City-zen Amersfoort Roadshow



















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Oct 16-18

Roadshow Team

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Tolga Özdemir (TUD)

Lincheng Jiang (TUD)

Javier Montemayor Leos (TUD)





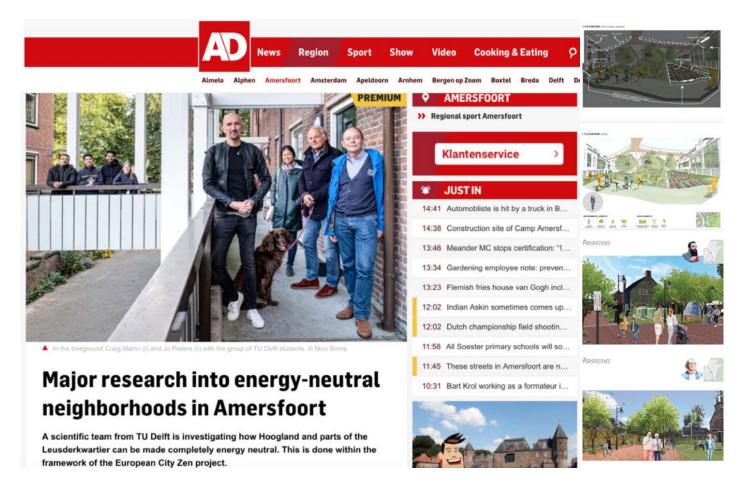
City-zen Roadshow Leader – Prof.Dr. Craig Martin



- Live. Onsite.
- City-specific.
- Sustainable Neighbourhood / City Visions.
- Heart of Community.
- Team specialisms



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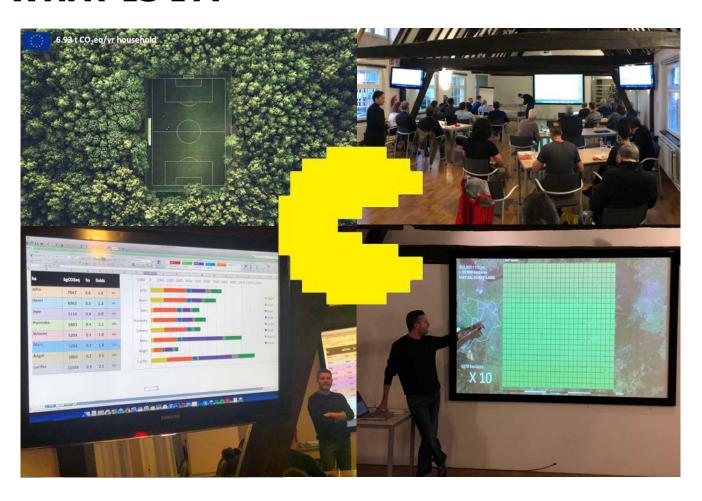
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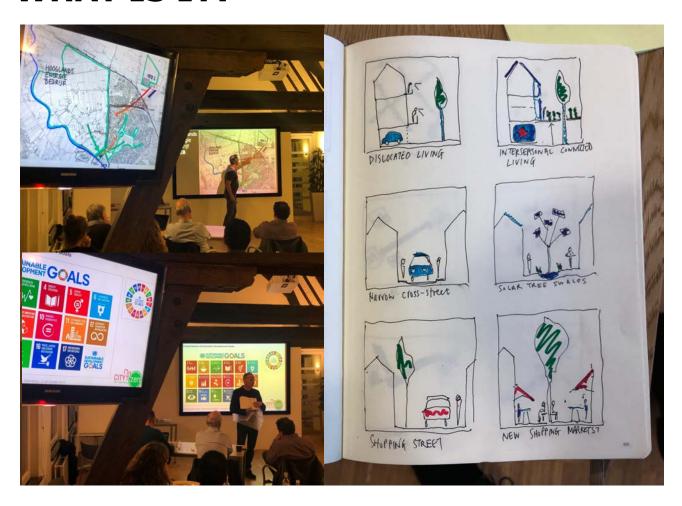
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City-zen Roadshow Leader – Prof.Dr. Craig Martin



- Too radical!? Fantasy?
- Aim: Carbon Zero city!
- Not preaching to the converted.
- Cards on the table.
- Not a closed shop!



City-zen Roadshow Leader – Prof.Dr. Craig Martin



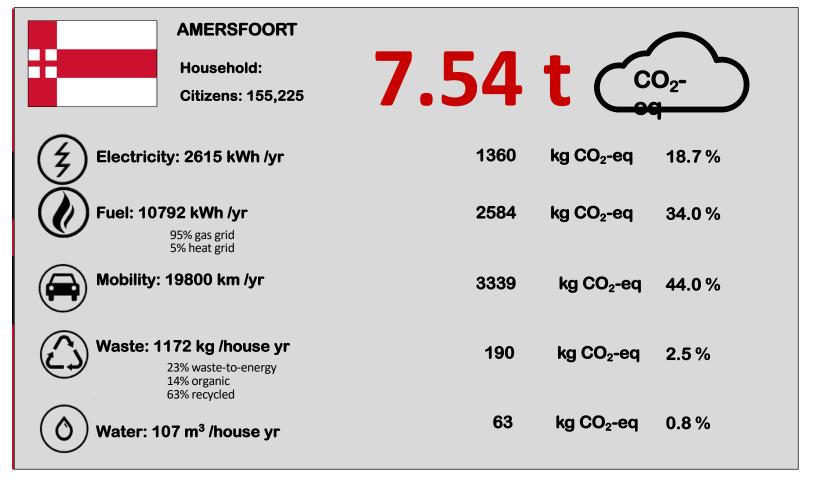
City-zen Roadshow Leader – Prof.Dr. Craig Martin

- Health & Well being.
- Even more enjoyable.
- Zero carbon city & Future...
- For Amersfoort families.





What's the emission of one single household in Amersfoort?





EU household 2.3 citizens 6.93 t CO₂ eq/yr

Pulselli et al."Carbon accounting framework for decarbonisation of European city neighbourhoods". Journal of Cleaner Production 208 (2018) 850-868.

Carbon Footprint per household

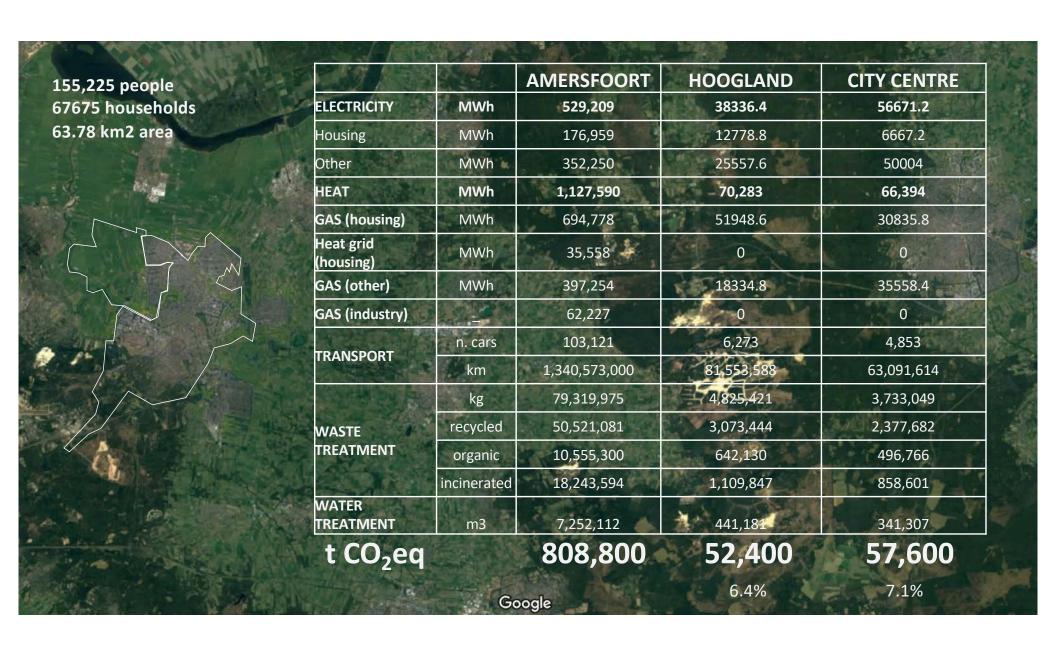




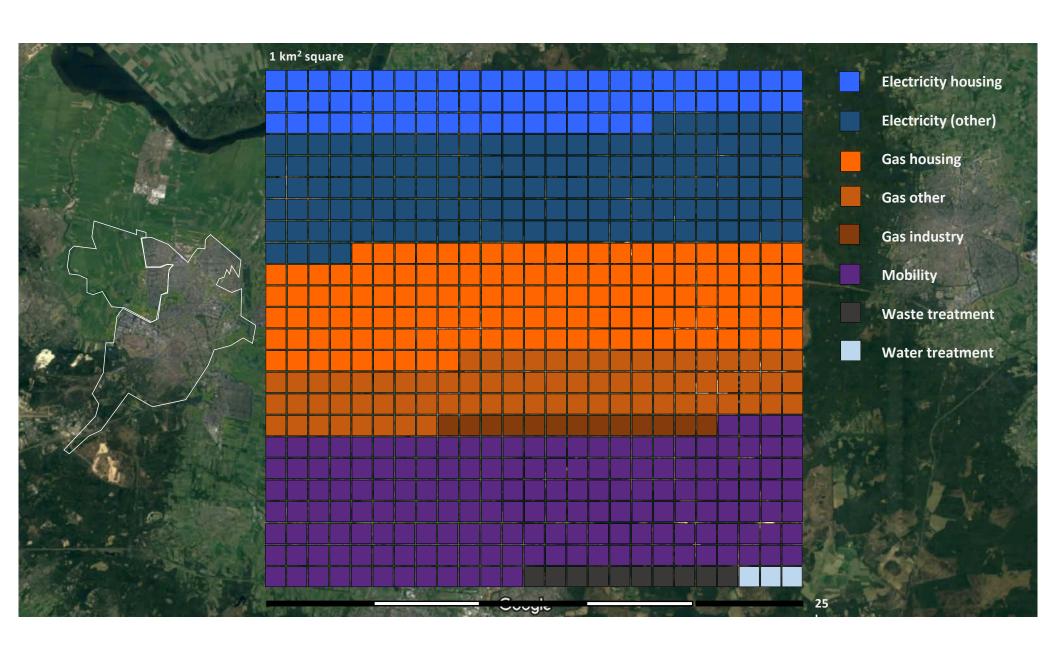
EU household
2.3 citizens
6.93 t CO₂ eq/yr
0.51 ha
Virtual forestland
1 field

