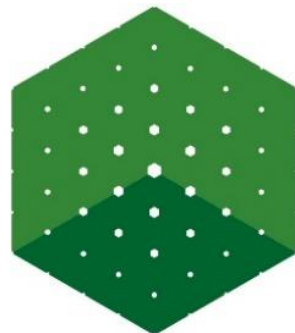


# Unleashing VR's participatory power to communicate the energy transition

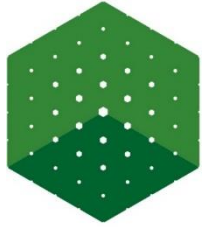


VR RENOVATE



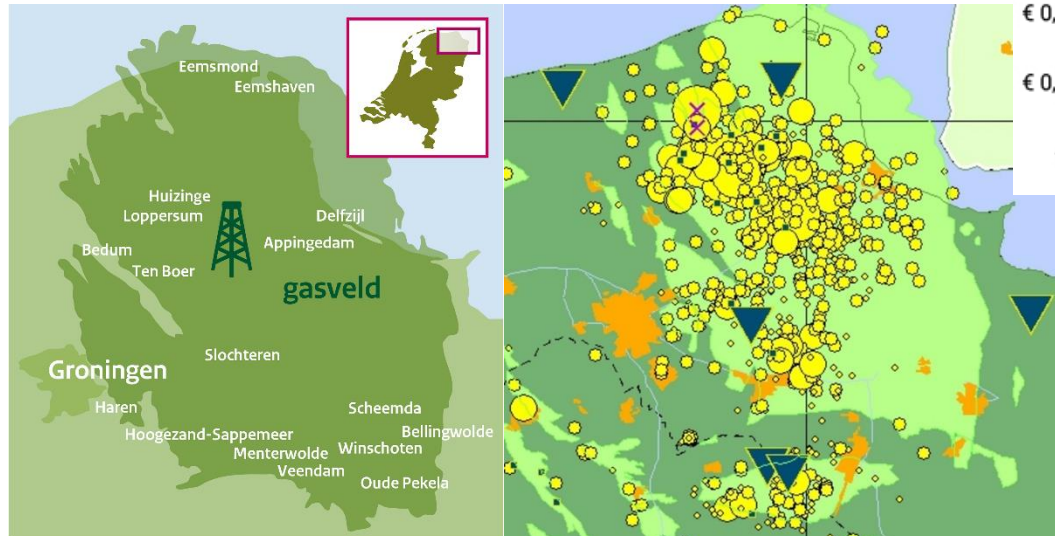
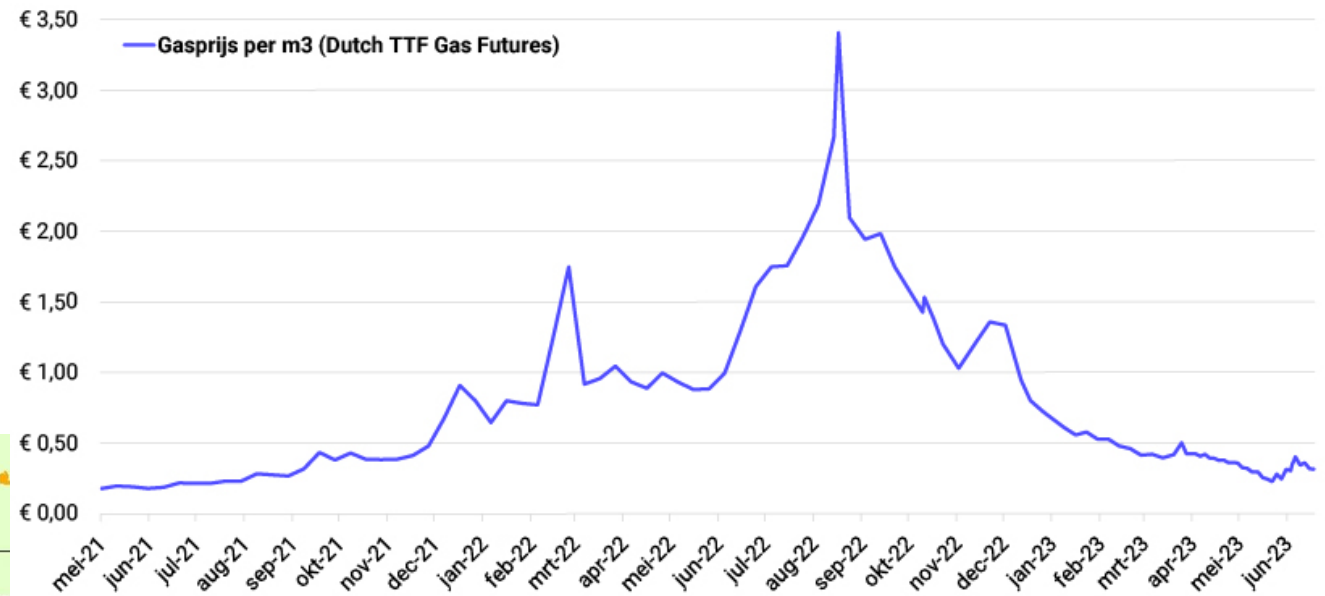
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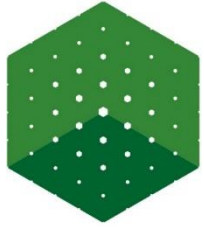




