

Planning the heat transition of Amsterdam historic city centre

Introduction to Leidsekade community
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High-hanging fruit team



Paul Voskuilen

Program developer
Urban Energy
AMS Institute



Prof. Andy van den Dobbelsteen

Professor & Principal
investigator
TU Delft & AMS
Institute



Kyra Koning

Research engineer
AMS Institute



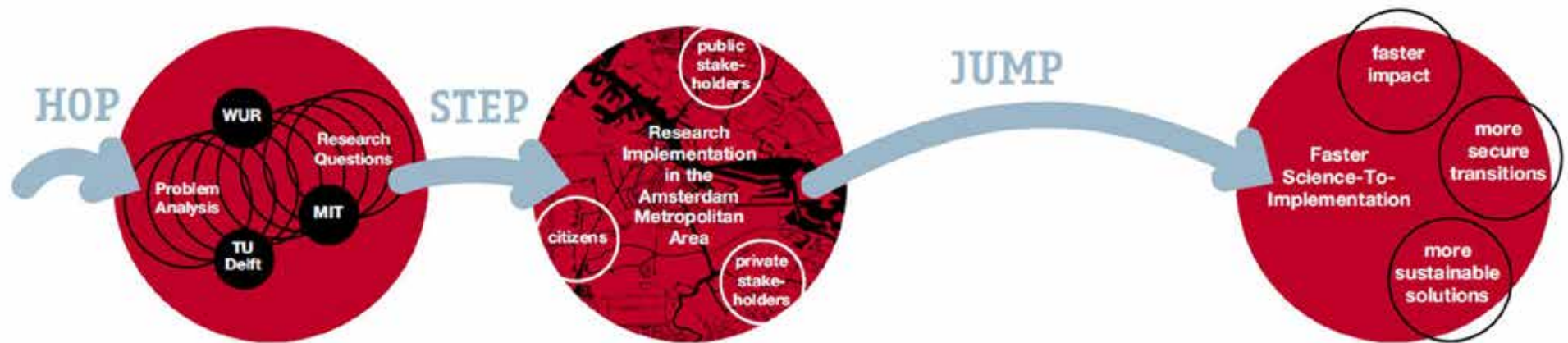
Dr. Maeva Dang

Research Fellow
TU Delft & AMS
Institute



AMSTERDAM INSTITUTE FOR
ADVANCED METROPOLITAN SOLUTIONS

AMS Institute is an internationally leading institute where talent is educated and engineers, designers, and both natural and social scientists jointly develop and valorize integrated metropolitan solutions.



senseable
city lab.

Working on metropolitan challenges



Smart Urban Mobility

Ensuring an accessible and liveable city by developing smart and sustainable and seamless mobility solutions that can be integrated into the urban fabric.



Urban Energy

Accelerating the urban energy transition, by combining integrated innovations in energy systems with urban (re-)development.



Circularity in Urban Regions

Redesigning resource flows that drive urban activities, whilst establishing integral sustainable urban ecosystems, supported by a new, resilient economic model.



Metropolitan Food Systems

Designing inspiring scenarios to make food systems more sustainable and future-proof, by focusing on core elements such as: economic development, health, mobility and regional attractiveness.