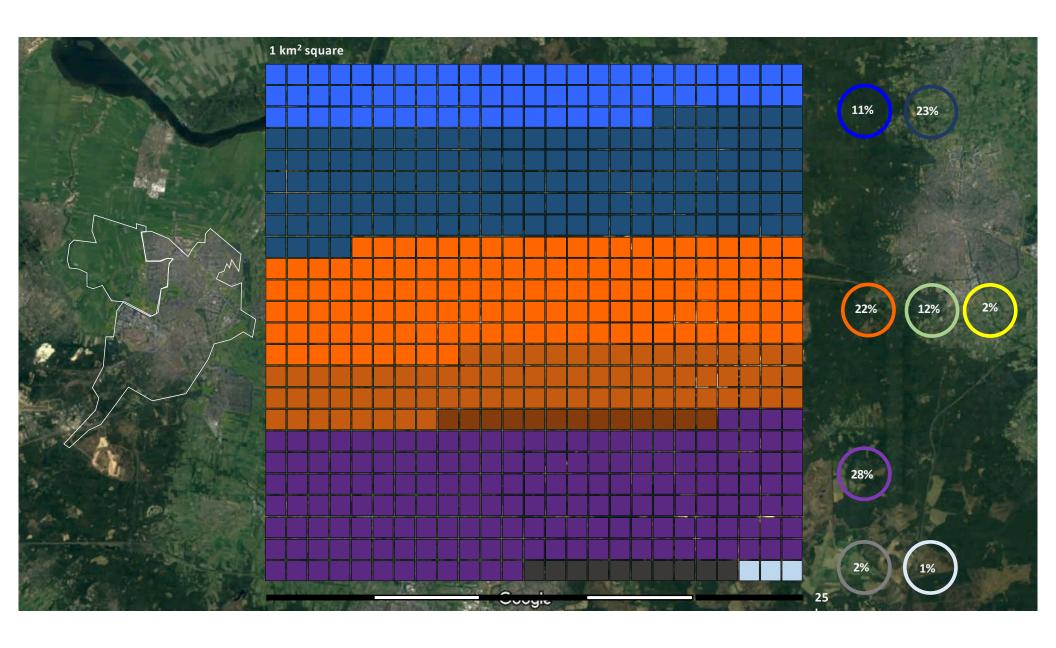
Pulselli et al."Carbon accounting framework for decarbonisation of European city neighbourhoods". Journal of Cleaner Production 208 (2018) 850-868.

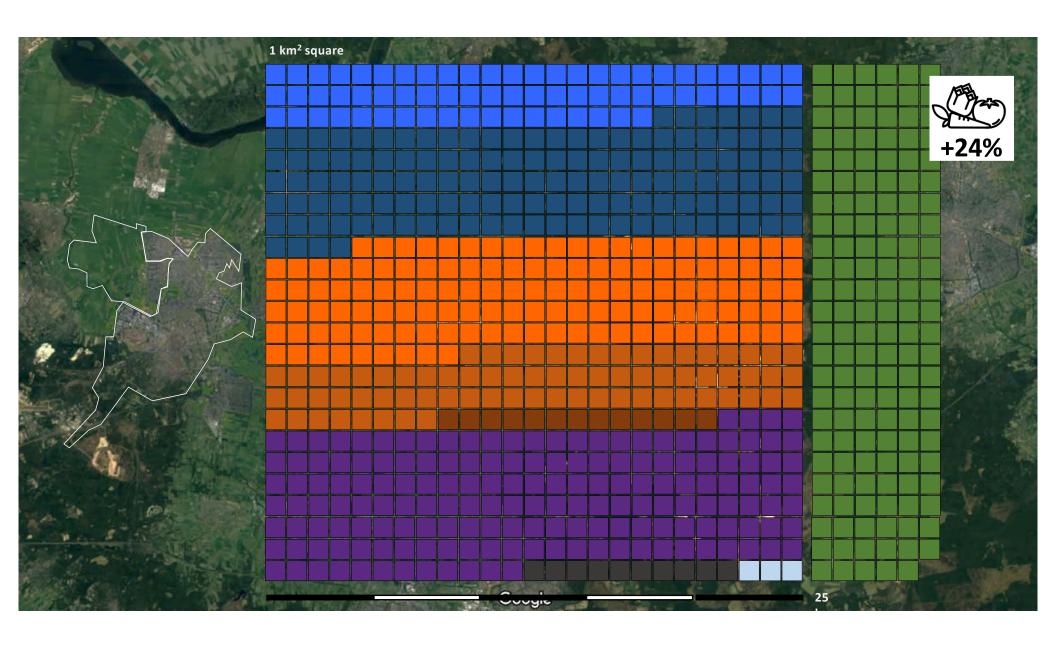
Dr. Arch. Riccardo M. Pulselli – "Carbon Accounting explained" – Amersfoort, 16-18 October 2019