VR RENOVAATE

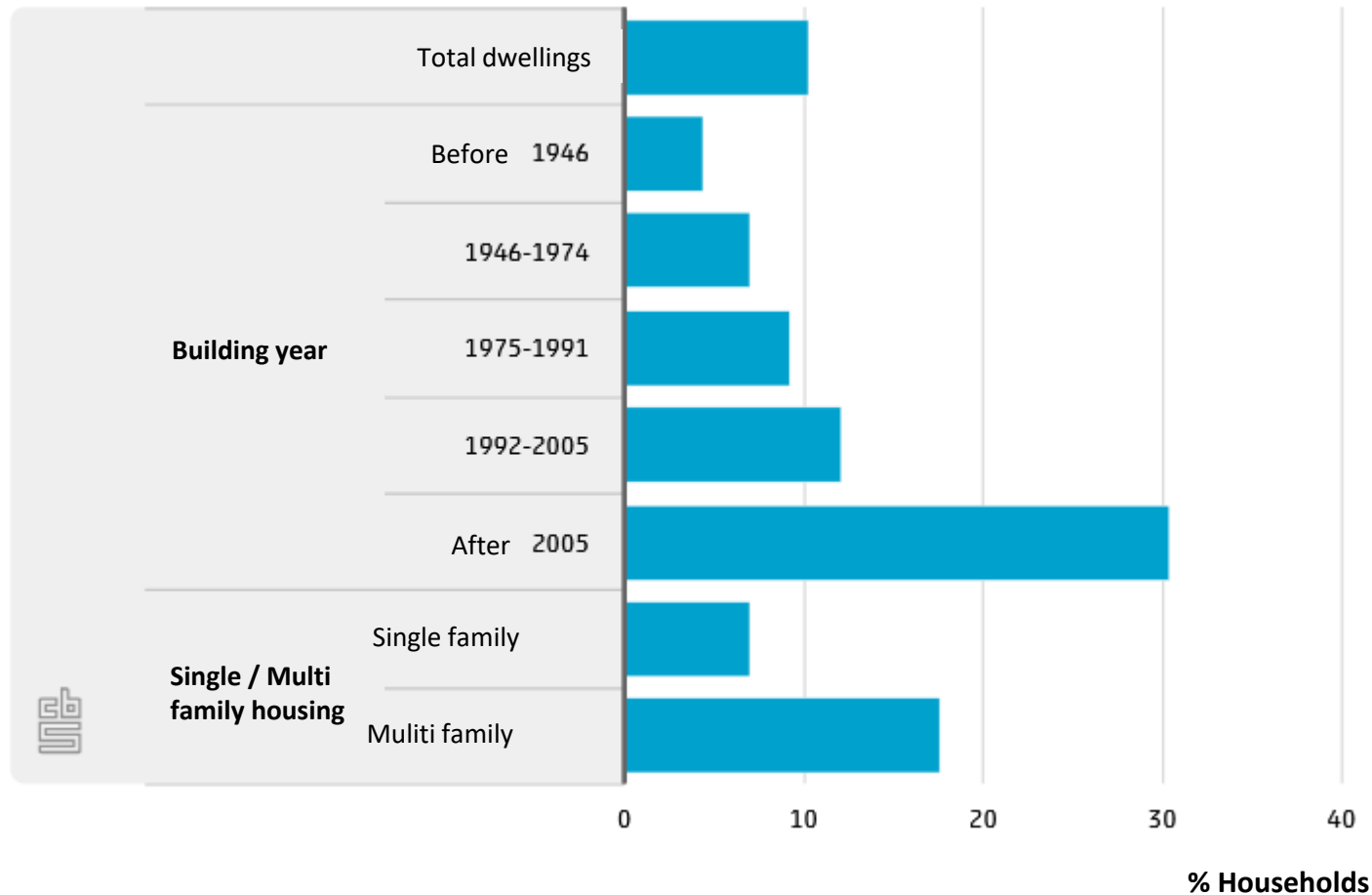
# Speed up the energy transition



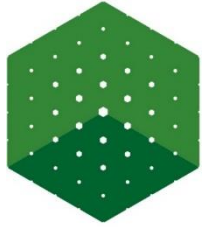


VR RENOvATE

# % of households without natural gas



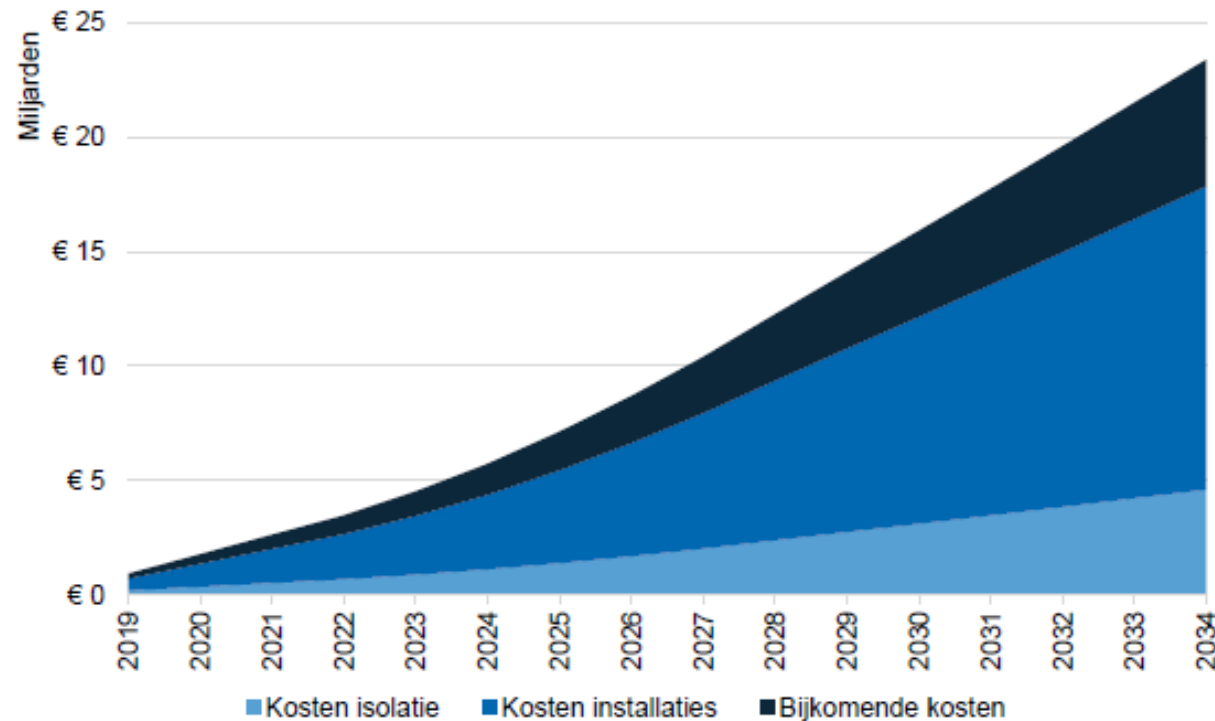
Auteur: Rianne Kloosterman, Math Akkermans, Carin Reep, Marleen Wingen, Hermine Molnár - In 't Veld, Jacqueline van Beuningen  
Publicatiedatum: 4-6-2021 00:00



VR RENOVATE

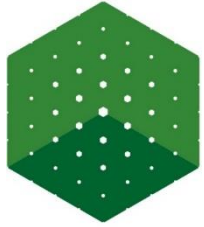
# Speed up the energy transition

Figuur 3-9: Cumulatieve investeringskosten verduurzamingsopgave, 2019-2034; bronnen: PBL, TNO en Arcadis



There is momentum, but perspective housing association:

- › €52.000 per dwelling (AEDES 2018!), pricing went up > 30% (material and staffing)
- › Require 70% of the tenants to consent.
- › Since 2022 no rent increases allowed for insulation

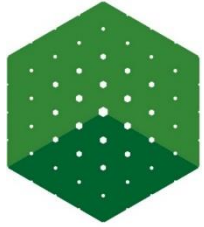


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# Speed up the energy transition

There is momentum, but in addition to our nitrogen crisis impeding construction and renewal:

- Focus on newly built nearly zero-energy housing
- Emphasis and hope is put on technological solutions such a heat grid, hydrogen, and in addition to solar and wind energy.
- Emphasizing the calculating nature of citizens (rationalist approach)
- High energy costs, energy poverty