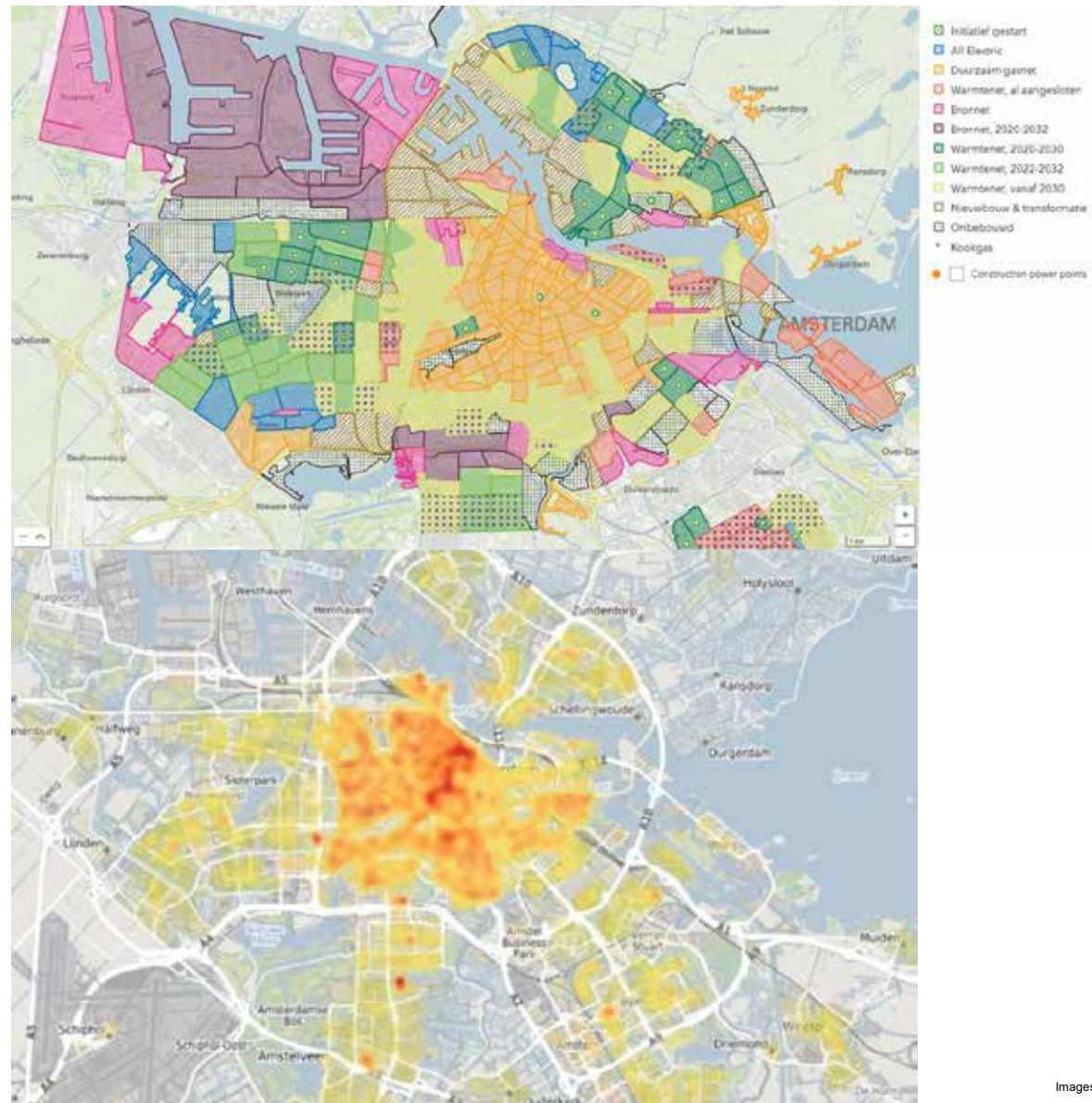
Responsible Urban Digitization

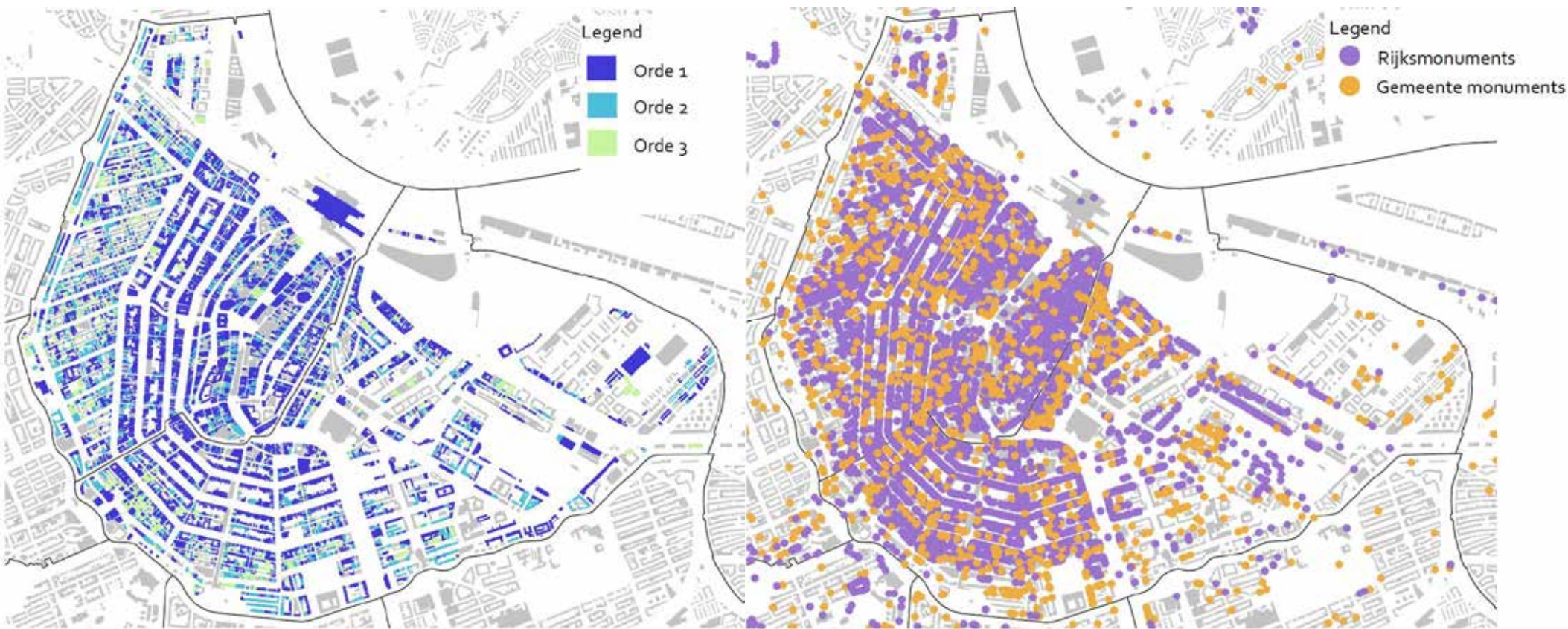
Mobilize new analytical tools to better use urban (big) data and improve city life, while strengthening and safeguarding the democratic values of citizens and society.



Climate Resilient Cities

Building preparedness and resilience by reducing cities' weaknesses and the impact of climate change: environmental, health related and societal.





Architectural heritage

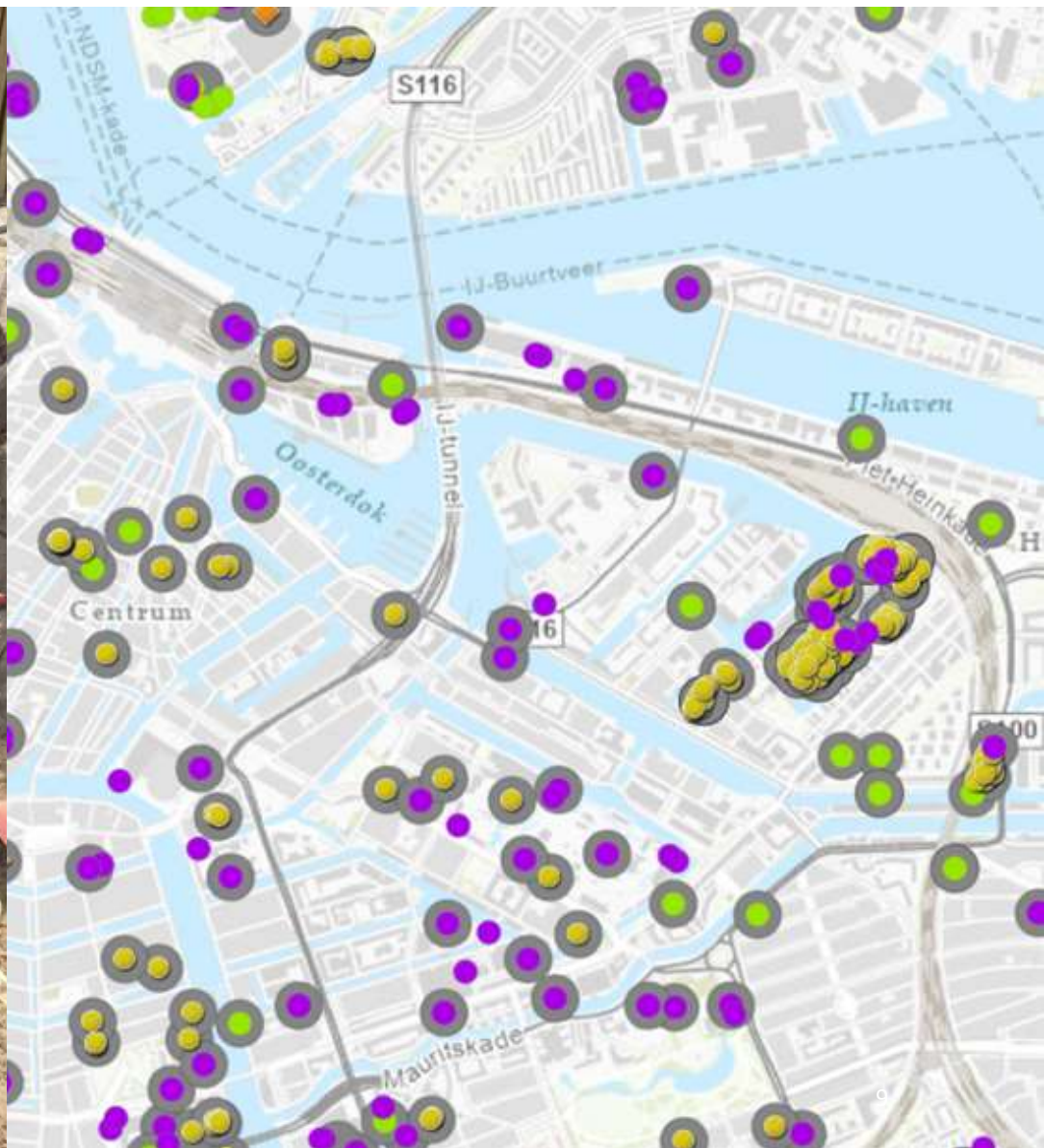


Building envelope

Heterogeneity



Image source: [amsterdamsetaxiservice.nl](https://www.amsterdamsetaxiservice.nl)