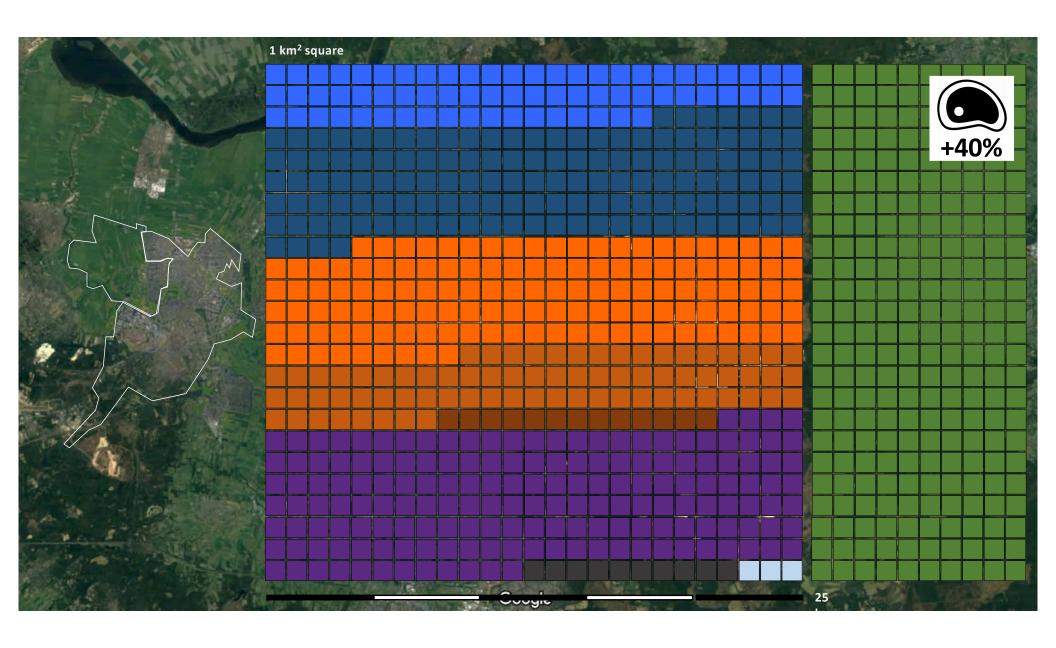


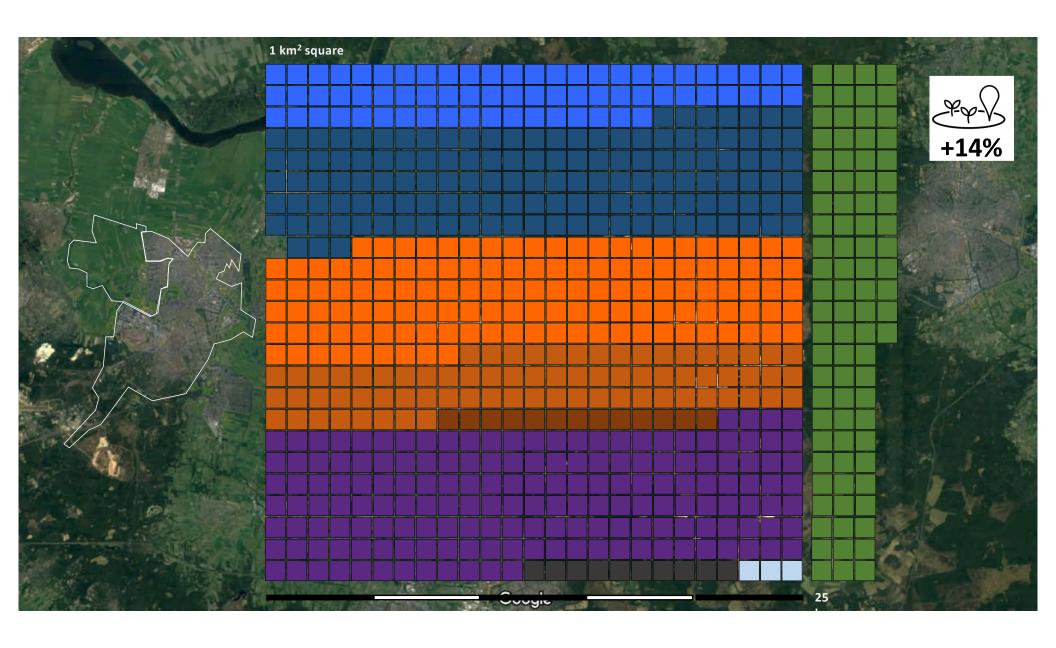


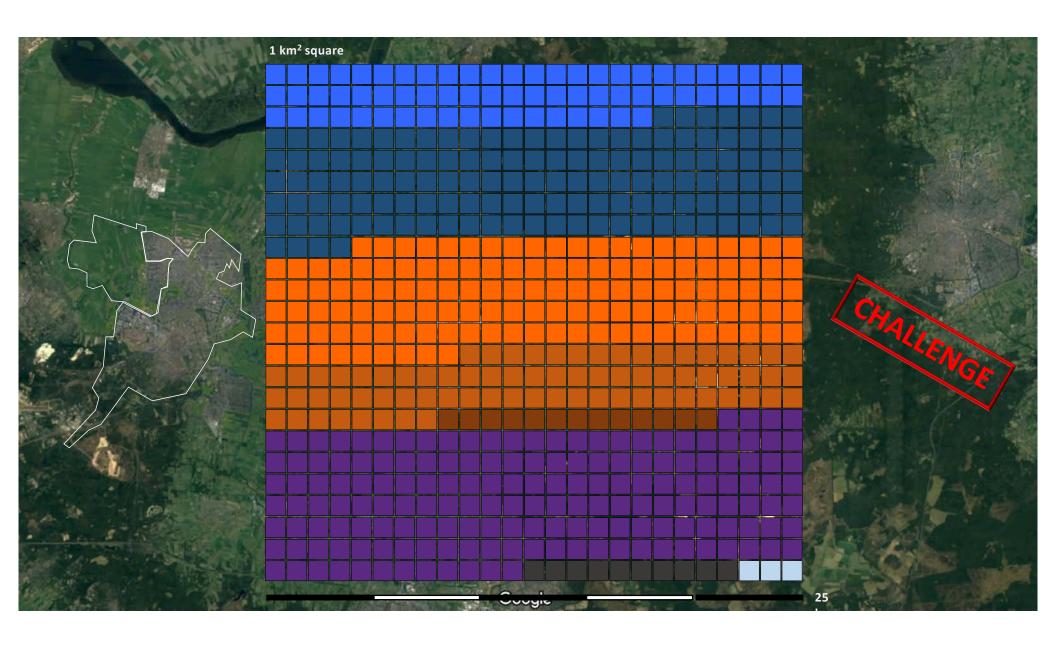




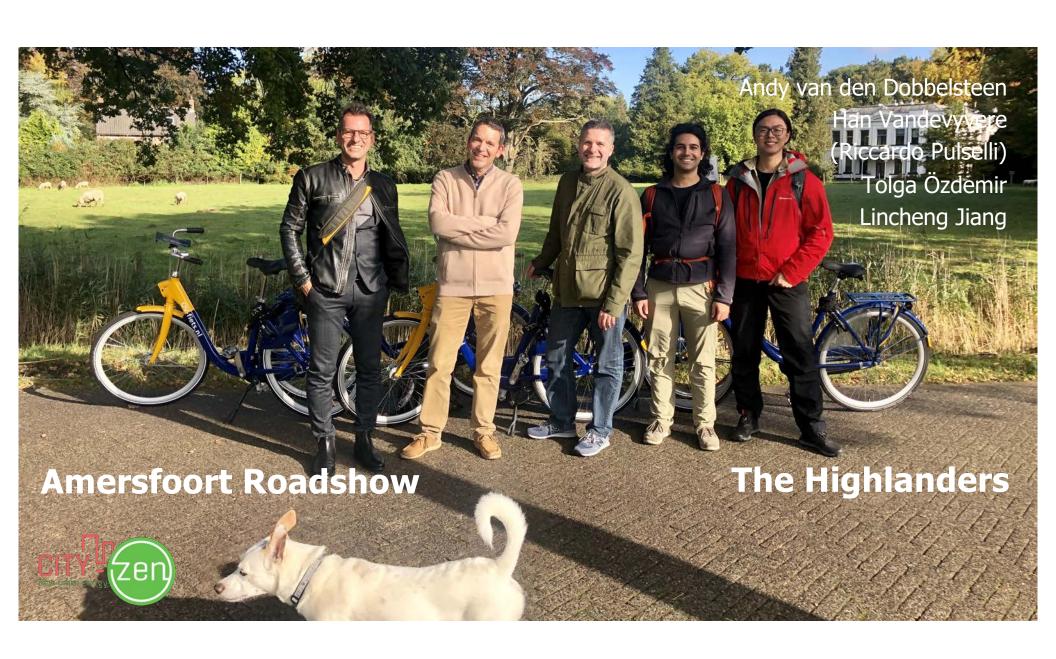












Content

Understanding Hoogland
Sustainability Opportunities
Energy Strategies



Understanding Hoogland







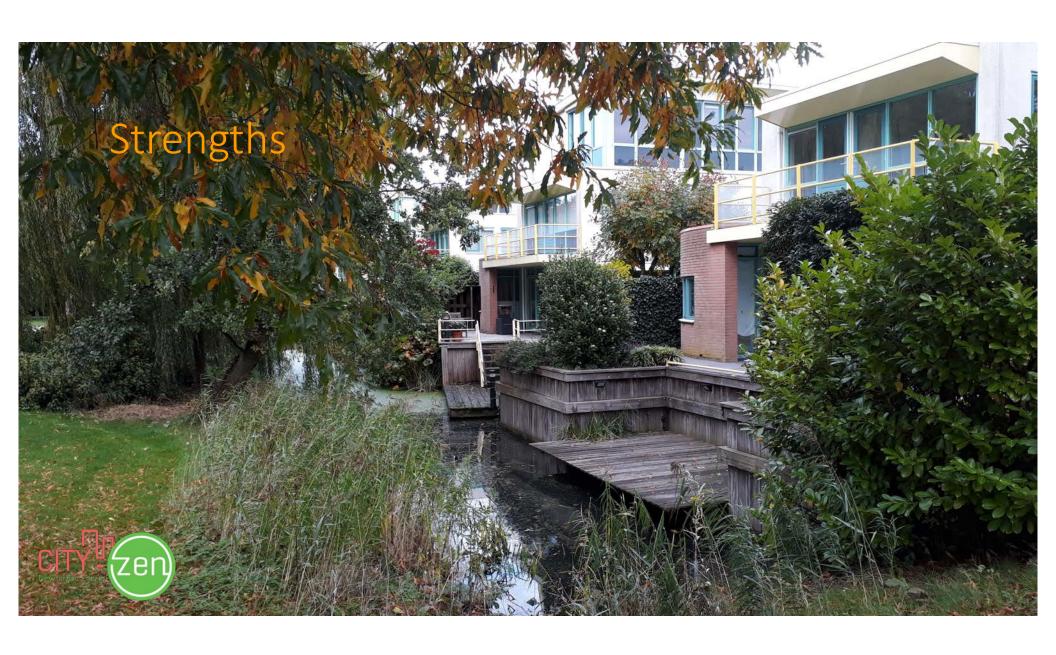
Hoogland is a part of Amersfoort. On paper.