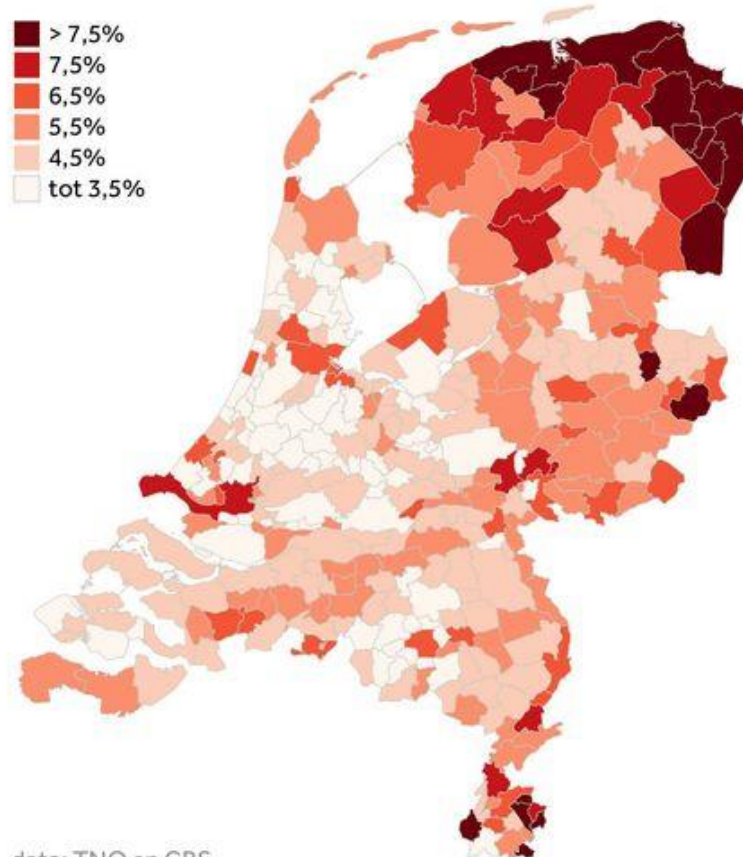
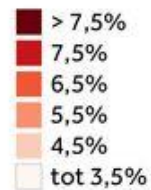


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# Speed up the energy transition

## Lage inkomens en energielabel F/G

% huishoudens met een laag inkomen, een woning met slecht energielabel en hoge energiekosten

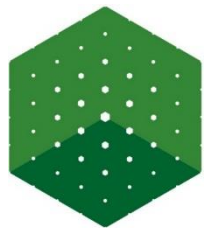


data: TNO en CBS

## Energy poverty

% households with

- Low incomes &
- Poor insulated homes
- High energy costs



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# Speed up the energy transition

## Challenge:

Misperception on the energy use by social tenants:

The **Dutch** government in communications:

Zet je  
thermostaat op  
maximaal 19  
graden

Zet de thermostaat niet hoger dan 19 graden als je thuis bent. Met elke graad lager bespaar je gas en dus geld.

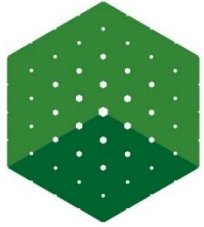
**Besparing €200 per graad** ⓘ

*Tip! Trek een warm vest of warme trui, sokken en sloffen aan. Ben je actief bezig in huis, dan kan de thermostaat misschien nog wel een graadje lager.*



01



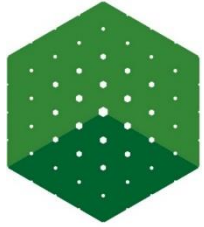


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# Speed up the energy transition

Guerra-Santin et al. (2017) found that social tenants **were deeply concerned** about the **affordability** of the rent upon renovation, particularly given their **lower-than-average spending on energy** which the authors had **not expected in advance**.





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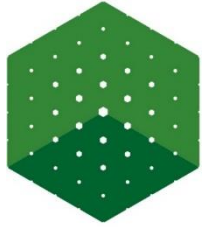
# Speed up the energy transition (2023)

How did you end up here?

Gambling? Drugs?



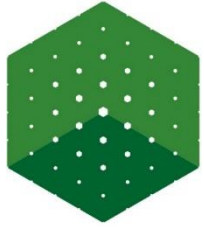
Left the lights on ...



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# Challenge: how to communicate

Communication measures	Participation measures
One on one interviews / home	Face to face conversation
Informational meetings	(Digital) Surveys
Drop-in evenings	(Social) Media
Consultation hours	visits Design Workshops
Brochures and folders	Advisory groups/ residents committee / quality team
Newsletters	
Infographics	
Personal letters	
Spokesman ship (active tenants or advisory group)	
Emails or E-newsletters	
Digital communication services / app	
Prototype / mockup dwelling	
Videos / Commercials	
Website	
Events Excursions or other ways of exchanging knowledge	

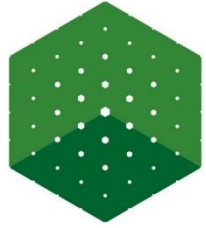


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# Challenge: gaining commitment

Is about Gaining Commitment to make the choice for renovation, and money might not be a major driver. Effort and annoyance are also important.

Our central theme is that  
**communication and empowerment**  
are major drivers for participation

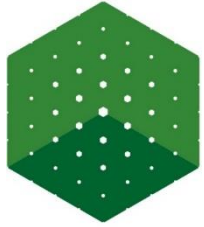


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# Aim of the living labs

To improve tenant communication and facilitate participation using immersive visualization as **boundary objects** during the renovation increase commitment for sustainability amongst social tenants.

And add to empowerment of social tenants



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# Boundary objects

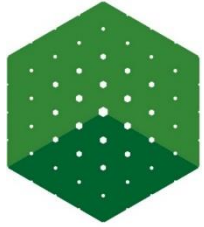


A heat pump as depicted in a brochure

Given the energy transition, social tenants need to decide about measures that improve the sustainability of their homes.

But:

- Energy poverty
- Low literacy
- Not fluent in Dutch



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# Boundary objects

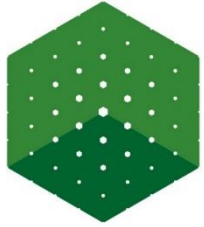


Heat pump in a brochure



Actual installation  
tenant's home

- mismatch between professionals and social tenants



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# Boundary objects (Star and Griesemer, 1989)



Heat pump in a brochure

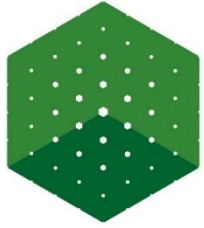


Actual installation  
tenant's home



VR representation

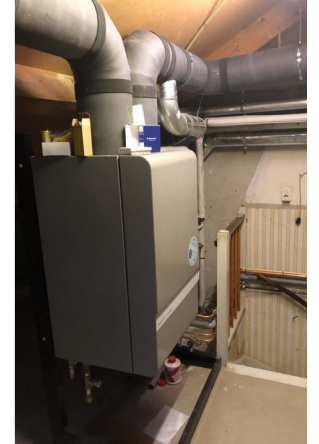
- Virtual Reality (VR) gives tenants a voice and possibility to early participate
- VR acts as a boundary object to facilitate understanding



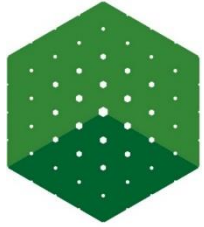
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## Why does this add to empowerment?

- VR offers a process whereby individuals can transform the knowledge being used →
- we were asked by a woman whether we could set an additional appointment for her and her daughter. Her daughter suffers from autism and she saw VR's potential in transferring her acquired knowledge to her daughter and even used VR to explain in more detail what consequences the renovation had for her.



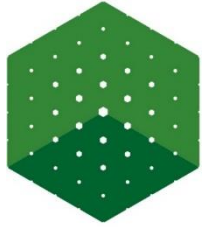




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# Our Living Lab Approach

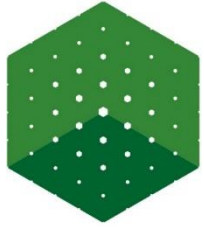
- Practice-based research, with end-user needs central to the debate
- Create and validate innovations in real-world environments – no role play
- As a consequence our Living Lab approach is more than a research method.
- A Living Lab implies a collaborative learning process



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# Every Living Lab is different

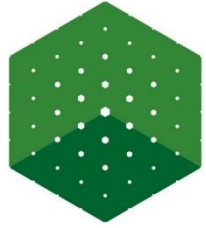
Renovation practices are **socio-technical** in nature, as it involves technological measures and installations, infrastructure (e.g. electricity, heating systems), institutions (e.g. housing association, contractor, municipal), actors, networks (e.g. supply chain, welfare) and social norms that have co-evolved over time (Breukers et al., 2017; Sovacool et al., 2020).