Ageing infrastructure



Citizen groups

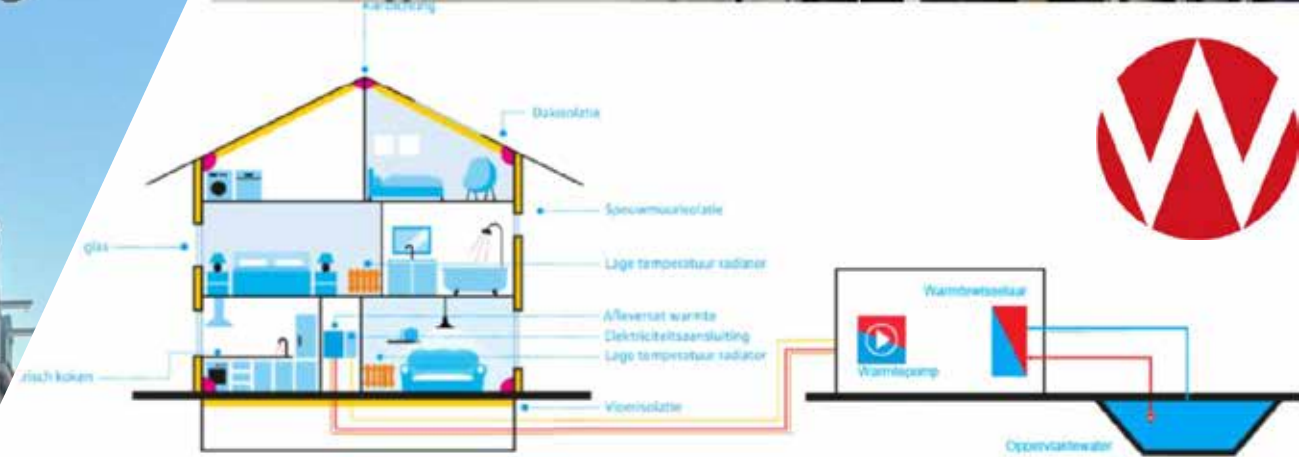
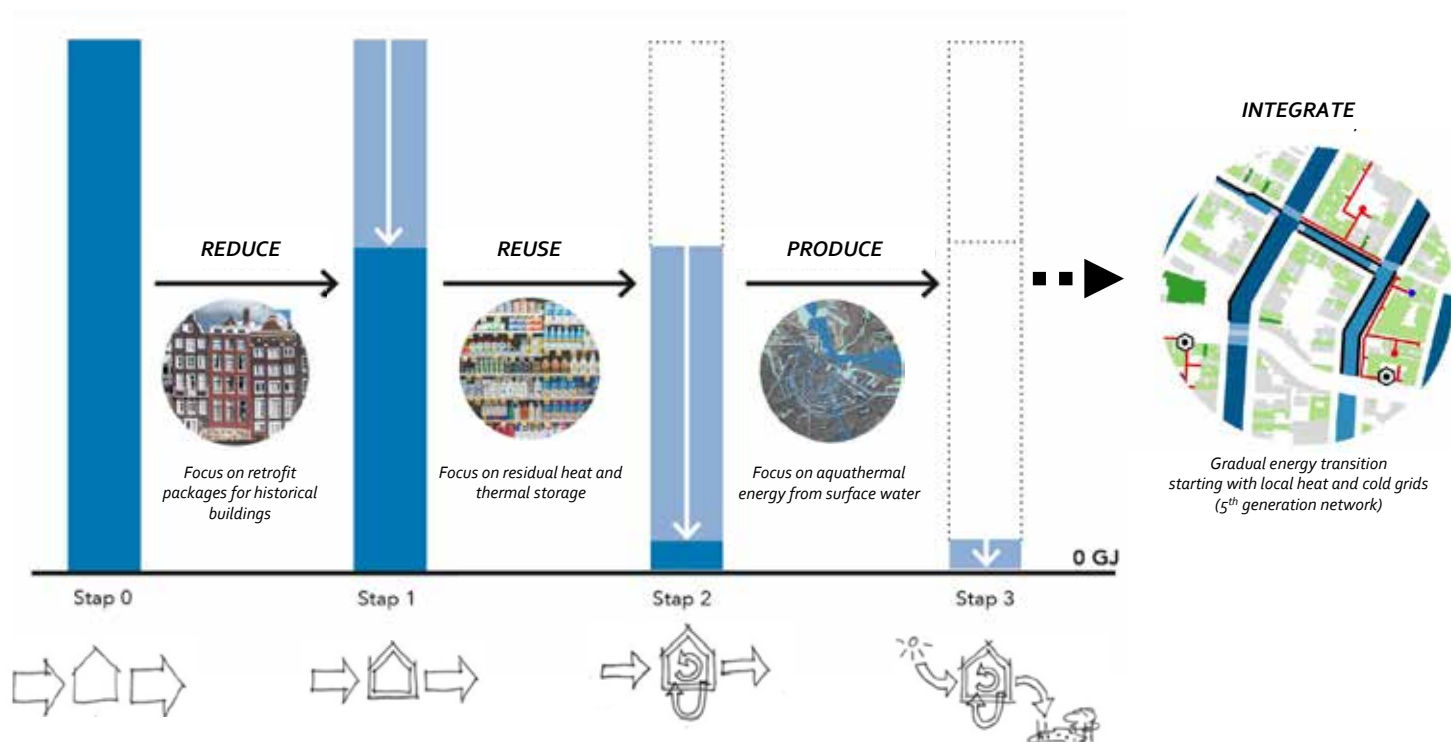


Image sources: <https://warmereus.eco/> (2023)

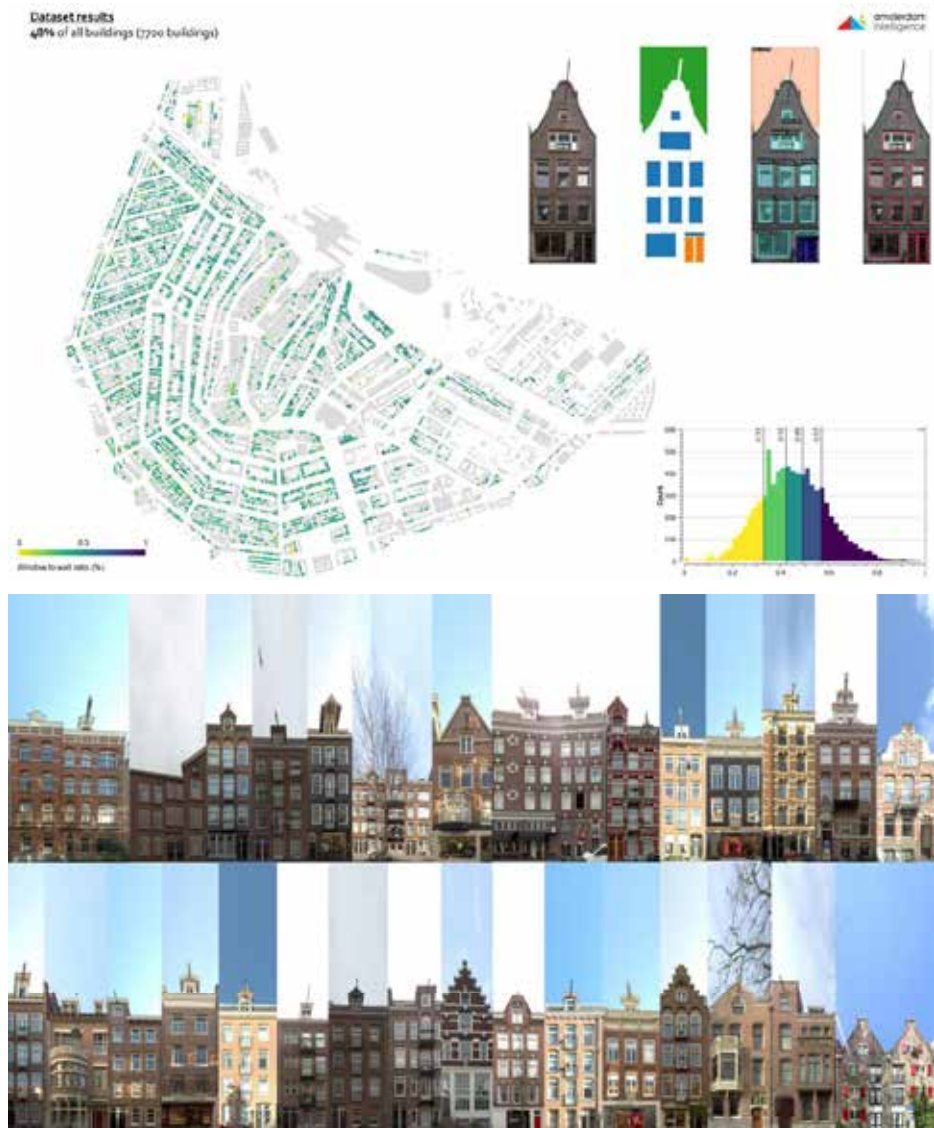
How can the heat transition be shaped (planned, designed, engineered...) for Amsterdam's historic inner city?