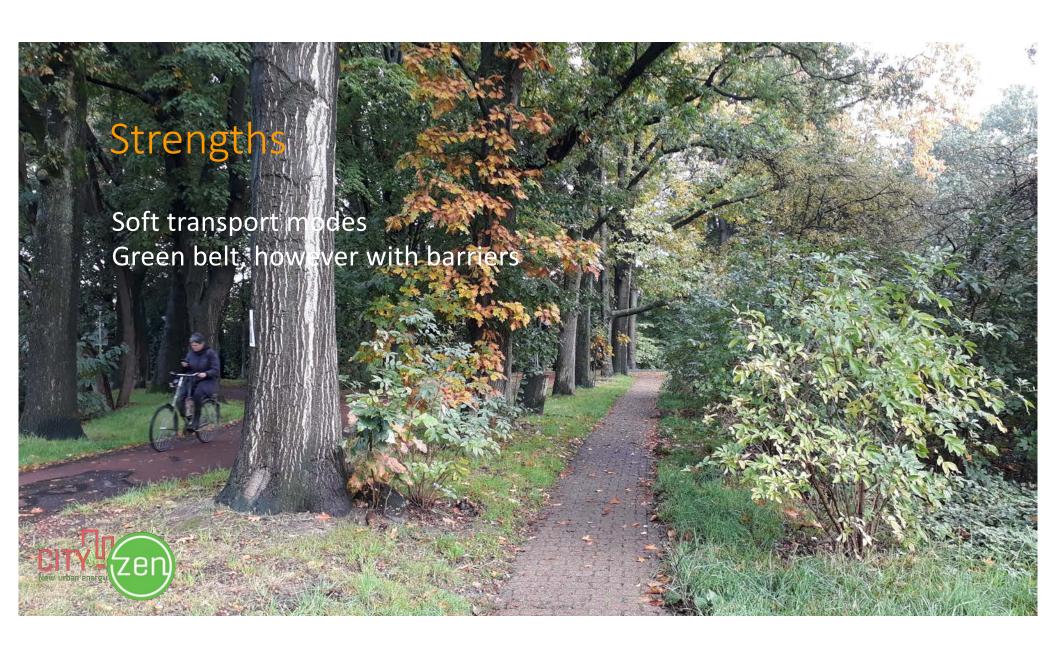










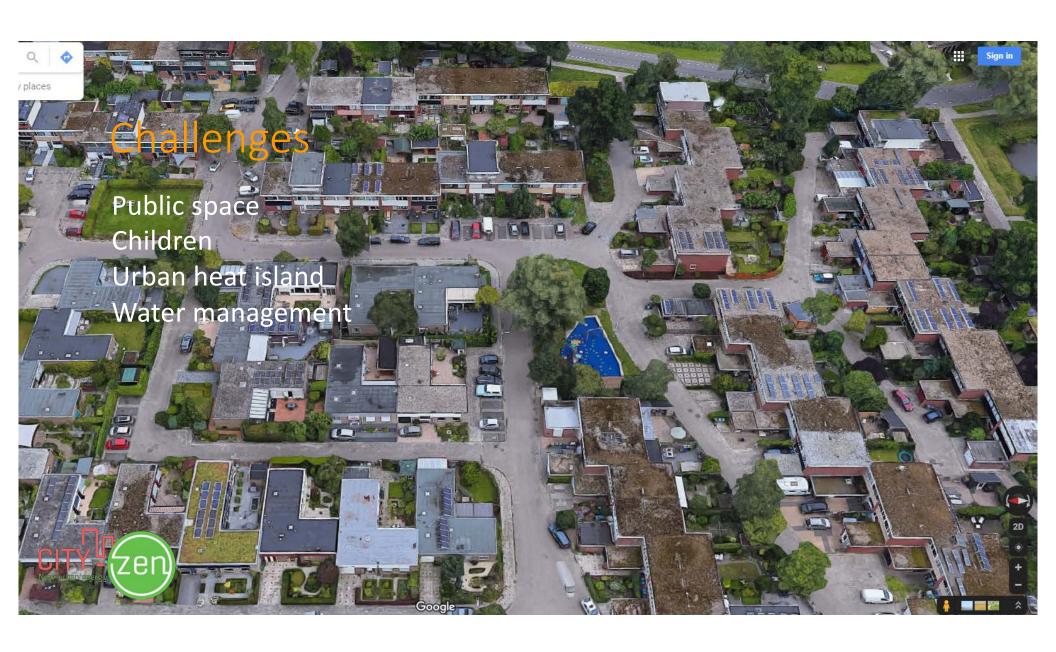


Challenges

Noise













Sustainability Opportunities

In and around Hoogland – starting from what is already present



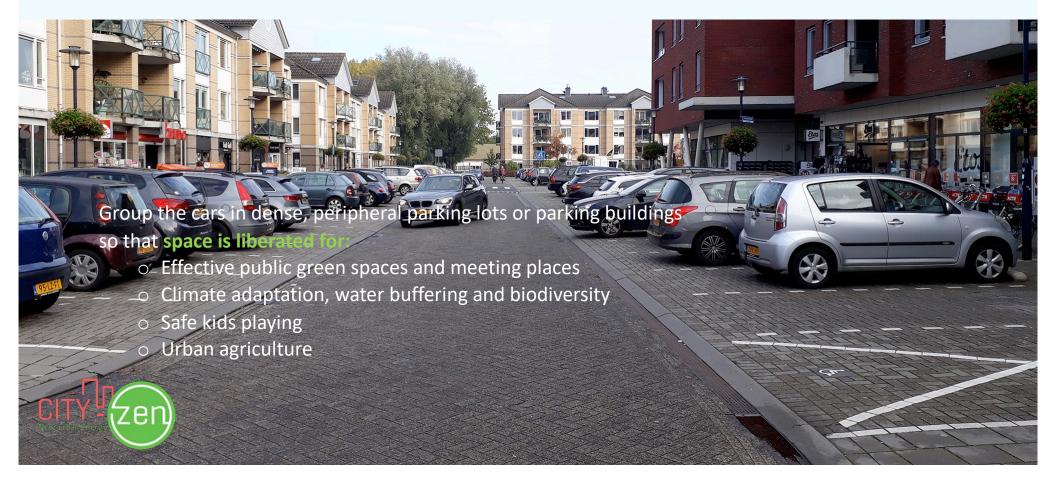


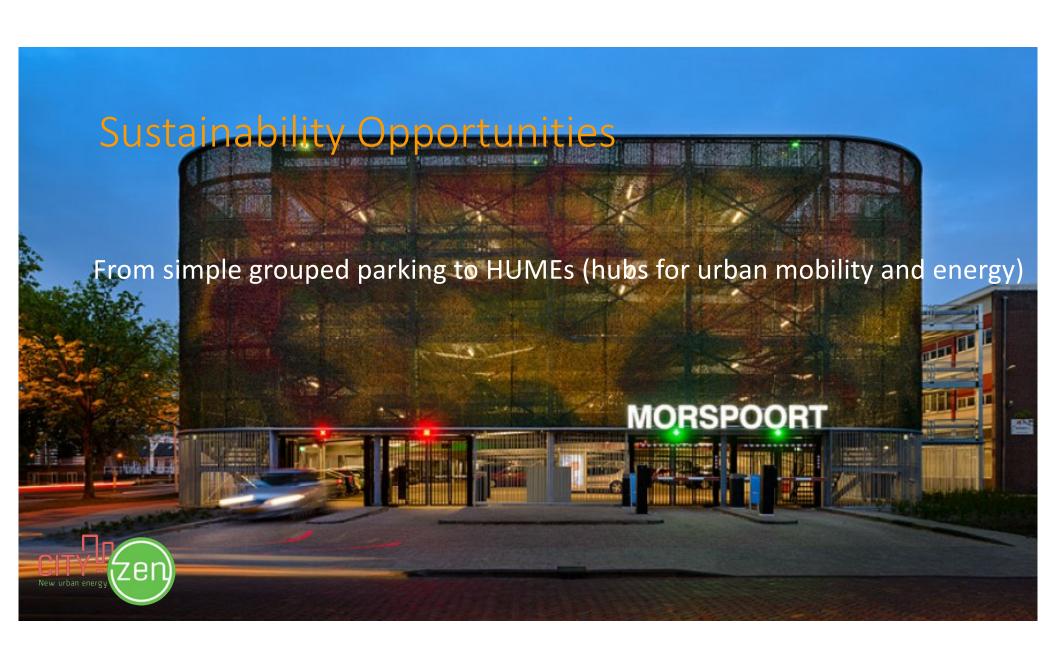






Undoing the empire of the car





Sustainability Opportunities

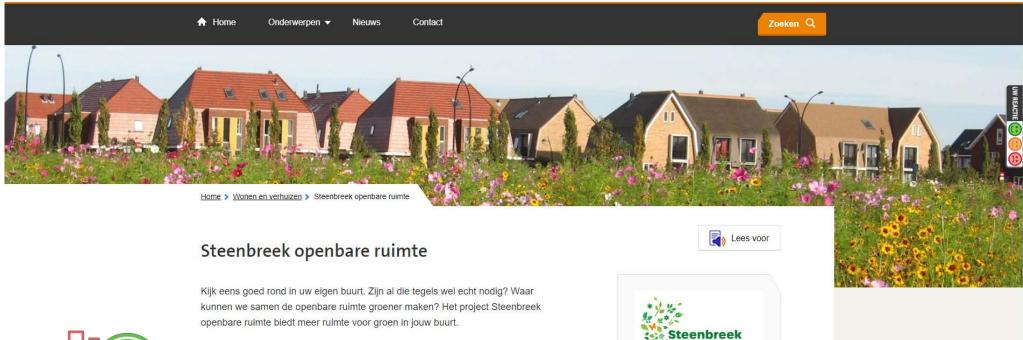
Gemeente Amersfoort



Tegels eruit, groen erin

Bedankt voor het indienen van alle vergroeningskansen! Nu

beoordelen wij op uitvoerbaarheid



















ility Opportunites



Home

Vereniging

Projecten

Energietransitie in de

wijk.

Schoon Soesterkwartier

Szaai groen

Welkom in de wijk

CV-optimalisatie

Wijkeconomie

Buurtmobiliteit

Buurtuitvaart

Duurzaamheidsvisie

GroeneSpoor

Soesterwijkwiek

Woonwerkplaats

Zon op school

Soesterhof

Straatprojecten

Zonnecollectief

Straatprojecten energiebesparing



In diverse straten in het Soesterkwartier werken de bewoners samen aan energiebesparing. Gezamenlijk maatregelen inkopen is natuurlijk voordeliger én gezelliger. Zo wordt je huis op een simpele manier energiezuinig én comfortabel. Dit succes gaan we wijkbreed doorzetten. Met u als aanspreekpunt komen we ook bij u in de straat! In maar liefst 20 straten zijn al diverse woningen gemeenschappelijk geïsoleerd. Soesterkwartierder Huib Schoonhoven heeft in

samenwerking met de gemeente Amersfoort twee filmpjes laten maken over de straatprojecten in het Soesterkwartier. Ze staan op Youtube: één over de Puntenburgerlaan en één over de Soesterweg.



Roerstraat methode

Roerstraat I In de Roerstraat heeft men gezamenlijk ramen met dubbelglas en spouwmuurisolatie ingekocht. Dat scheelde duizenden euro's en in de

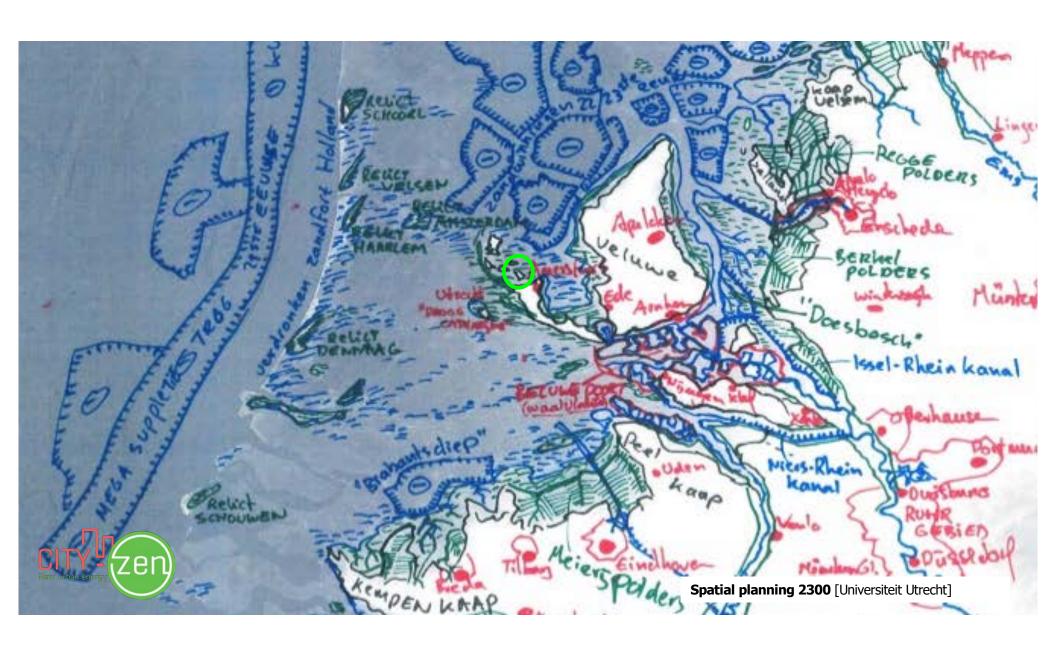
toekomst vele honderden kubieke meters gas. Voor de een was het comfort volg de isolatie van het huis van belangrijk, voor de ander de lage maandlasten en voor een derde de waardestijging van het huis en weer iemand anders doet het vooral voor het milieu. Natuurlijk hebben wij ons van tevoren goed geïnformeerd welke maatregelen het grootste effect hebben op de maandelijkse energierekening. ledereen heeft zijn persoonlijke stap kunnen maken vanuit zijn eigen situatie. En dankzij de collectiviteit was het voor iedereen voordelig om aan te sluiten.

Maar het leukste is dat je met deze gemeenschapsactie je buren beter hebt leren kennen. En dit is een mooie voedingsbodem om meer met elkaar te organiseren.

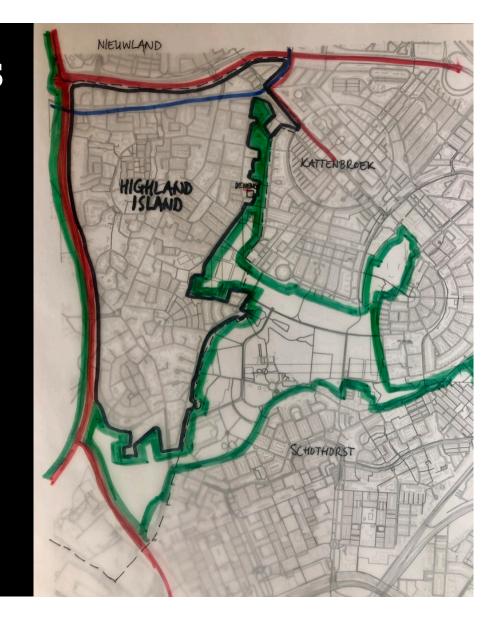








Surrounded by barriers





Main choices for the heat transition

- 2: HT/MT district heating
- → Sustainable heat supply for old districts that are hard to renovate
- 1|2: Heat pump system with HT/MT district heating for hot water
- → For districts that are well insulated but with little potential for PV thermal
- 1: All-electric, with heat pump system
- → For buildings that can be renovated (insulation, windows, services) to a LT system
- 1|3: Hybrid heat pumps, with green gas as backup
- → For buildings that can be renovated, but LT heating in winter is not enough
- 3: Green gas (bio, H₂, CH₄) in the current gas grid
- → For old districts that are hard to renovate and when district heating is impossible

Strategy at the village scale Hooglands EnergieBedrijf

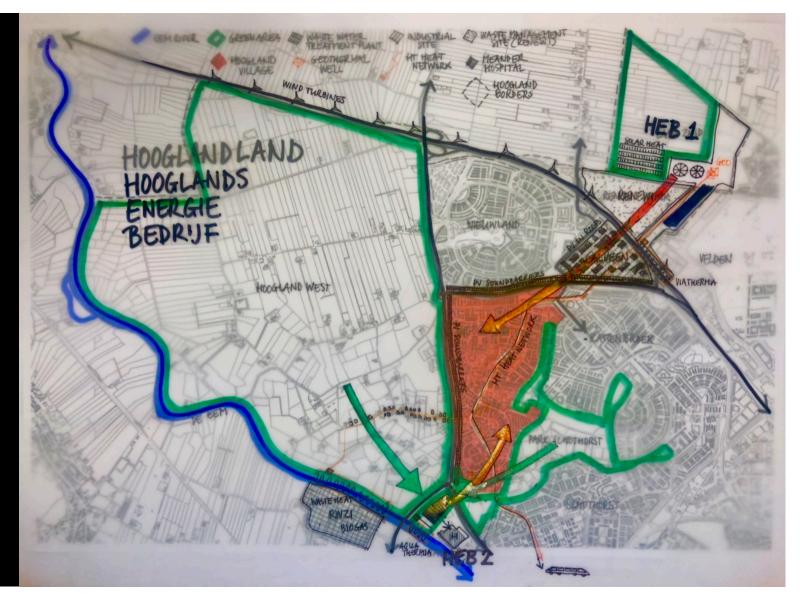


Hoogland is huge!