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# Our Living Lab Approach - Veendam

- Social housing residents
- Mostly Dutch residents; some who have always lived in Veendam, others from other parts of Netherlands, very few emigrated from abroad
- Varying levels of education and literacy, but generally less than in previous living labs. Generally, a more vulnerable group as well.
- Mixed age group; some more senior, some in 20's
- Officially residents cannot live there if they have children. In practice this is sometimes not the case

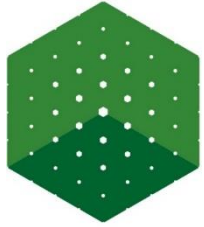


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# Our Living Lab Approach - Veendam

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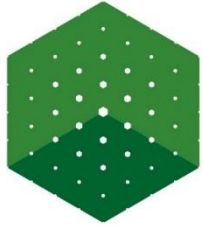




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# Our Living Lab Approach evolves ...

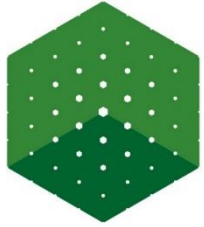
- Nov. 2020 – interviews on participation & collaboration with professionals
- Based on this: proposed
  - **February 2022: VR Choice support kitchen and bathroom just before collection 70% consent tenants. At 70% consent the renovation will go ahead (late July 2022)**
  - **Explanation on the renovation measures and related hindrance, and how to prepare (2-3 weeks before actual renovation starts: September 2022 – March 2023)**
  - **At the same time, we did the Garden Tinder to prepare for the Garden VR (Sept. 2022 – March 2023)**
  - **Garden VR aiming at social cohesion (30 May – 2 June 2023)**



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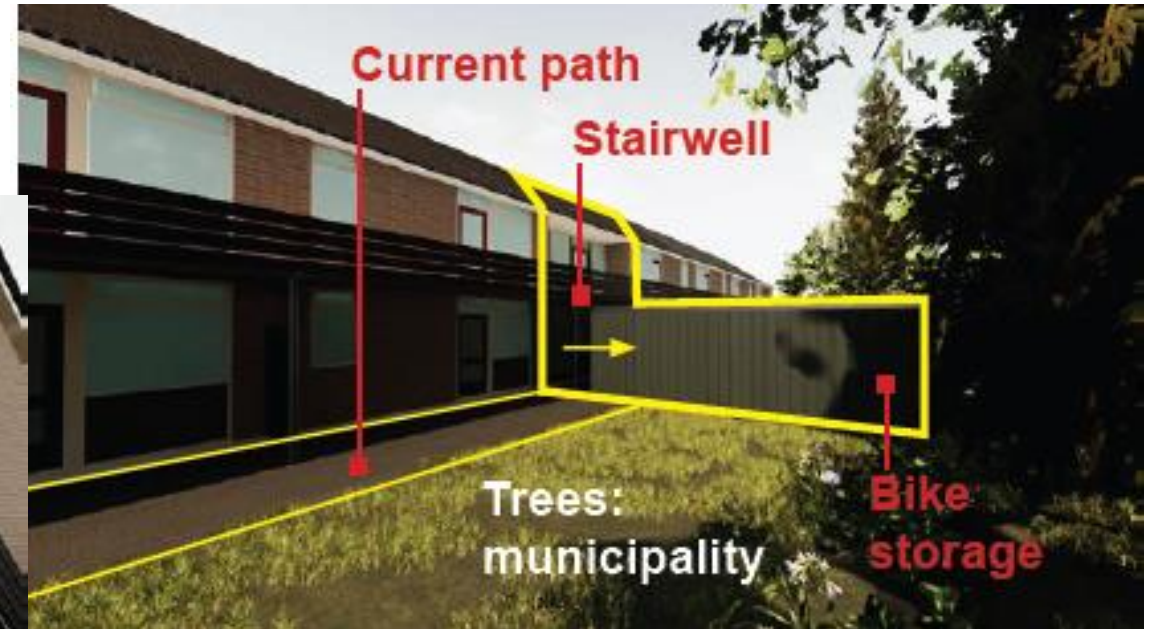
# Some preliminary results of using I-VR

- Extreme high percentage of tenants consenting.
- Tenants were very satisfied (contractors are evaluated for this)
- In supporting choices in VR, about 25% changed their choice;
- Decision-making in VR is much easier, and there were no tenants who like to change their choices afterwards. Without VR several tenants contacted the tenant consultant;
- Tenants were prepared, and this saved the contractor about a day.

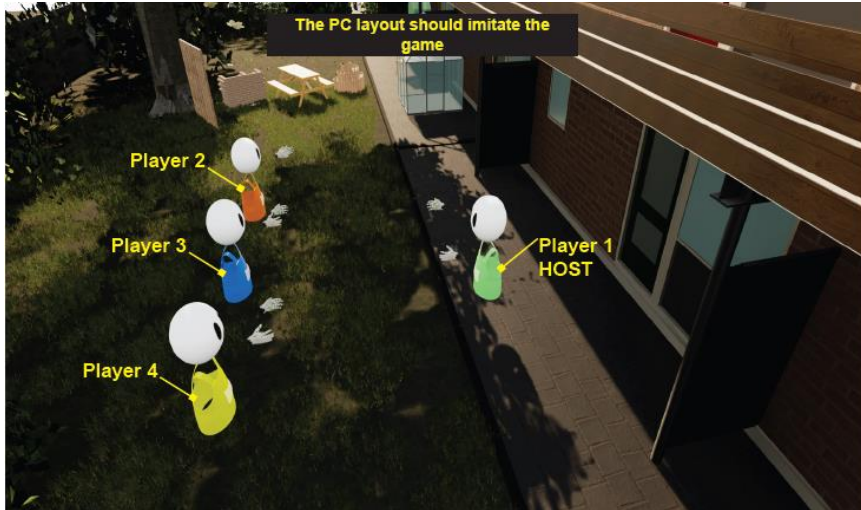


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# Our Living Lab Approach develops



# Codesign Workshop



Codesign Guide diagram

- 5 headsets available
- In practice, groups of 3 or 4 people due to participant availability
- Each group consists of 2 Guides in VR from TU Delft who lead the workshop, and 1 – 3 residents from the same block on the street
- Physical setup mirrors position of players in VR
- Residents sit and dictate what they would like to see in their garden regarding issues in access, privacy, maintenance, and what features and furniture they would like to see