Images sources: (LES, 2019), (Dobbelsteen et al., 2008)

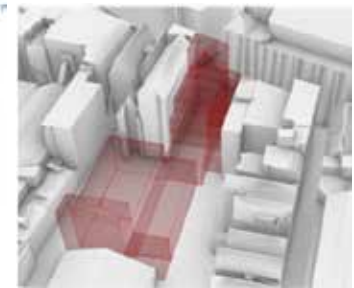
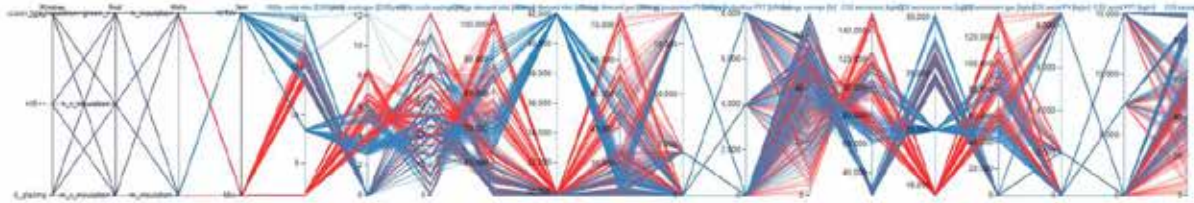
An aerial, black and white photograph of a dense urban landscape. A prominent church spire with a dark roof and a lighter-colored tower rises above the surrounding buildings in the center-left. The city is packed with various types of buildings, including residential houses and larger commercial structures. A river or canal is visible on the left side, winding through the city. The overall scene is a high-angle, wide-area view of a historic city center.

Step 1 'Reduce': Energy retrofitting

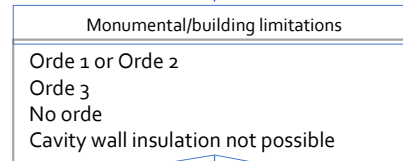




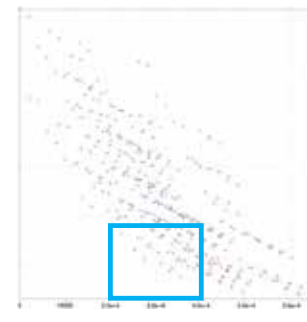
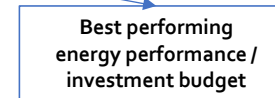
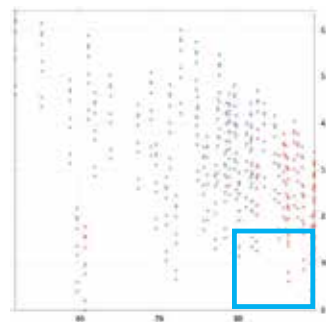
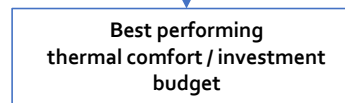
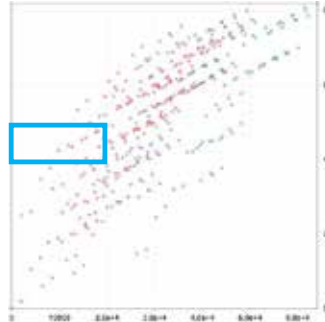
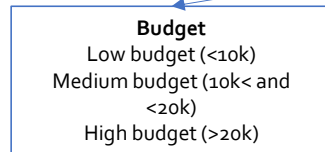
Iterations



Limitations



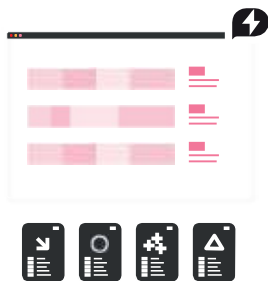
Best-performing scenarios



- Optimization VS Preferences
- Allows Design Exploration
- Current interface too technical to be used by homeowners

Collect Your Retrofits





1

Current situation

Current energy resource usage and flows within the building



2

Proposed scenario

A serie of potential energy retrofit is shown to the community



3

Collective negotiation

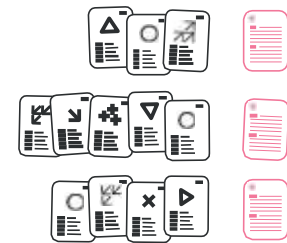
Alternative scenarios making based on collective intelligence and simulations



4

Rank scenarios

Alternative scenarios making based on collective intelligence and simulations





Bijdrage aan het energieverlies in de huidige situatie

Indicatie van het effect op energieverbruik van deze renovatiemaatregel

ramen
hoog



HR++ glas

HR++ glas waar mogelijk vervangen huidig glas of aanbrengen achterzetramen a.d. straatkant



€	12.500€	/woning	-13%	gem.
1	-800€	/woning	-21%	gem.
or				
+2	-1.600€	/woning	-27%	gem.

Kosten v.d. renovatiemaatregel per woning

Mogelijke subsidie per woning i.h.v. 1-2 maatregelen

productie
medium



electriciteit zonnepanelen medium

medium dekking met 15 panelen op gebouwen straatkant



€	1.600€	/woning	-6%	gem.
1	-€	/woning	-4%	gem.
or				
+2	-€	/woning	-1%	gem.