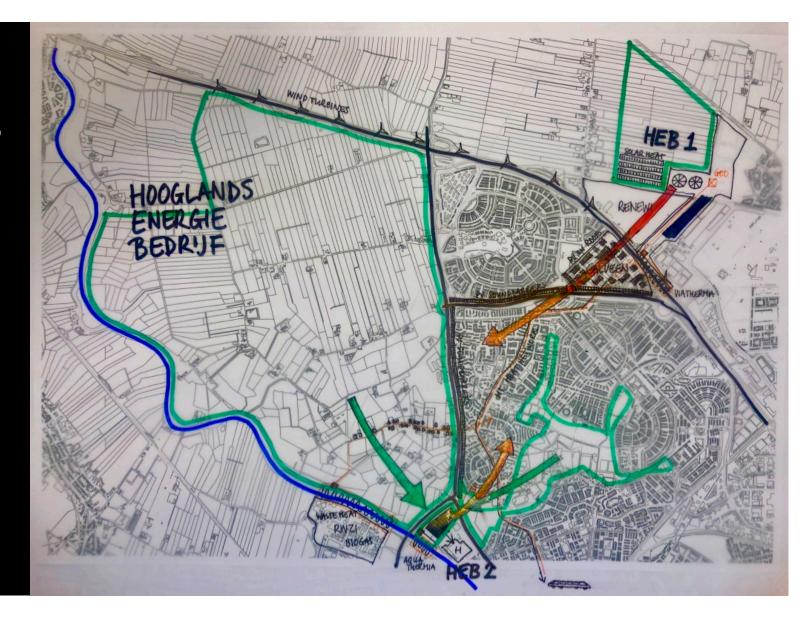


HEB Hooglands Energie Bedrijf





HEB
Hooglands
Energie
Bedrijf





Heat demands



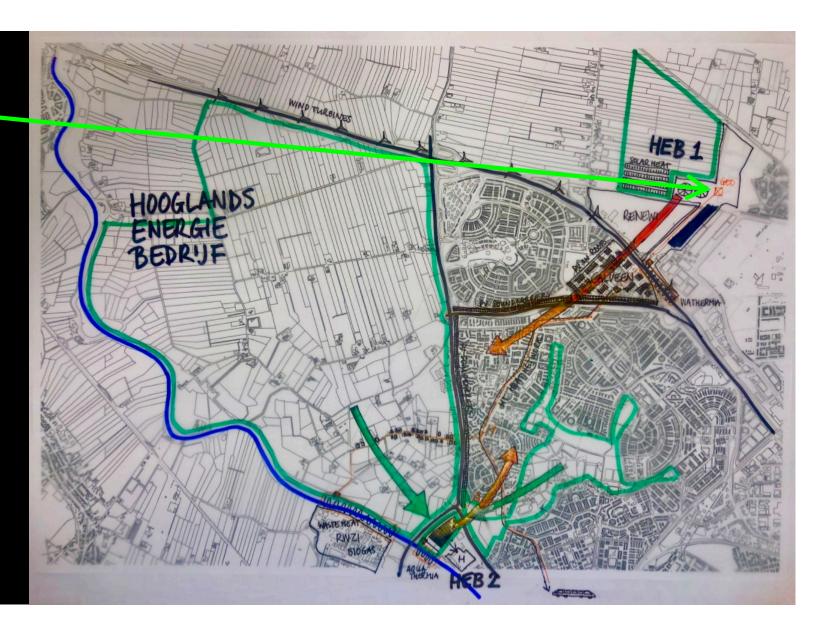


The most difficult street in the village

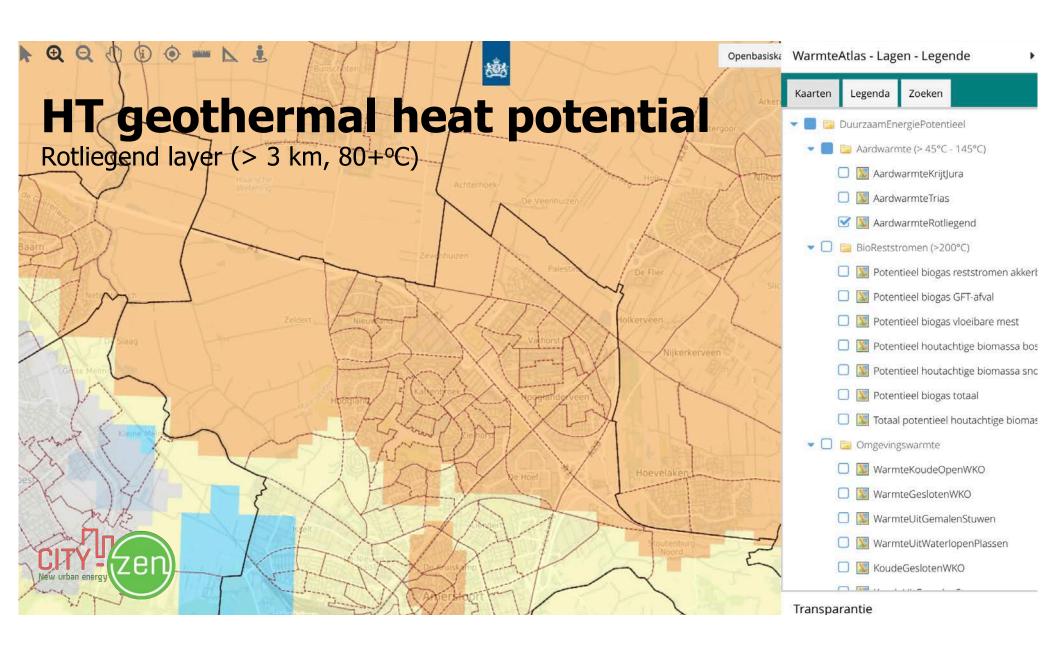




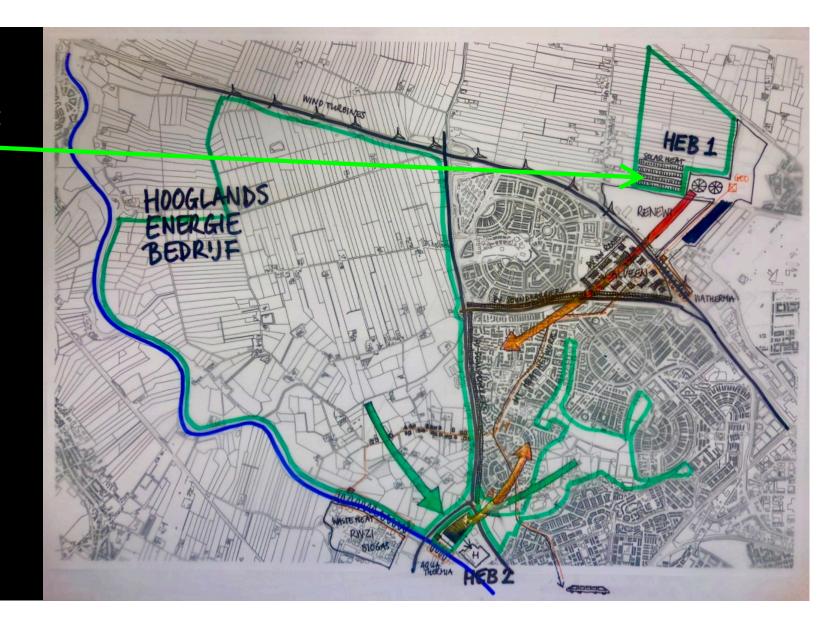
HEB Geothermal heat







HEB Geothermal heat Solar heat



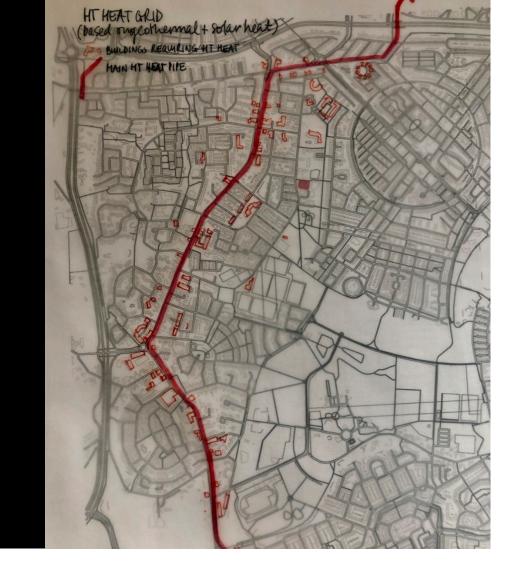








HT heat network powered by geothermal



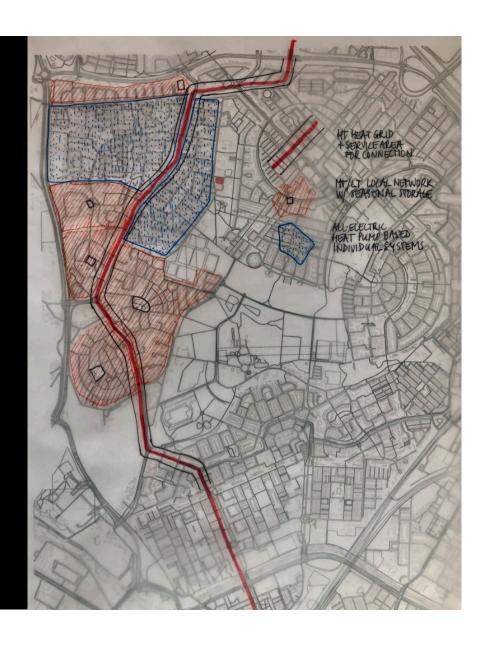


HT heat pipe

Local LT heat networks

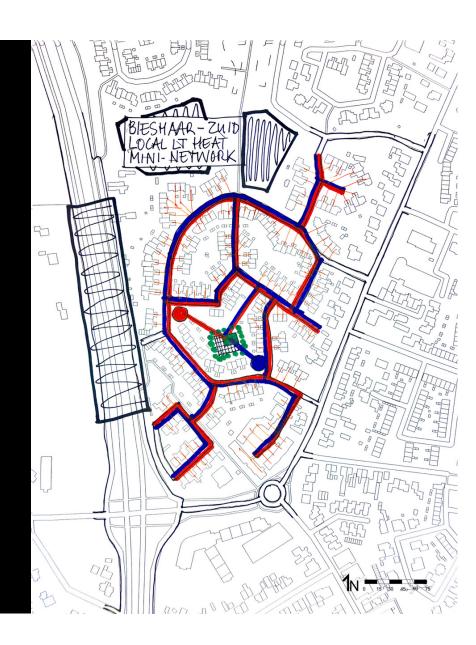
Individual heat pumps



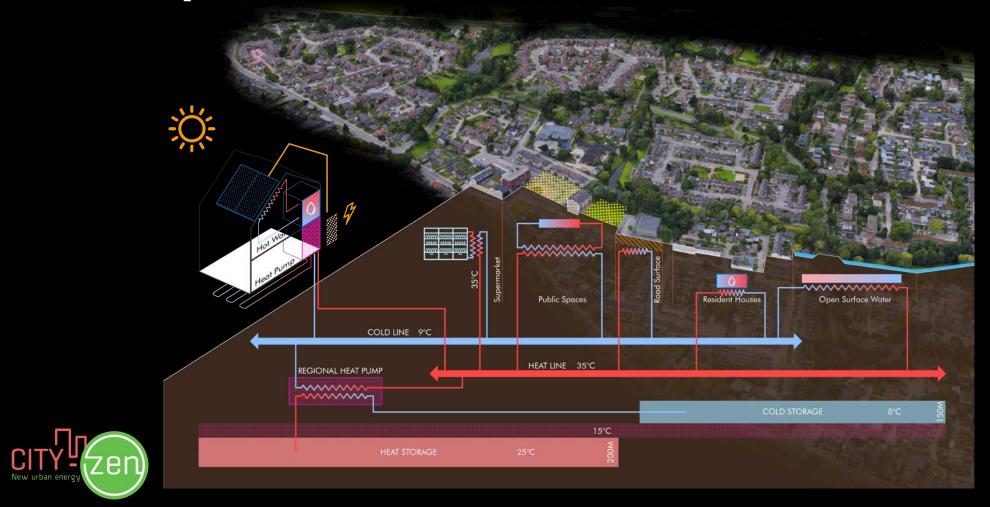


