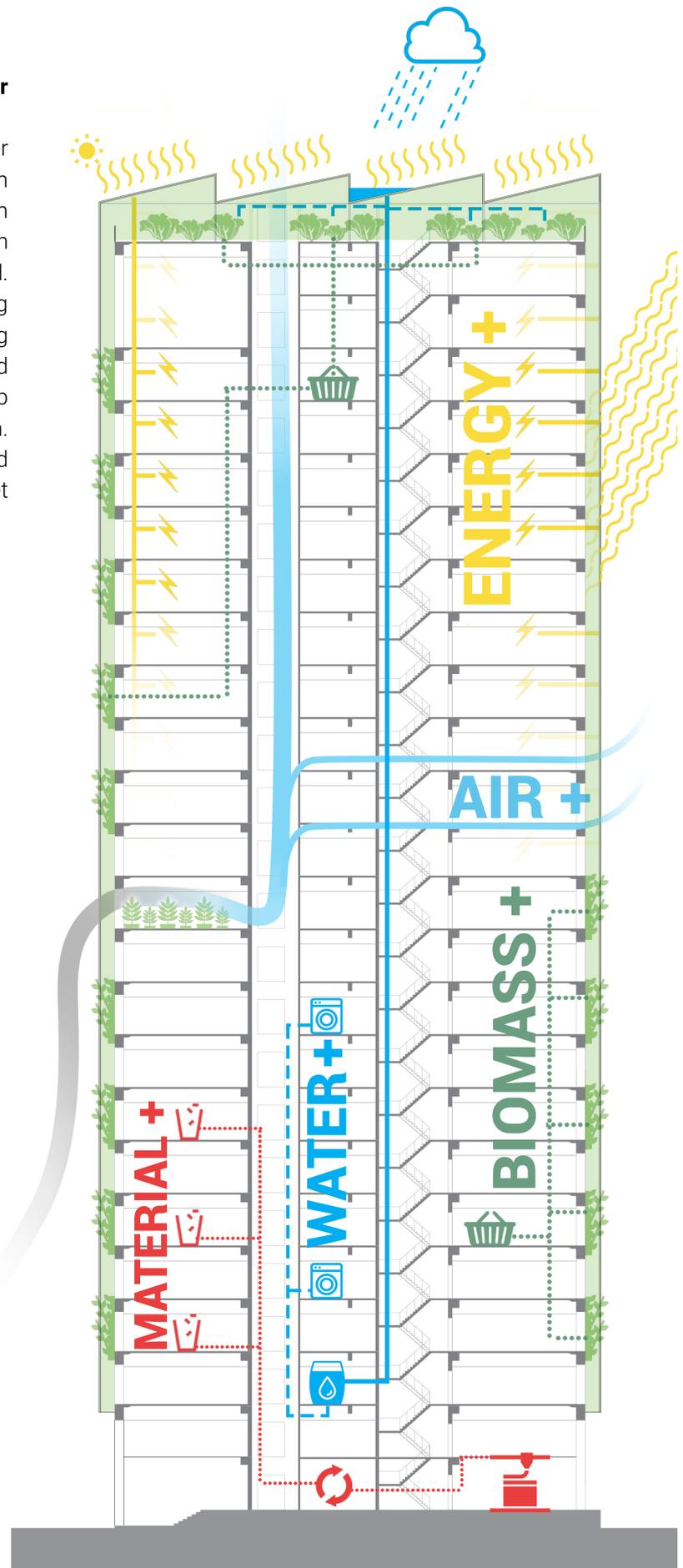
Due to the large vertical surface area of the structure, the facade will be one of the most important aspects of the design. The facade will not only act as our passive skin to regulate the climate inside, but it will also become the main energy generator of our structure by usage of BIPV. In total, this allows our entire complex to become an energy supplier to the neighborhood rather than user.



### Water: Rain water harvesting & ground floor reservoir, grey water treatment

A net water positive system will output water that is cleaner than or as clean as the fresh water supplied. This is done through a system designed to collect and reuse water rather than a linear system of supply-consume-discard. Two ways in which this can be done is by using the rainwater that falls in the site and reusing grey water after treatment. Rainwater and greywater are two local water types that help reduce the demand for fresh water per person. Excess rainwater is then used for food production in the building, thus creating a net water positive system.