Interessante combinatie om rekening mee te houden

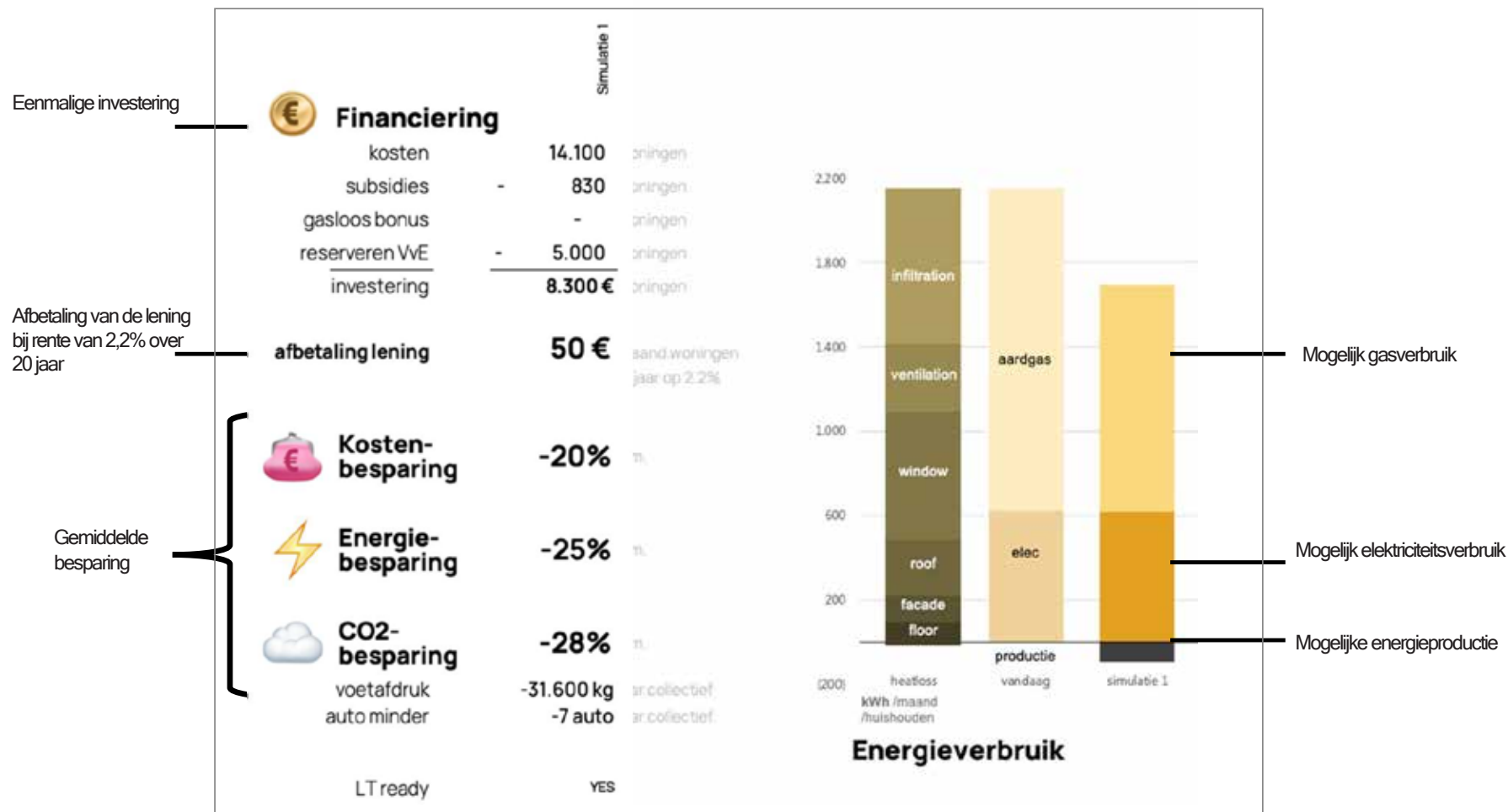
Kosten

Energie

CO2 impact

Gemiddelde besparing bij implementatie van deze renovatiemaatregel

Combineren van renovatiemaatregelen



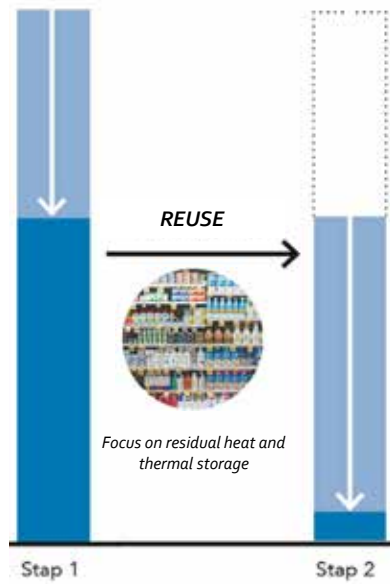
Overzicht van een scenario

An aerial, black and white photograph of a densely packed urban area. A prominent church spire with a dark roof and a lighter-colored tower rises above the surrounding buildings in the center-left. The city is characterized by numerous multi-story buildings with varied rooflines, including many gabled roofs. A river or canal is visible on the left side, winding through the city. The overall scene depicts a historic, compact city center.

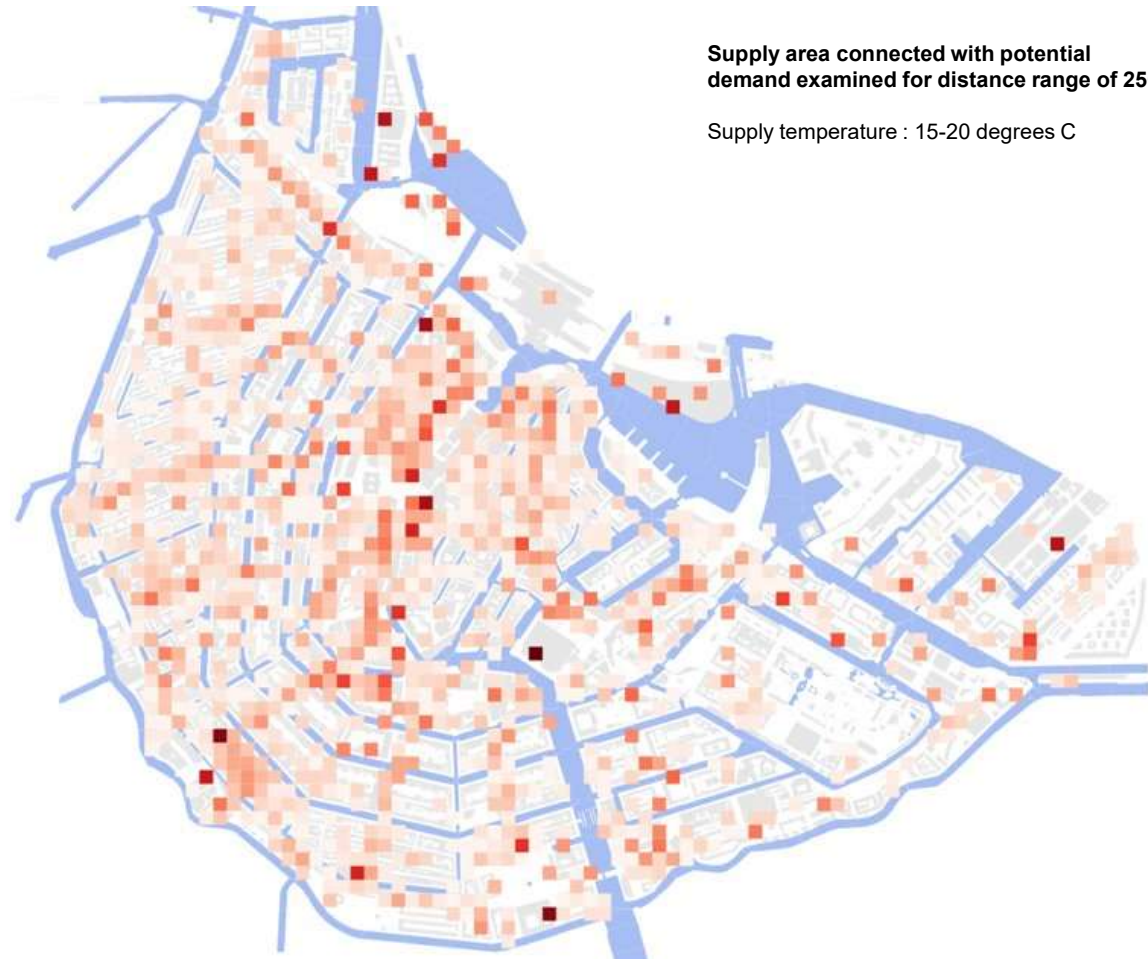
Step 2: 'Reuse'

STEP 2: 'Reuse' residual heat

(preliminary results)



- Waste heat can be stored conveniently in shallow groundwater aquifers.;
- Decentralized heat pumps (use electricity + LT heat)
- CO2 emissions = depends on electricity mix and COP of cooling machines and HP

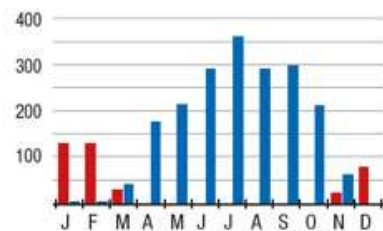


Supply area connected with potential demand examined for distance range of 250m

Supply temperature : 15-20 degrees C

Spatial distribution of waste heat potential from cooling processes in Amsterdam centrum

- 1 Hermitage beschikt over een klimaatstelsel ten behoeve van de kunst in het gebouw. Doordat er meer koeling dan verwarming nodig is, is een overschot opgebouwd.