Bieshaar South Local LT mini-network

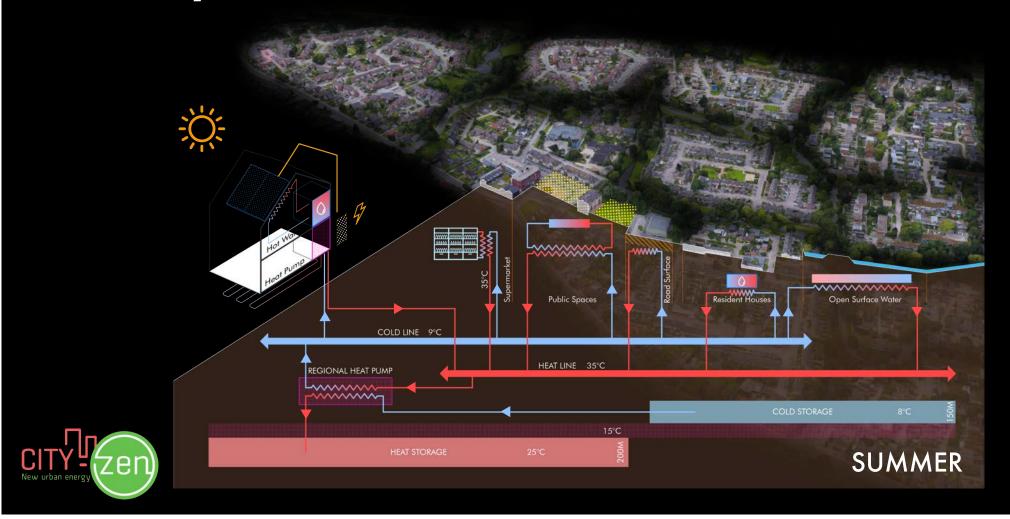




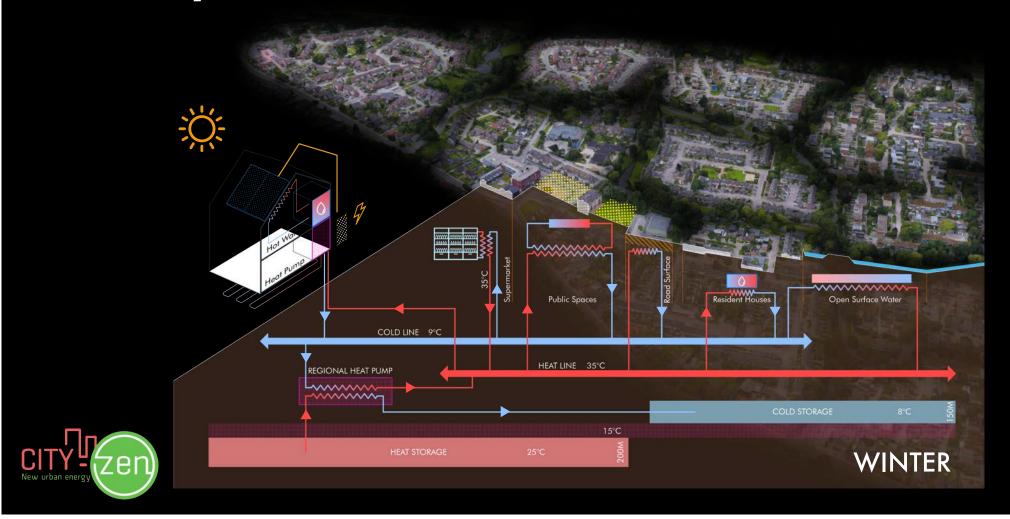
The many sources for a local LT heat mini-network



The many sources for a local LT heat mini-network

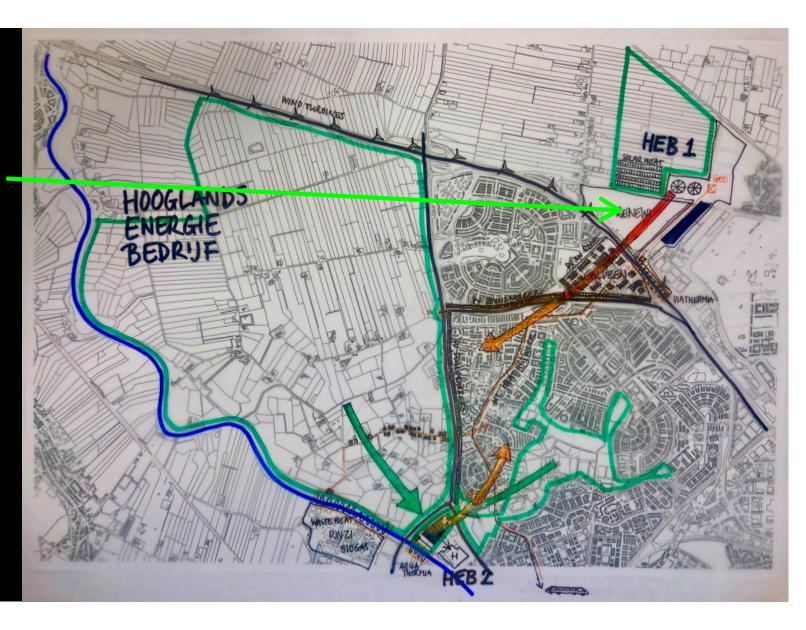


The many sources for a local LT heat mini-network

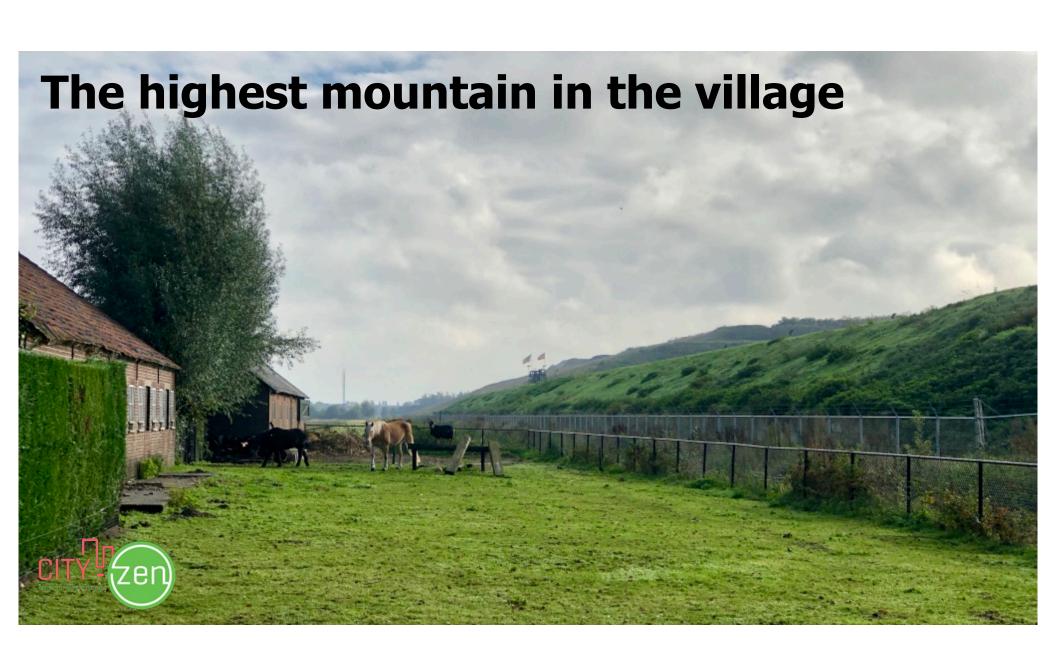


HEB

Geothermal heat Solar heat Biogas from waste -







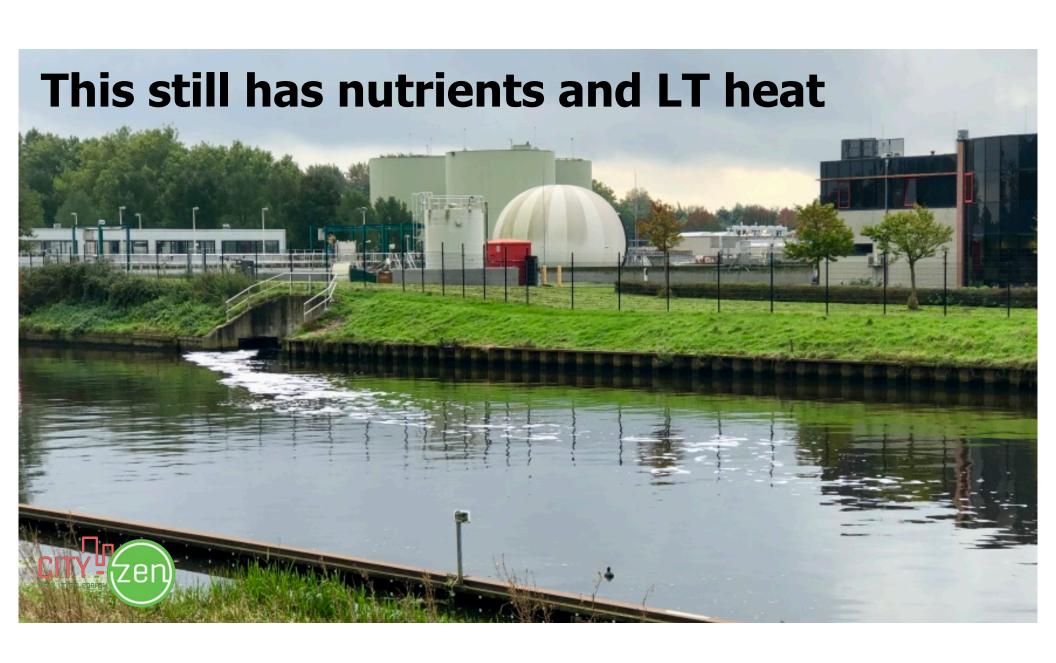


Geothermal heat Solar heat Biogas from waste Waste water heat

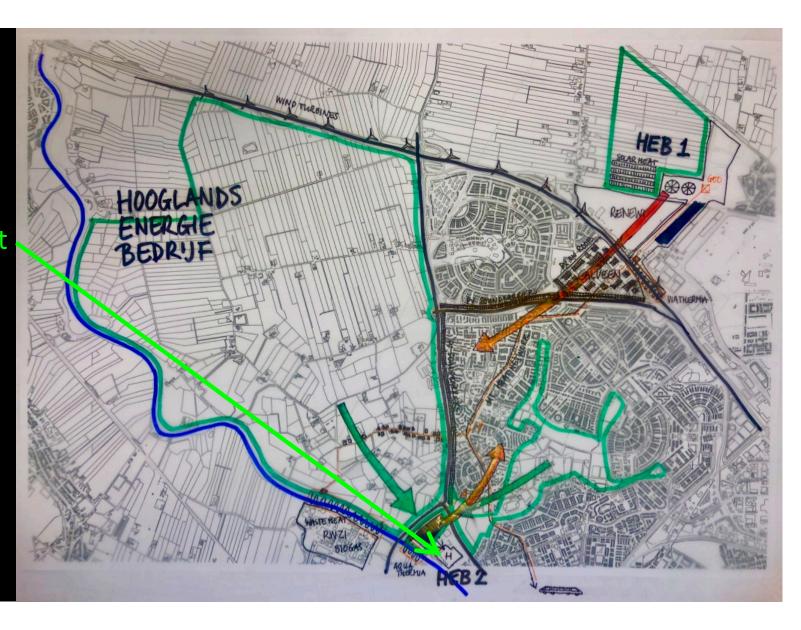








Geothermal heat Solar heat Biogas from waste Waste water heat Hospital waste heat