OUR PROPOSAL FOR  
VACANT BUILDINGS



## HOUSE DESCRIPTION & RELEVANT ITEMS

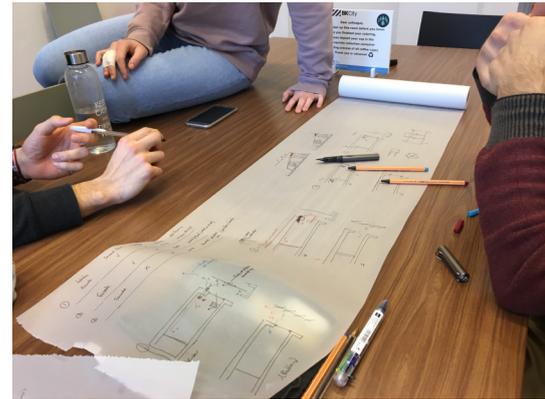
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### **Air: Passive ventilation**

Similar to water, air is also purified within our structure. Vegetation on the facade and floors are carefully selected to purify air quality and this purified air is brought in through the second skin to pre-heat in winter. A central solar chimney or Venturi roof then extracts the air through the central core where energy is recovered. In summer, cross-ventilation through private gardens and the open floor plan with shading by the second skin ensure a comfortable climate.

### **Biomass: Toilets and greenhouse**

In a typical water consumption pattern, a sizable amount is used for flushing. What is ignored in such a sanitation system is the potential of nutrient return from human urine and faecal matter. Our proposal involves a system that returns nutrients that were consumed as food back to the soil, thus closing the nutrient loop. It also has the benefit of not producing black"water" which would otherwise require its own separate plumbing and treatment system.



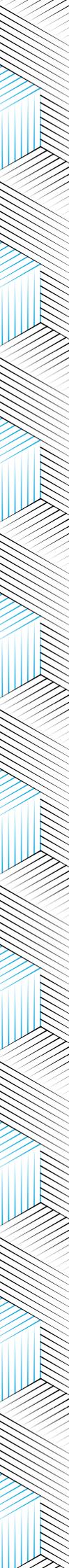
The idea of urban agriculture in Rotterdam and other parts of Europe has been picking up pace for the past 5 years. This renovation proposal aims to be not only a net-positive residential dwelling for people, but also a food production unit (in the form of a rooftop greenhouse and some vertical farming) integrated into Rotterdam's existing network, contributing to the larger goal of closing the food loop locally, and hence reducing food miles.

### **Materials: Upcycle, material passport**

Our strategy in the use of materials is to keep biological and technical materials in their respective flows, rather than use composites that are hard to disassemble and recycle. Components designed to be taken apart easily allow individual materials to have a second life instead of being discarded in landfills or incinerated. For example, partition walls added to the existing building can be designed as bolted frames with demountable panels, rather than using permanent joints such as welds and glues.

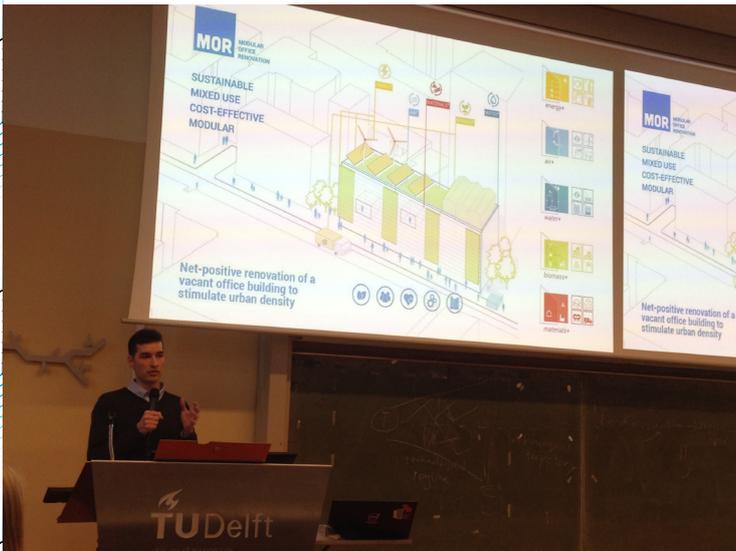
## EARLY CONCEPT

The render shows how the architectural design of the building will look like.



## DISSEMINATION ACTIVITIES & CURRENT IMPACT

Due to its important objectives and its multidisciplinary character, the MOR Team is collaborating on different levels. Since December 2017, we participated to the Transformatie Congres in Rotterdam, to the Circular Economy Master Thesis market, to the lecture series of Meet the Energy Leaders at TU Delft and to the opening of the World Horti Center in Naaldwijk, establishing numerous collaborations with like minded professionals aiming for sustainable transition. Since the project has a concrete outcome and an important impact, the professionals from the private sector have also shown an overwhelming response at several networking events. We are looking forward for their support not only in the form of sponsorship but also sharing of information, experimenting with materials and systems and mentoring the committees through the process. And this is only the beginning!



## CONTACT INFORMATION

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