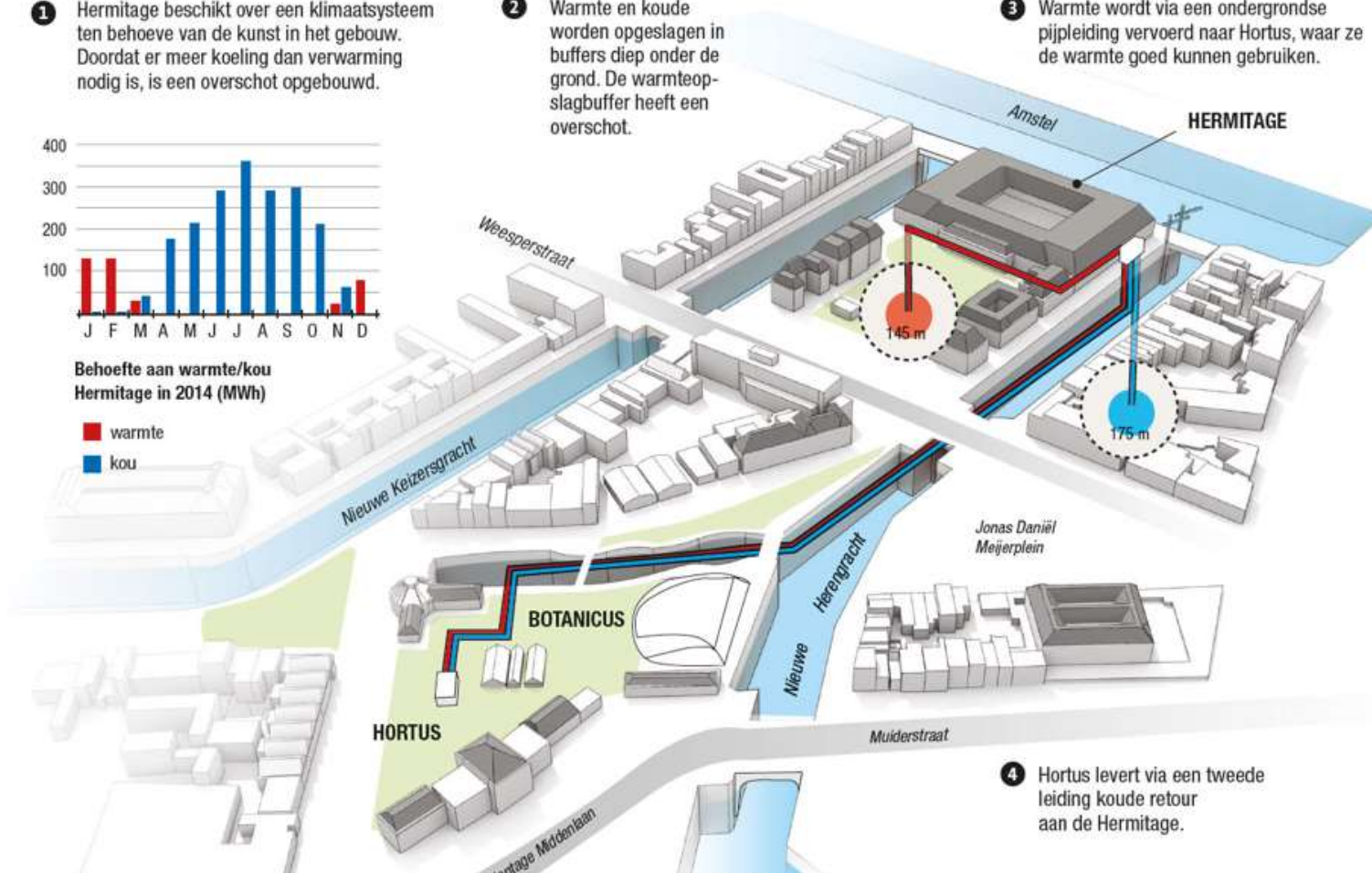


Behoeftte aan warmte/kou
Hermitage in 2014 (MWh)

■ warmte
■ kou

- 2 Warmte en koude worden opgeslagen in buffers diep onder de grond. De warmteopslagbuffer heeft een overschot.

- 3 Warmte wordt via een ondergrondse pijpleiding vervoerd naar Hortus, waar ze de warmte goed kunnen gebruiken.

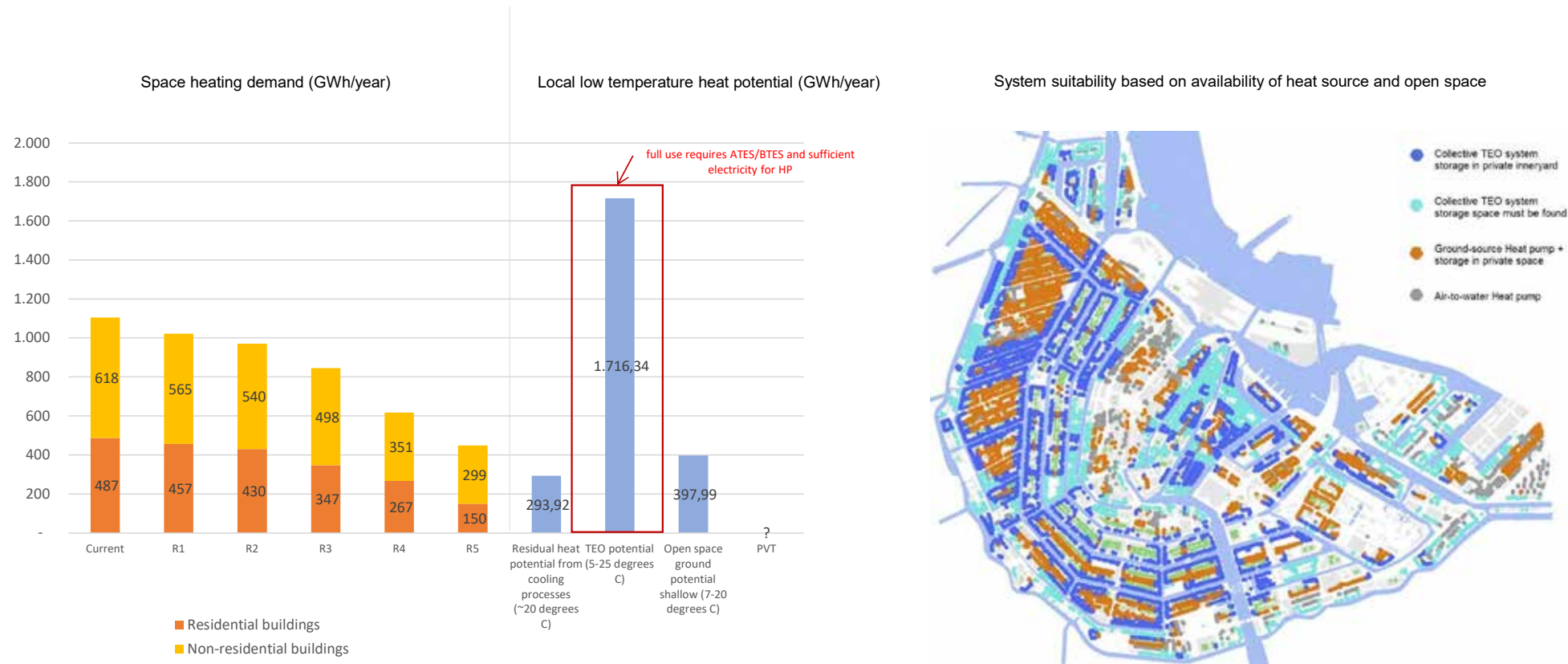


- 4 Hortus levert via een tweede leiding koude retour aan de Hermitage.

An aerial, black and white photograph of a dense urban landscape. A prominent church spire with a dark roof and a lighter-colored tower rises above the surrounding buildings in the center-left. The city is packed with multi-story buildings, many with gabled roofs. A river or canal winds through the lower-left portion of the image. The overall tone is historical and detailed.

Step 3: 'Produce'

Bridging urban morphology and energy planning (show spatial implications = giving heat transition space)





Model testing on Leliegracht neighbourhood

- showcase opportunities for **collective renovation**, collective use of **local heat sources** and **exchange of energy**;
- run multiple scenarios in parallel