Geothermal heat
Solar heat
Biogas from waste
Waste water heat
Hospital waste heat
Aquathermia



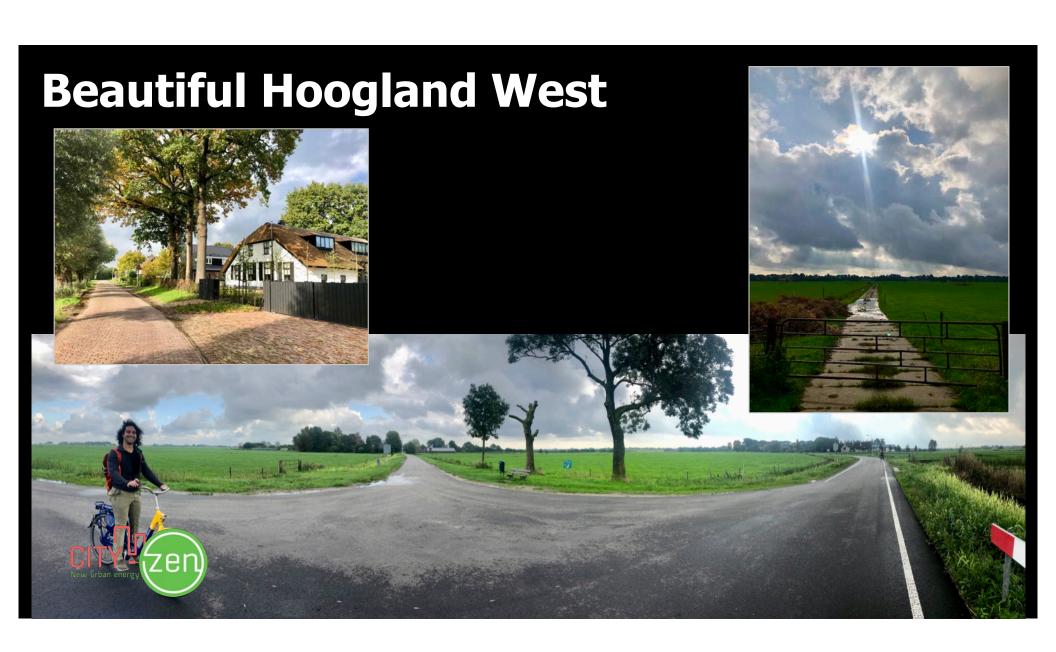




Geothermal heat
Solar heat
Biogas from waste
Waste water heat
Hospital waste heat
Aquathermia
Bio-organic waste









Organic waste from Schothorst Park







Geothermal heat
Solar heat
Biogas from waste
Waste water heat
Hospital waste heat
Aquathermia
Bio-organic waste
Wind turbines





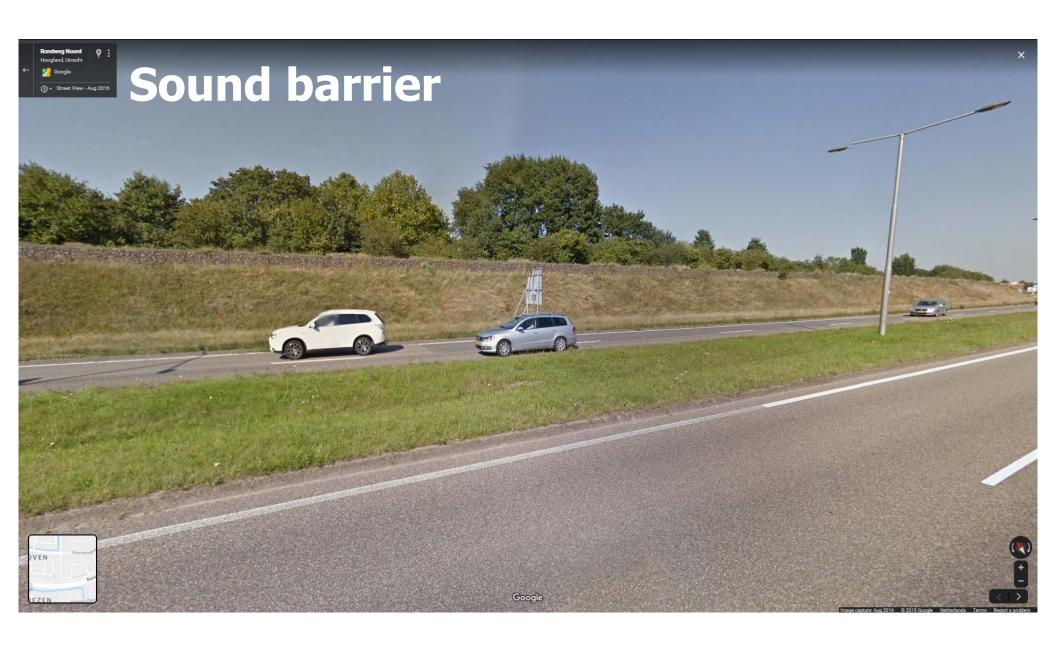




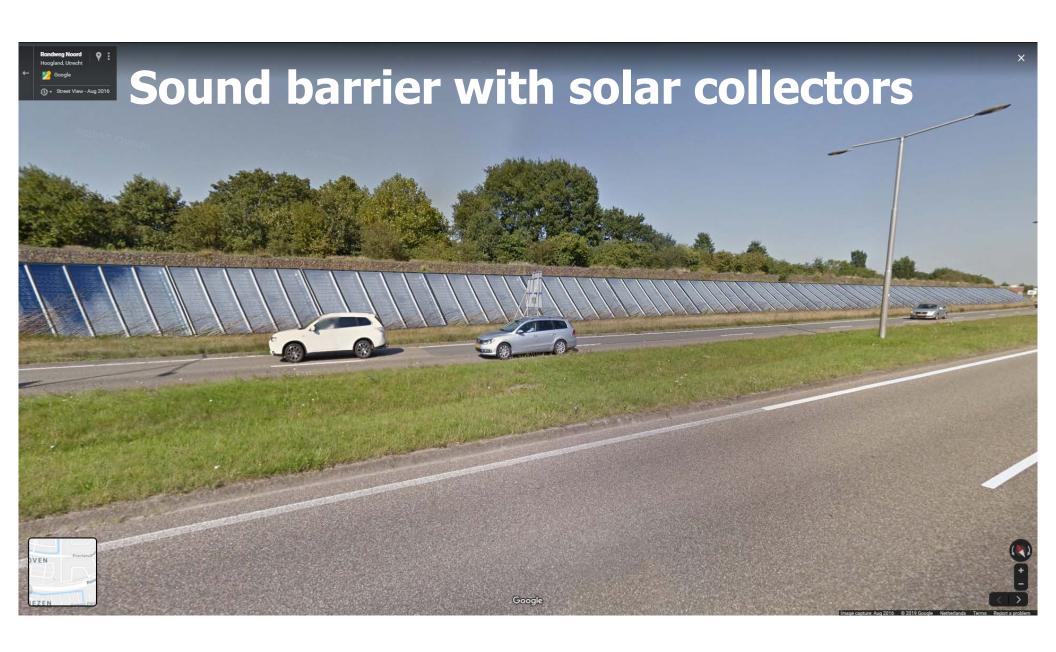
Geothermal heat
Solar heat
Biogas from waste
Waste water heat
Hospital waste heat
Aquathermia
Bio-organic waste
Wind turbines
Photovoltaics



