“Together we can make sustainable living fun and easy for everyone, everywhere”

VIRTUe is multidisciplinary international team from Eindhoven University of Technology (TUe) and will be participating in the Solar Decathlon Europe 21/22 (SDE 21/22). With the support from the TUe and various respectable partners we believe that we can inspire sustainable behaviour by bringing people together and creating a ripple of change.
our vision
Strive for the transition to sustainable cities worldwide

our mission
Stimulate a communal, sustainable mindset of people through the building industry
Solar Decathlon Europe 2021/2022

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Challenges and Goal

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The Solar Decathlon is an international competition that challenges university teams to design and build highly efficient and innovative houses powered by renewable energy. The main goal is to tackle energy transition by blending architectural design and engineering knowledge with innovation, market potential and building efficiency. Initiated in 2002 by the United States Department of Energy, the Solar Decathlon takes place every year in a different city in the world. The houses are operated, demonstrated to the public, and evaluated by a jury in a campus of exposition and interaction. The competition involves a broad scope of expertise by challenging teams on 10 contests—recalling the deca (ten) contests of the Olympic decathlon.

Today, it is clear that energy transition cannot be successfully achieved if it is not tackled in an urban perspective. The built environment is responsible for 40% of EU’s energy consumption, and 75% of the building stock in the EU is energetically inefficient (SDE). Cities are the hotspots of these issues, and it is by revitalising the urban building stock and innovating the urban mobility that densifying cities can be transformed and become resilient.

Wuppertal, Germany

Wuppertal lies in a valley in the middle of North Rhine-Westphalia, in Germany. Its proximity to the river Wupper and the access to wood and metal deposits facilitated the development of the textile industry in the city during the 20th century. After suffering from the global financial crisis and a loss of attractiveness, Wuppertal is now experiencing a wave of changes initiated by bottom-up actions of citizens. The Mirke Quarter, hosting neighborhood of SDE21/22, best reveals these purposes and vibrates of a diverse, dynamic, innovative and creative atmosphere.
The Netherlands and the world are standing in front of an incredible challenge: getting our emissions to net-zero, as soon as possible. The construction and operation of our building are responsible for 39% of all greenhouse gasses emissions. The issue lies both in the way we build, as well as in the way we live.

While the urge for new homes in our cities grows, the industry uses obsolete building methods and construction materials with high embodied energy. At the same time, the way people live has an impact. We consume too much space, electricity, materials and we lack individual responsibility towards climate change.

We are stuck in a destructive loop where the industry is not guiding people to adopt a sustainable lifestyle. People, in turn, do not give enough incentive back to the industry to change the design and production methods.

We aim to break this loop and introduce an integrated approach to both sustainable building and living. To change both how we build and how we live, our goals are to:

1. **Future proof** our building
2. **Normalise** low-impact living
Our solution is called *ripple*, inspired by the Ripple Effect. Like a drop in the water, our project creates a *ripple of influence*, based on both a top-down and bottom-up approach. We aim to spread sustainable change in existing situations with a *renewed urban plan* and a design proposal for *vertical extensions*, both of which are adaptable to many situations.
The concept behind ripple stimulates design in layers. Introducing wood as primary building material, the building is designed in three layers: fixed, flexible, and free.

The fixed layer consists of the load bearing core and columns, which are made of high-quality timber, giving the building an almost similar lifespan to concrete and steel, without the high emissions.

The flexible layer, such as the facades, bathroom- & kitchen-modules, are easy to dismount, making the building ready to change function in the future, or replace the recycled wood in the façade, without touching the fixed layer.

Together with the free furniture, the building is easy to maintain and adjust for future demand. The design in layers, together with the use of bio-based and recycled materials makes the building demountable and hence almost completely circular.

FUTURE PROOF OUR BUILDINGS
The façade also houses a part of the solar panels in the so-called *Solar Belt*. The combined PV and PV Thermal panels (generating electricity and warm water) are custom made in a colour that matches the recycled wood, to show that solar panels can be *attractively* integrated in our architecture. Besides, in an ever-busier city, less garden space becomes available, which impacts humans and animals. Ripple therefore wants to reclaim this space to promote *biodiversity* and *social interaction*, using green, communal roofs.
NORMALISE LOW-IMPACT LIVING

We can only decrease our collective environmental footprint if we do so together. We therefore activate people by creating smart communities. The design of ripple steps away from the common building block by replacing corridors with communal rooms and stimulates sharing appliances, tools, and activities.