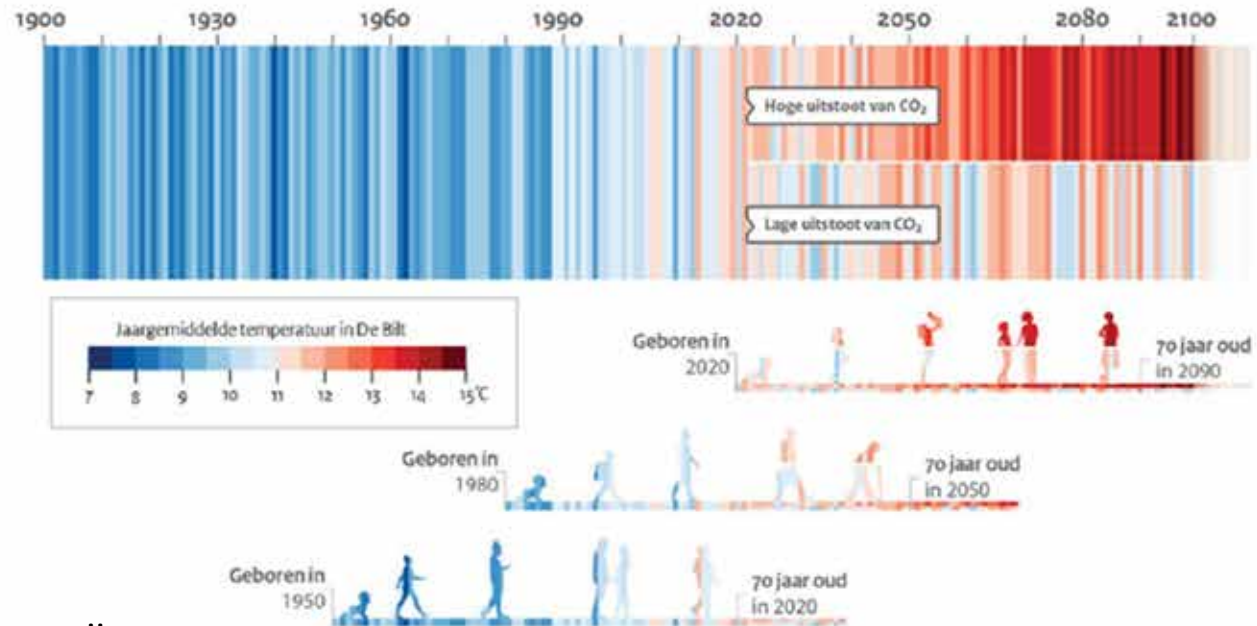
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Integrating climate resilience

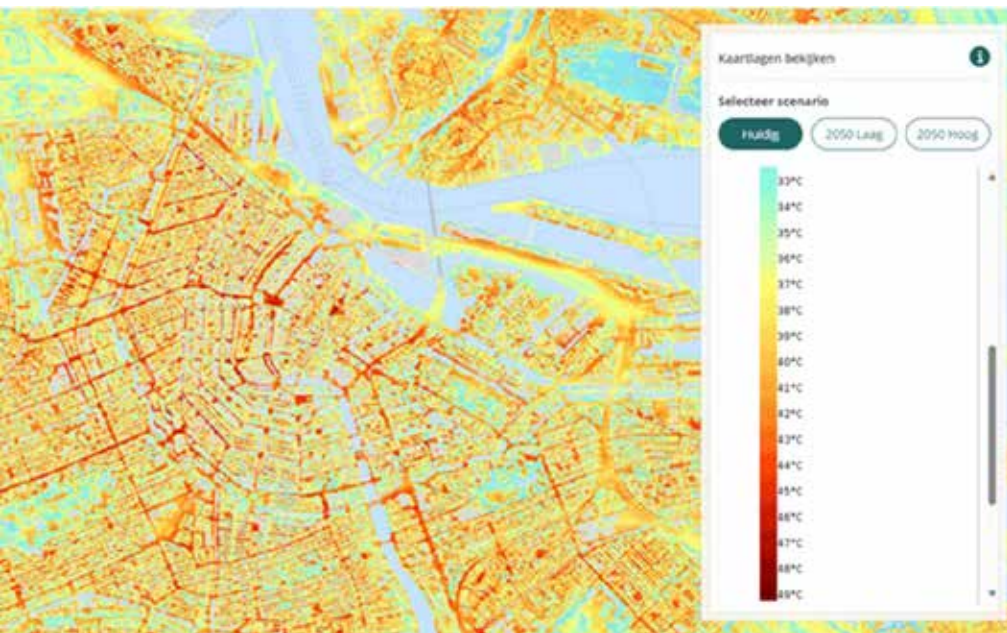


Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Waterstaat

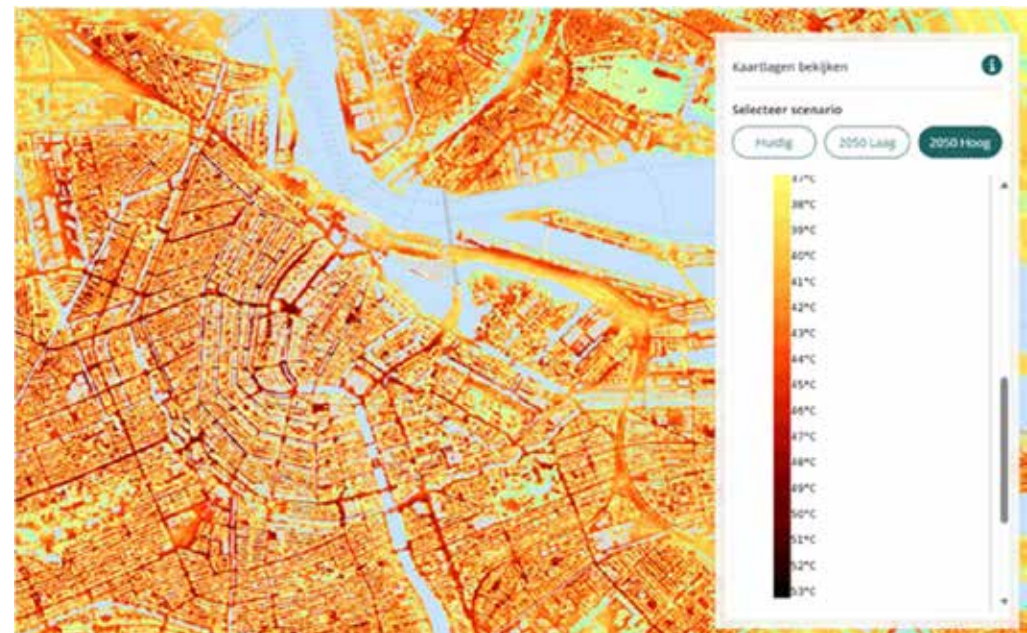
KNMI'23 klimaatscenario's voor Nederland



- Meer zomerse dagen en tropische nachten
- Minder ijs- en vorstdagen.
- Hittegolven zullen vaker voorkomen en intenser zijn
- Steden zullen het meest lijden onder hittestress.
- Langdurige droogte zal vaker voorkomen
- Vergeleken met 1850-1900 is de mondiale temperatuur nu gemiddeld 1,2°C warmer. In Nederland is dat zelfs 2,3°C.
- Het KNMI roept overheden op om meer aandacht te besteden aan het verduurzamen van de koelvraag van de gebouwde omgeving.



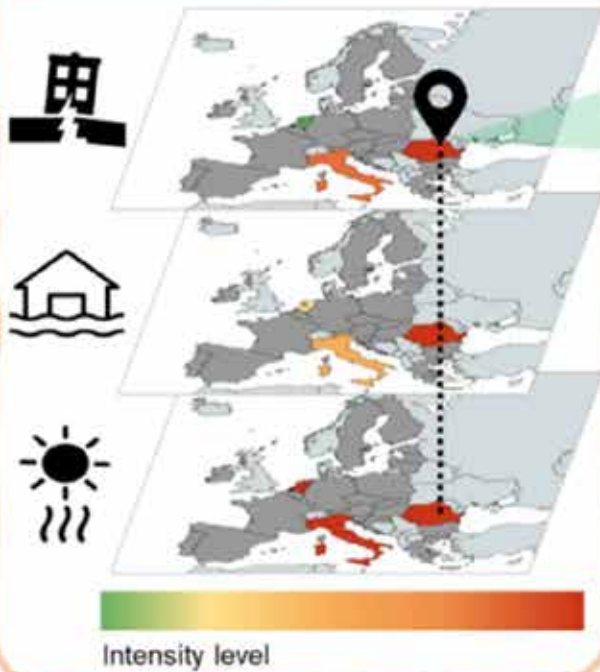
Gevoelstemperatuur tijdens een extreem hete zomermiddag nu