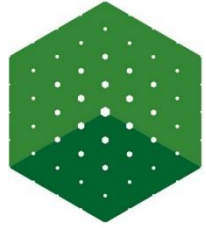
# Codesign Workshop



Codesign Workshop Session on 30/05/23 in Veendam

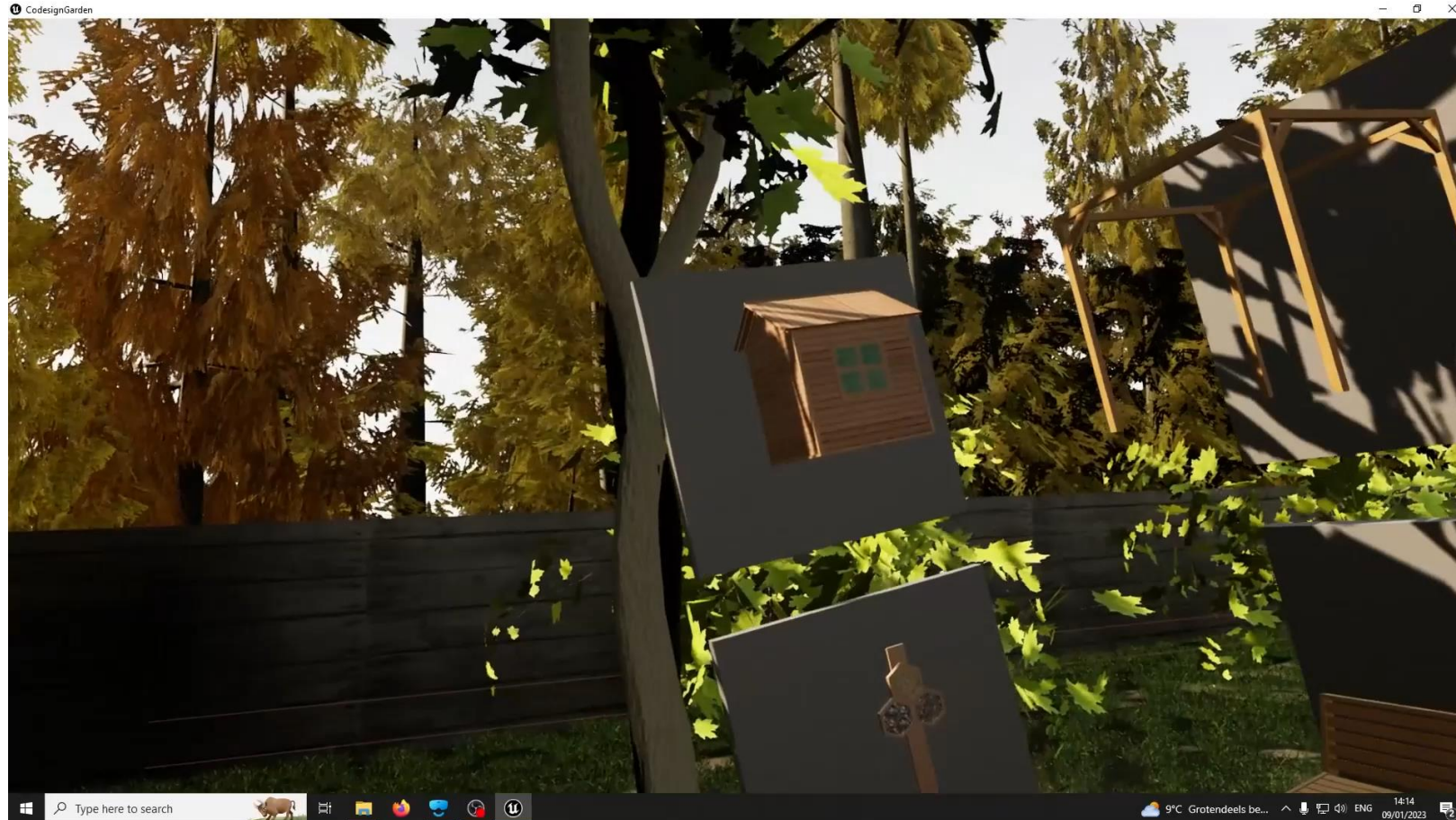


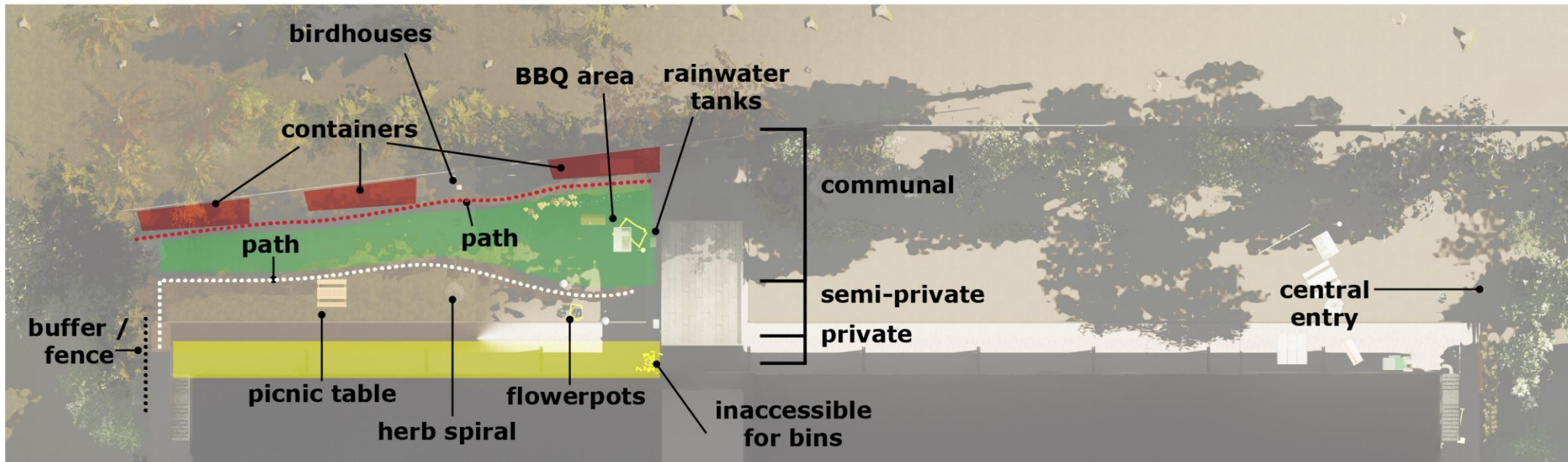
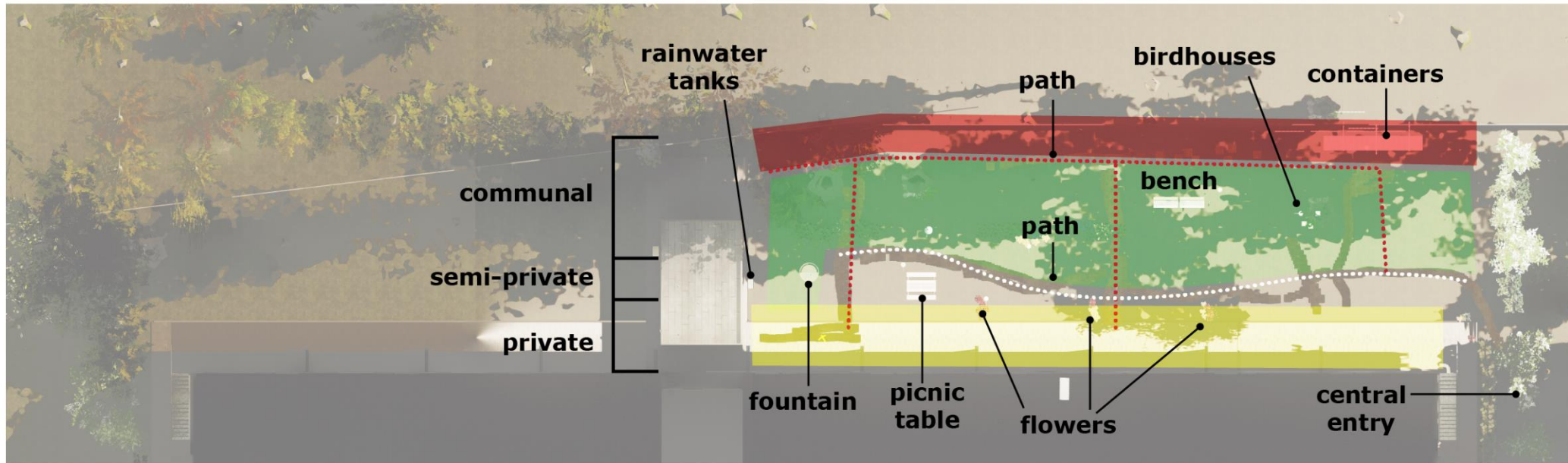
Codesign Workshop Session on 01/06/23 in Veendam