The modular unit houses two small apartments and a communal room, where residents share a washing machine, dishwasher, fridge, and oven. Through this, neighbours can interact and collaborate, or extend their tiny living, for example when inviting friends. The space in the apartments is therefore used very efficiently to promote smaller living without compromising on comfort, as this is the most effective way to save on energy and material use.
The communal room also introduces a new dimension in smart living. EQUI is an interactive display that can help residents gain insights in their energy management. With an increasing number of households relying on solar power, there is an increasing gap between production peaks (during the day) and consumption peaks (during the evening). The batteries of the house can cover some of this, but EQUI helps to bridge this gap by suggesting and scheduling appliances at the best time of the day based on sun forecasts. Leaving home in the morning and want the dishwasher finished when you get home? EQUI will schedule it at the most economical time to get the most out of your solar panels and move towards a fully self-sufficient building.
To further help residents adopt an environmentally friendly lifestyle, we designed RECAPP. It’s a positive recommendation app that provides with different goals and challenges, as well as insights in people’s footprint.
HOUSE OF THE FUTURE INSIDE THE
CITY OF THE FUTURE
A ripple of change in the way we build, as well as
the way we live, can only start in cities. This Ripple
Demonstration Unit is a piece – like a Lego block – of a
residential building complex.

The modular building follows the
tessellation shape, an angled design
that, when rotated, offers many
possibilities compared to a cube, while
being completely pre-fabricated. It can
be built next to-, and on top of- each
other to create a larger apartment
block; affordable, yet diverse.
Our strategy targets existing buildings with a public function, such as our case study Café ADA in Wuppertal. We renovate the existing building and integrate the residential block as a vertical extension, taking advantage of the roof space available in cities. The communal roof terraces connect to the public space through a vertical street, bridging the gap between our homes and the city.
While the modular extension can be universally applied to virtually any building, the renovation responds to the specific needs of the existing urban situation. To make the design universally specific, we introduce the concept of Complement, Connect and Contribute.

**Complement** represents the aim to create an attractive design for the citizens, by using the existing architectural features to their best, while also adding new functions that strengthen the current spaces.

**Connect** is the means of implementing active elements that encourage people to rethink the consequences of their actions on the environment. At the same time, it connects the existing community with the new inhabitants of the extension.

**Contribute** refers to our effort to stimulate a cohesive community to adopt low-impact living, through the interventions that we make in the renovation.

While the extension is designed to be self-sufficient and thus has a maximised implementation of PV panels, the appearance of the existing building is preserved, and the energy supply adapts to the opportunities given by the specific site.
Our urban mobility concept extends *ripple* to the scale of the *city*. Within 20 years, we strive to reduce the capacity for motorized traffic in cities and *reclaim space* for active and shared mobility. We make the streets more human friendly with lively spaces that will foster art routes, mobility pavilions and urban farming, to increase the *social interaction*. 
Start the ripple

ripple embodies our mission. First, the concept of a smart, sustainable community sees people influence each other to become more environmentally aware. Secondly, the demonstration unit is the start of this ripple of influence. By showing the possibilities of sustainable design in this house, we strive to create a growing impact in the way we build and live our cities worldwide.
PROJECT TIMELINE

2019-2020
- Concept Design
- Preliminary Design

2020-2021
- Final Design
- Detail Design
- Construction Design
- RDU TestBuilding

2021-2022
- Testing & Optimising
- Demounting
- Competition Prep
- Competition
EVENTS

**Testbuilding**
- **What:** Building the RDU to test the design
- **Who:** Team VIRTUe, partners
- **When:** 28th of June - 31st of July, 2021

**Teambuilding Activities**
- **What:** Event to increase team cohesion
- **Who:** VIRTUe
- **When:** 28th of May, 2021

**Grand Opening**
- **What:** Presentation to reveal the RDU
- **Who:** VIRTUe, partners
- **When:** 8th of October, 2021
ONLINE PRESENCE

The current COVID-19 situation has led to a strong prioritisation of online communication. Therefore our efforts have been addressed to developing and improving our online strategy, with the main priority of keeping people actively involved, and thereby also maintaining visibility.
In this part you can find an overview of our partners. Our network is still expanding and we hope to add many more partners to this!

The partners are categorised to give you an idea of how they are contributing to the project.
BOARD OF RECOMMENDATION

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