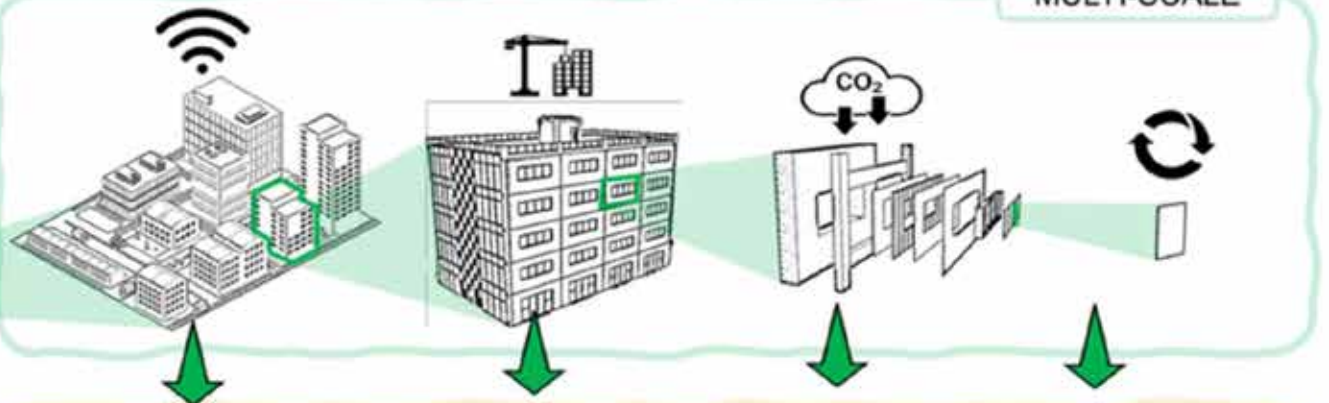
Gevoelstemperatuur tijdens een extreem hete zomermiddag voorspeld in 2050

MULTICARE concept

MULTI-HAZARD



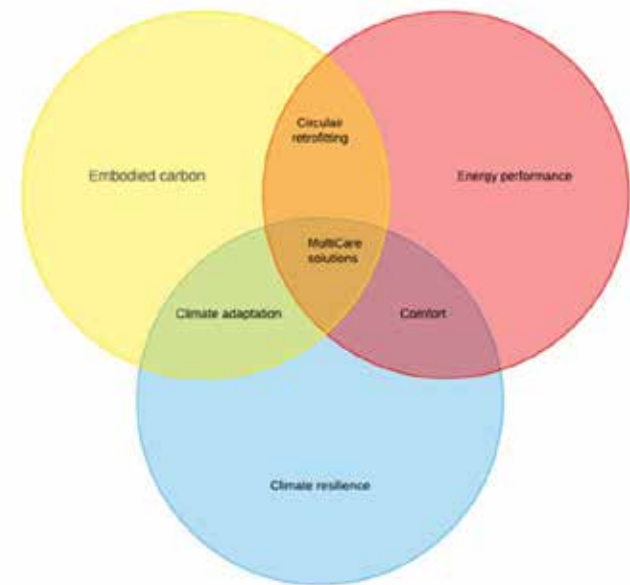
MULTI-SCALE



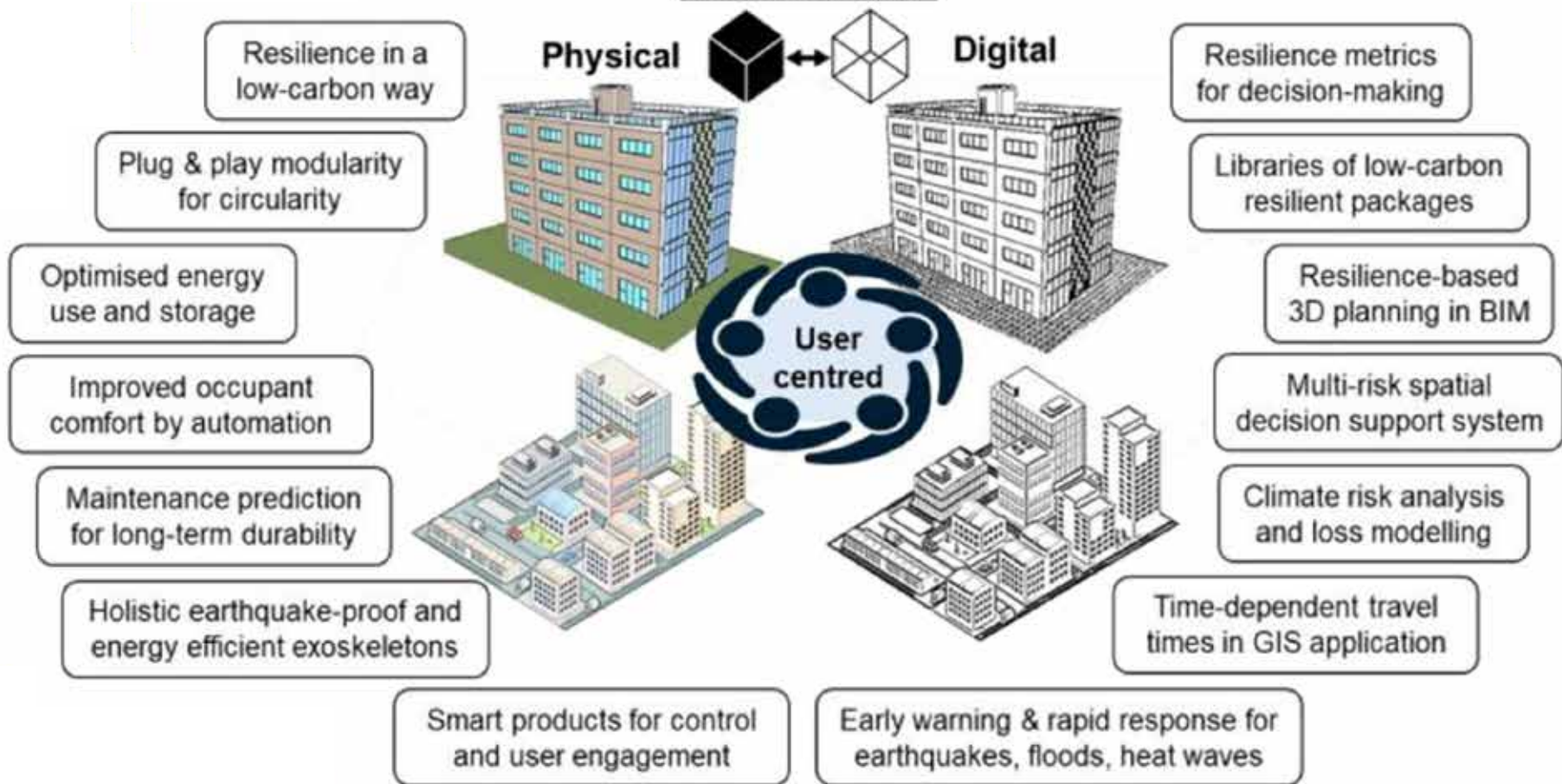
MULTI-DOMAIN



Source: Climate Atlas MRA (2019)



MULTICARE



An aerial, black and white photograph of Leiden, Netherlands. The image shows a dense urban landscape with numerous buildings, streets, and a prominent church spire in the center. The text "Leidsekade" is overlaid in white, centered horizontally. A thin white horizontal line is positioned above the text.

Leidsekade

Points of attention

- **small research team**, limited capacity and budget;
- we do research only, but we want to provide citizens with our insights
- **interest in confronting our theoretical models to practical cases**
- **Learn from your decision-making process**

Our contribution

- **review results of the exploration study** and provide complementary insights
- **(optional) opportunity** to use and test a WIP quick-scan on your area
(EU project Waterwarmth)



(optional) opportunity to use quick-scan EU-funded project on aquathermia potential



- working on a quickscan tool giving a (very basic) calculation on potential vs demand and many other factors that can either foster or impede a business plan;
- validate the research methodology and thresholds with Leidsekade community;
- one or more of the stakeholders to test the interface

Thank you for your interest!

Questions or suggestions?

Dr. Maéva Dang
M.K.Dang@tudelft.nl

Kyra Koning
kyra.koning@ams-institute.org



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Image source: Buck, N. (2023)