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# Our Living Lab Approach develops

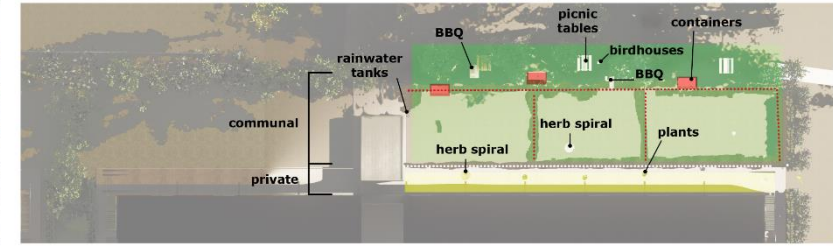
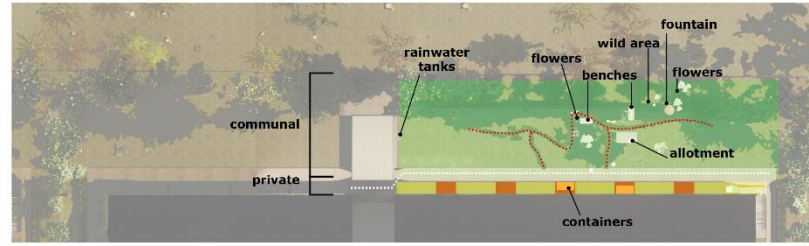
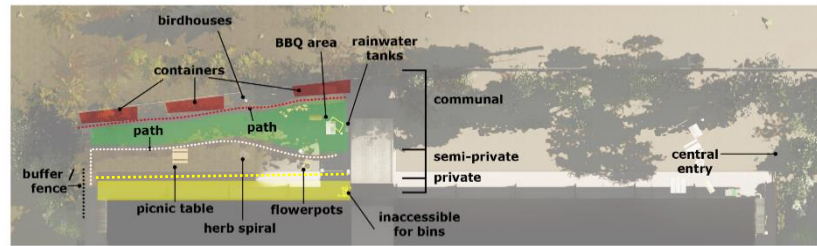
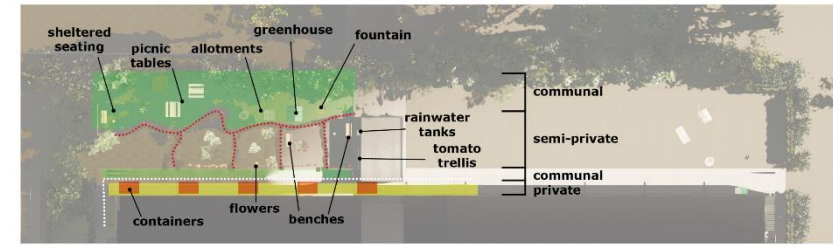
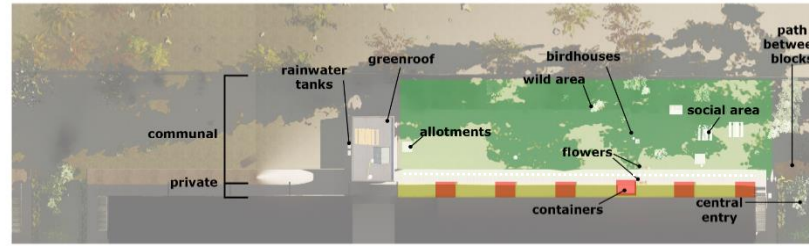
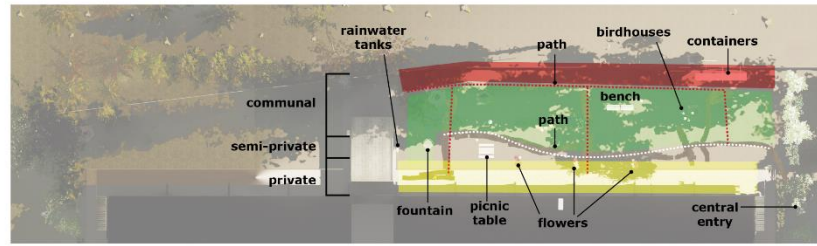




# Block 1

# Block 2

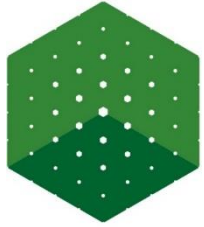
# Block 3



- Separate path
- Containers to the back
- Semi-private space; extension of private back garden
- Presence of nature; more biodiverse and visually engaging garden
- Zoning for sitting / social functions
- New path as divider

- Containers covered but stay with front door
- Shared path no issue
- Wild zone – biodiverse, natural, visually engaging
- Path through wild area
- Zoning for social functions and allotments
- Green roof? Greenhouse on roof of shed? Opportunity for 1<sup>st</sup> floor residents

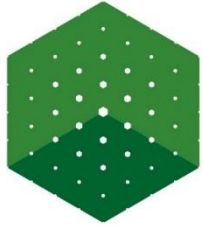
- Container location – depends
- Increase of semi-private or individual private space through use of buffers and zoning (paths and plants on existing path)
- New path acting as divider
- Desire for sheltered more private seating and social gathering spaces
- Presence of nature and visually engaging garden



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# General outcomes co-design

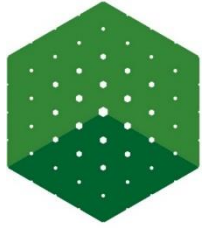
- Tenants were not much demanding, as some professionals feared;
- Safety: crash into each other, at the corners; and no place to step aside -fire safety stairs;
- Controlled access to the gardens – social security;
- Biodiversity highly valued; Shrubs and trees need to be trimmed;
- Bins generally placed halfway the garden (smell; new path)
- Private space: strong wish to have more space in front of the door – allowing tenants to leave their furniture and not have to push back everything each time;
- Clear distinction between private space and path to avoid conflicts.
- More social support among tenants than expected but can be enhanced by pushing picnic tables and BBQ to the back (noise annoyance).
- Highly dissatisfied with the contractor, felt mislead.



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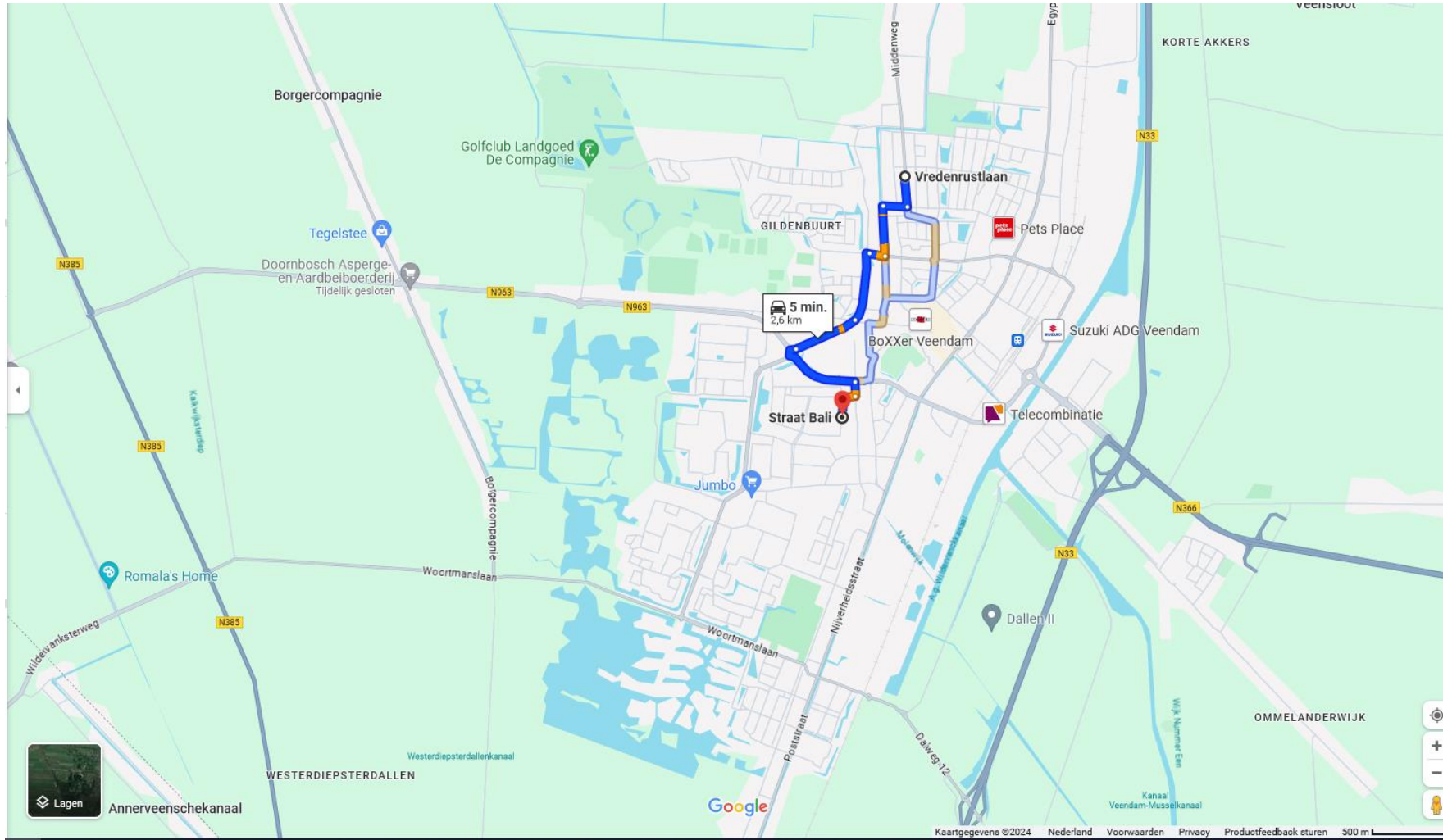
# Some preliminary results of using I-VR

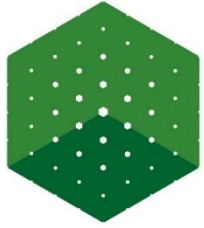
- In Veendam, except for 2 all others were willing to participate in the co-design of the communal garden;
- Because of miscommunication, vacancies, delays and dissatisfaction with the renovation process 9 tenants participated in co-design;
- All 9 were very enthusiastic, beyond their expectations about how it helped them to understand and to discuss their needs;
- One tenant mentioned that she would also take responsibility for safeguarding the garden.
- Greater value is with that tenants explained what, why they disliked or liked. This may help to improve the relationship between housing association and tenants.
- Bottom-up participation, tenants are involved in their own renovation process



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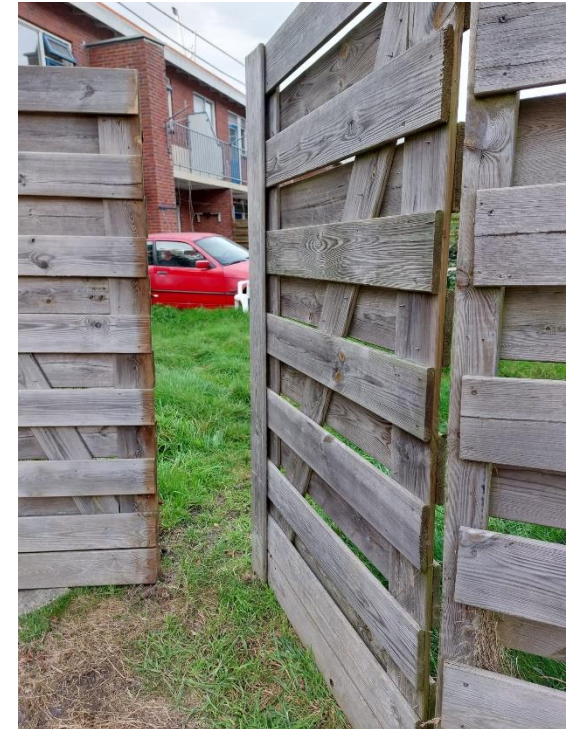
# Involving tenants in Climate adaptation



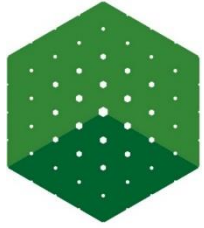


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# Involving tenants in Climate adaptation

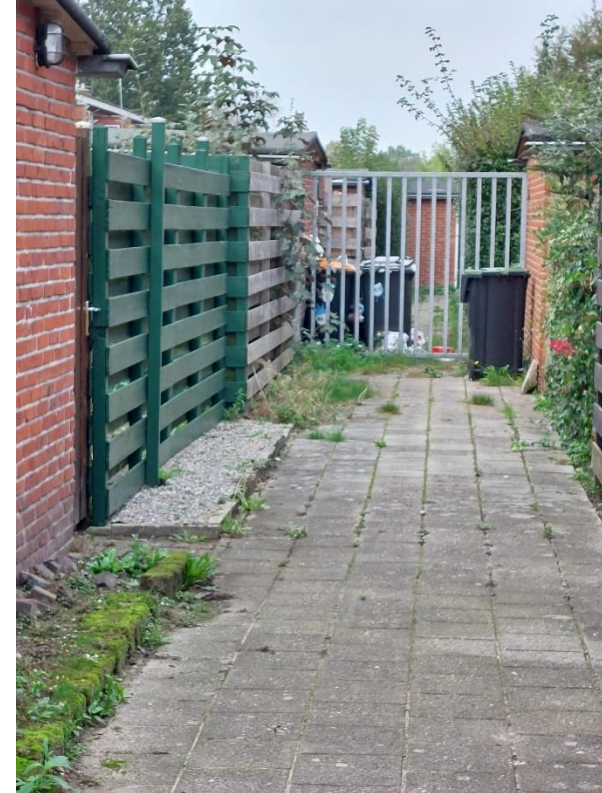


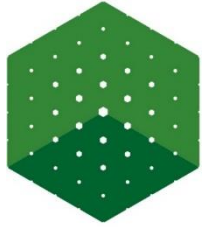




VR RENOVA

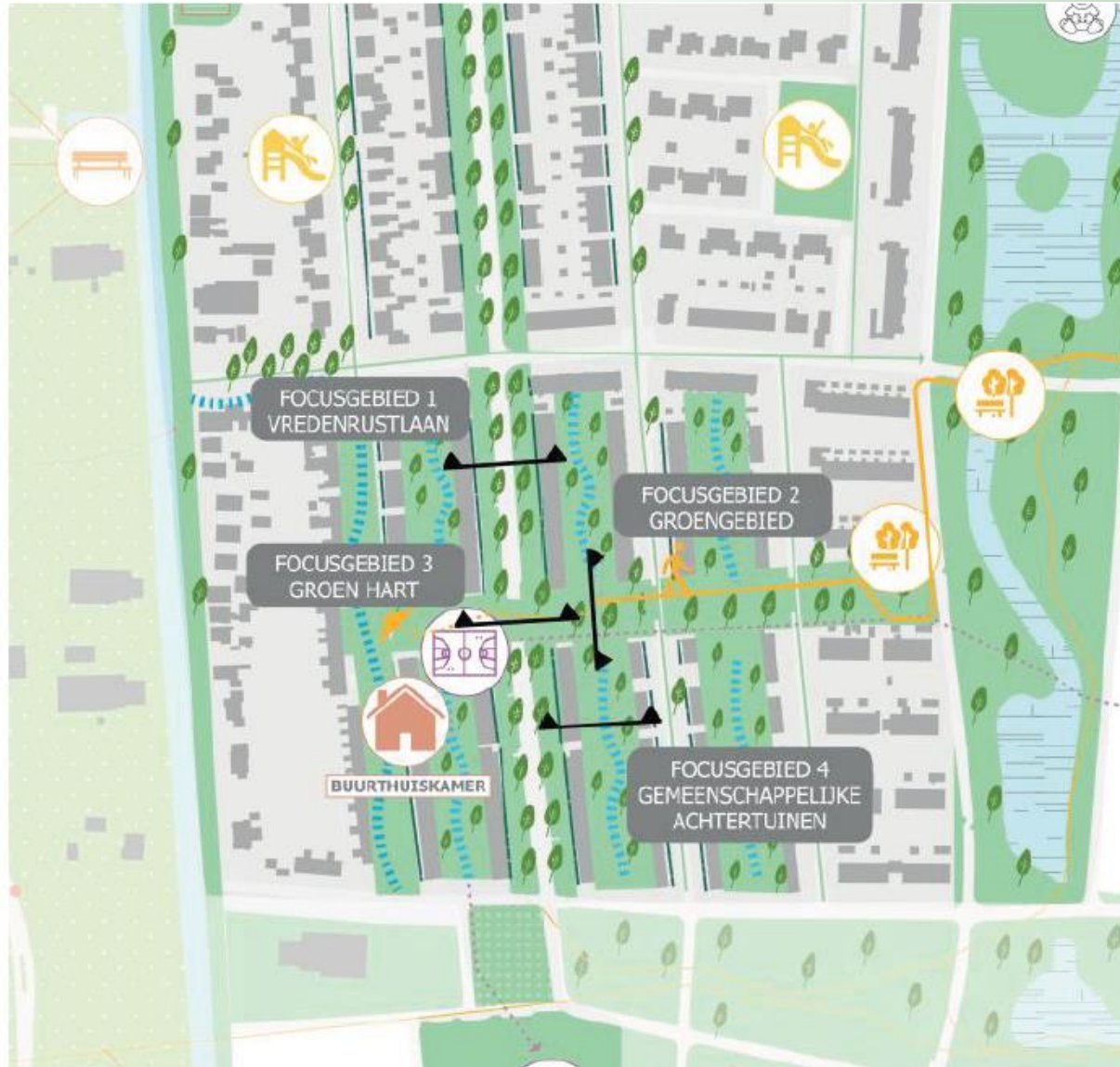
# Involving tenants in Climate adaptation

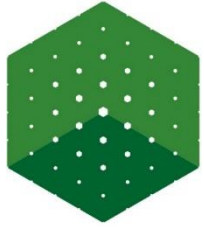




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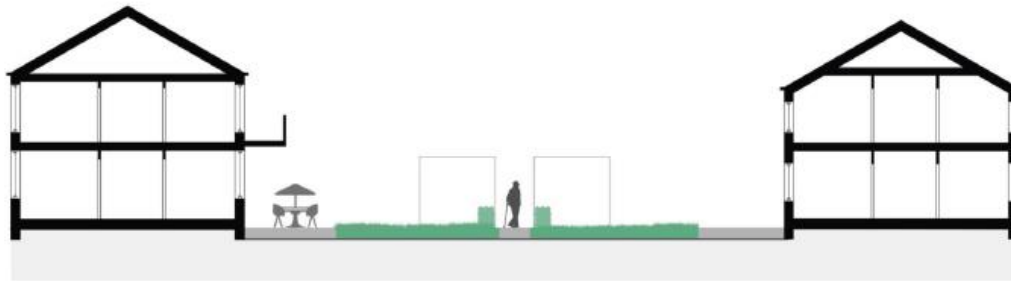
# Involving tenants in Climate adaptation





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# Involving tenants in Climate adaptation



zonnepanelen



variatie in soorten  
planten en bomen



waterberging



de juiste plant  
op de juiste plek



zonnepanelen



gezamenlijke moestuin



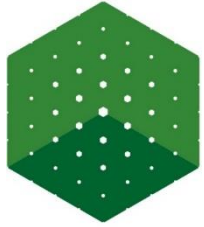
watertappunten



# u-VITAL

User-Valued Innovations for Social Housing upgrading  
through Trans-Atlantic Living Labs





VR RENOVATE

# Consortium & project team

**Zaanderwijk**  
bouw | onderhoud | innovatie

 Knaapen Groep

 **MATEBOER**



  
**TU Delft**

**Architecture / MBE**

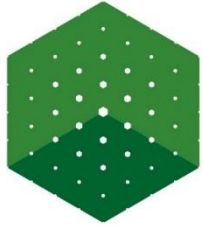
Clarine van Oel (PL)  
Chris Benning (PhD)  
Jelle Koolwijk

VR Zone:   
Arno Freeke

**CGV:**

Elmar Eisemann  
PhD (vacancy)

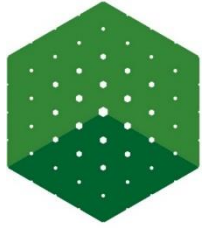




VR RENOVA

# Grants

- VR-Renovate, 2020-2025, (with project number 403.19.222) is funded as part of the research programme Transition & Behaviour by the Dutch Research Council (NWO), and the consortium partners Noorderberg B.V., Knaapen Renovatie en Onderhoud B.V., Mateboer Bouw B.V. en Zaanderwijk Beheer B.V.
- uVITAL, 2020-2023, extended until 2025, with project number 463.18.219 is funded as part of the social innovation program by the Trans-Atlantic Platform (T-AP) together with Brazil, Germany and the UK.



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