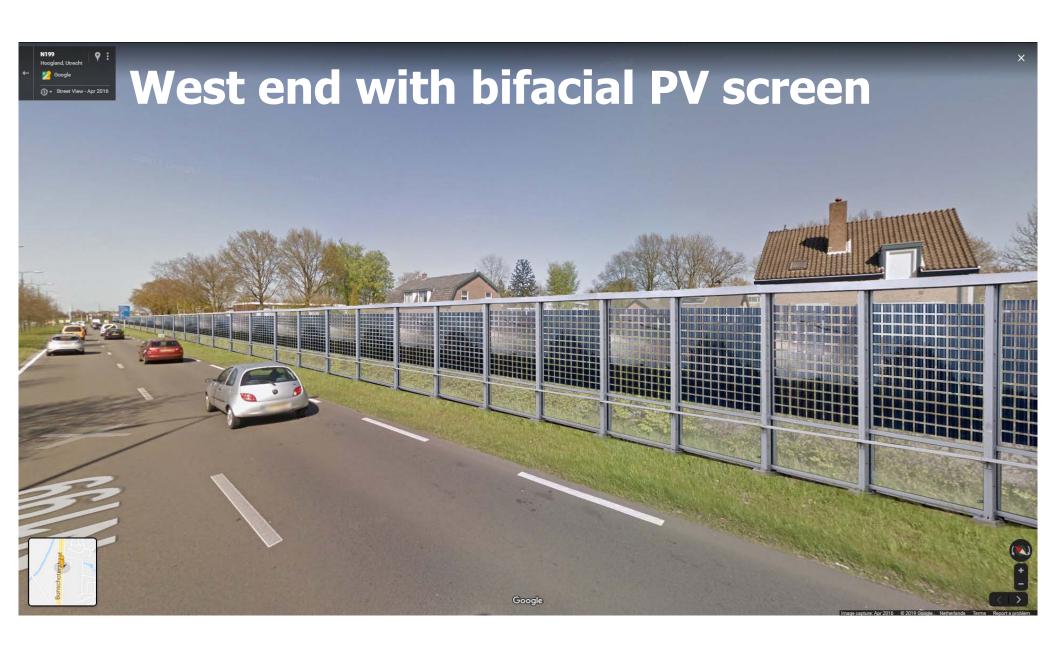


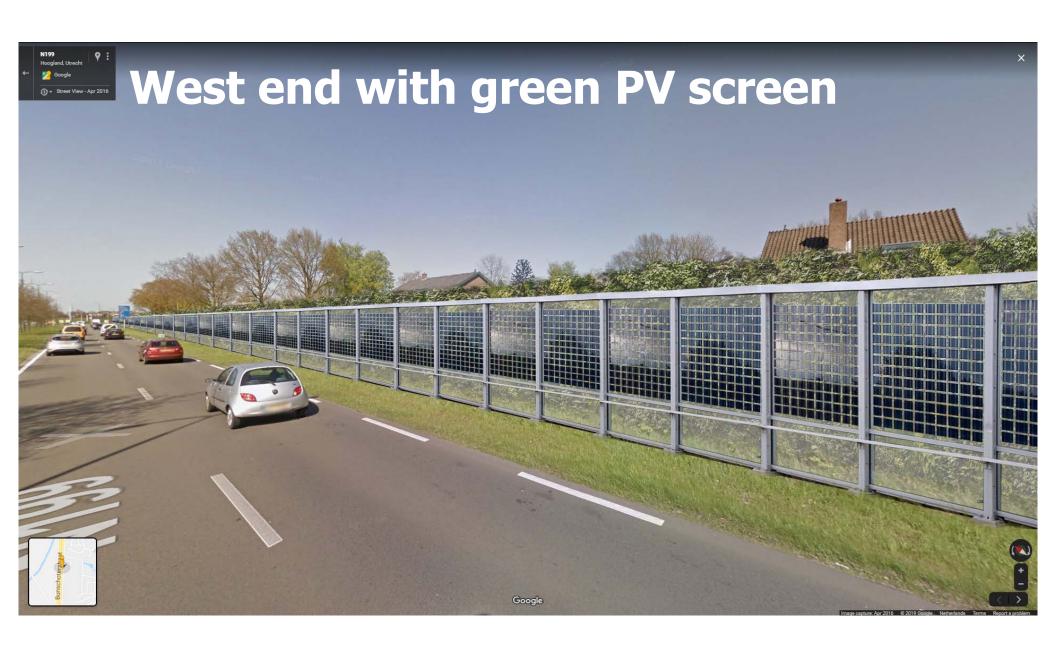












Solar potential









Solutions at the building scale Energy retrofit



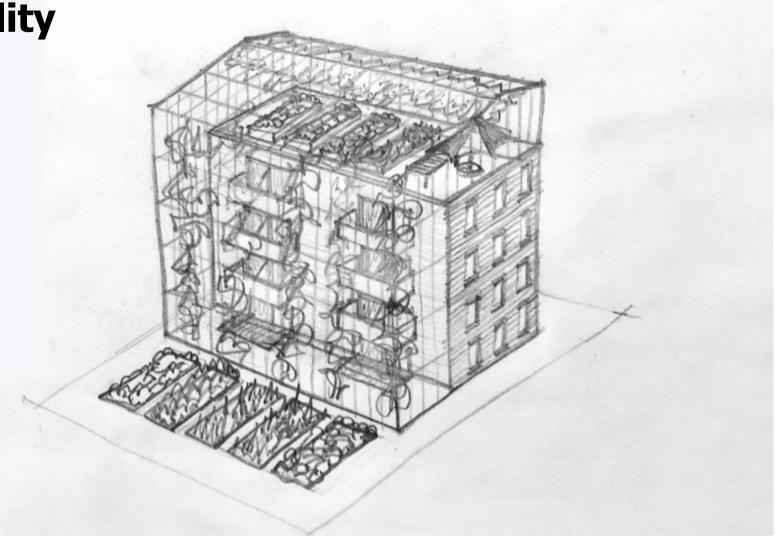
Energy labels





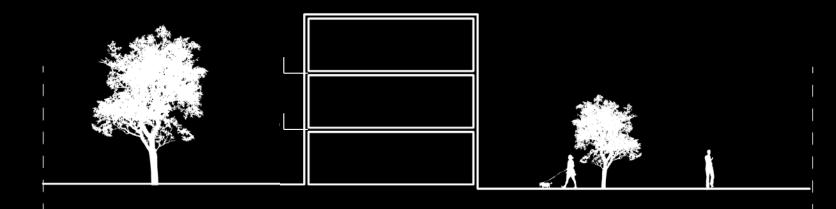


A new quality



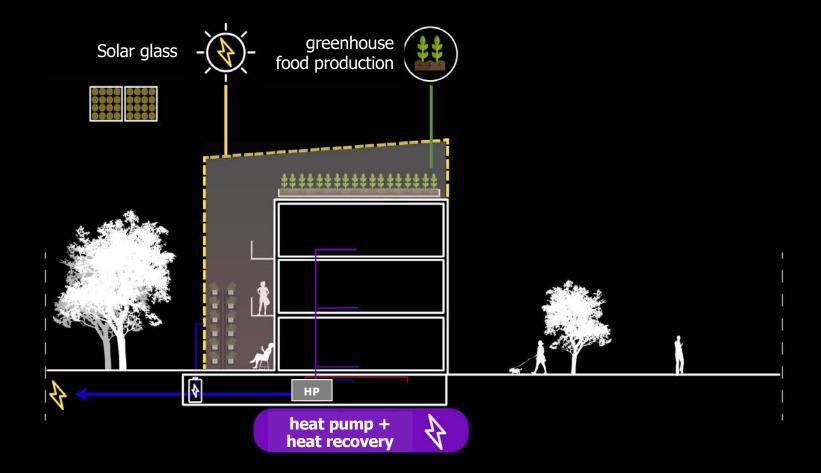


Original situation





Solution







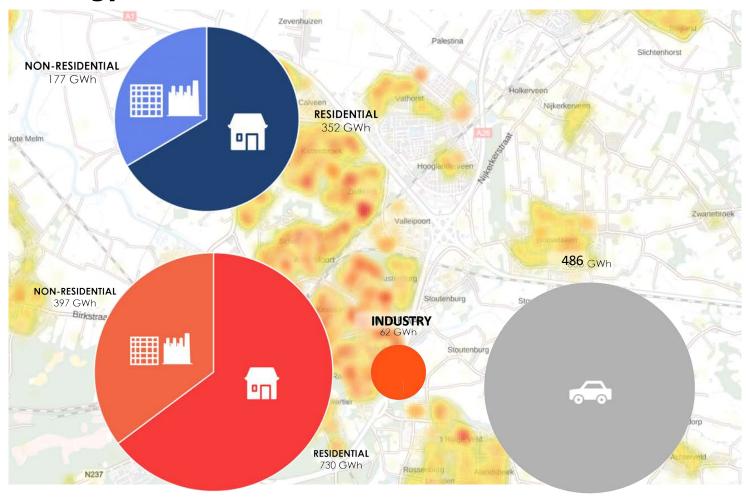




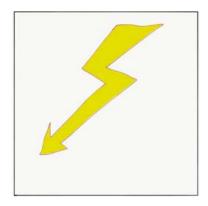




Energy demand Amersfoort 2017



Energy strategy: Siebe Broersma MSc, Technical University, Delft.



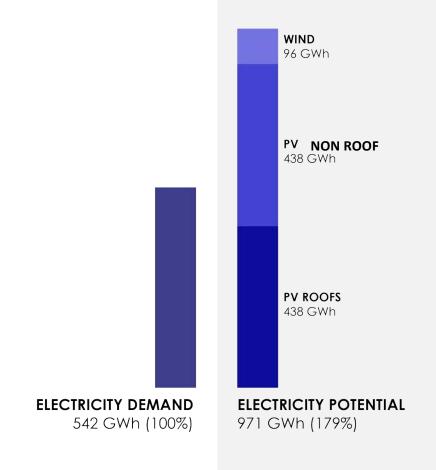
Heat demand 1127 GWh_{th} in 2017 + 62 GWh_{pr} in 2017

Electricity demand 529 GWh_e in 2017

Energy for mobility 486 GWh_e in 2017



Electricity potentials Amersfoort





Space for production

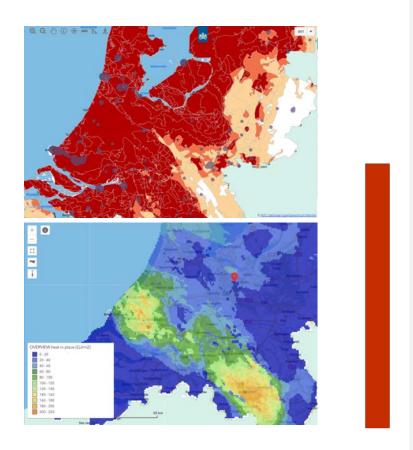
12 wind turbines25% of all roofs (250 ha)

250 ha non-roof



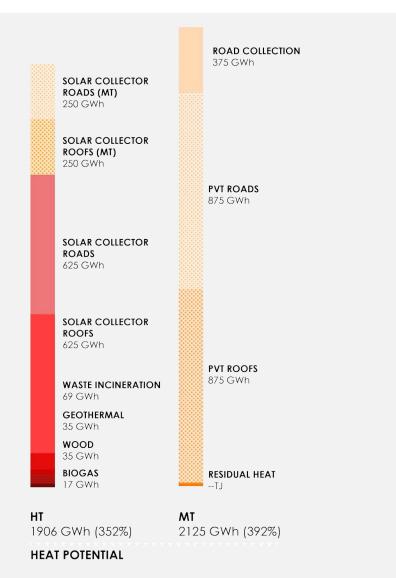
 ${\bf Energy\ strategy:\ Siebe\ Broersma\ MSc, Technical\ University,\ Delft.}$

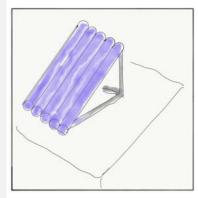
Heat potentials Amersfoort



HEAT DEMAND 1190 GWh (100%)

Energy strategy: Siebe Broersma MSc, Technical University, Delft.





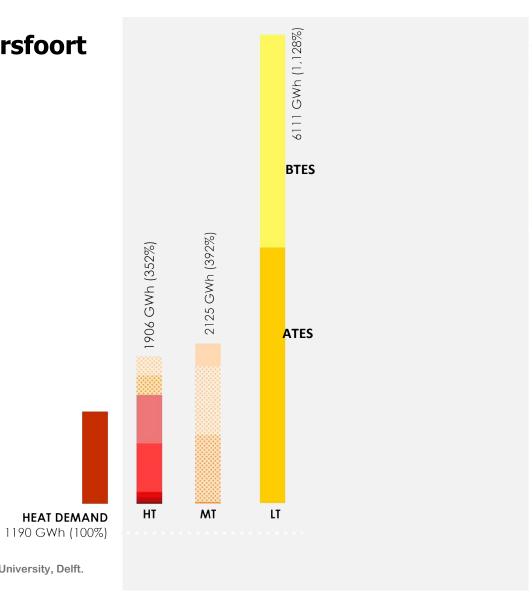
Temperature levels

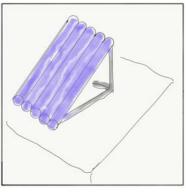
High-T for district heat network (DHN)

Mid-T often energy renovation is needed



Heat potentials Amersfoort





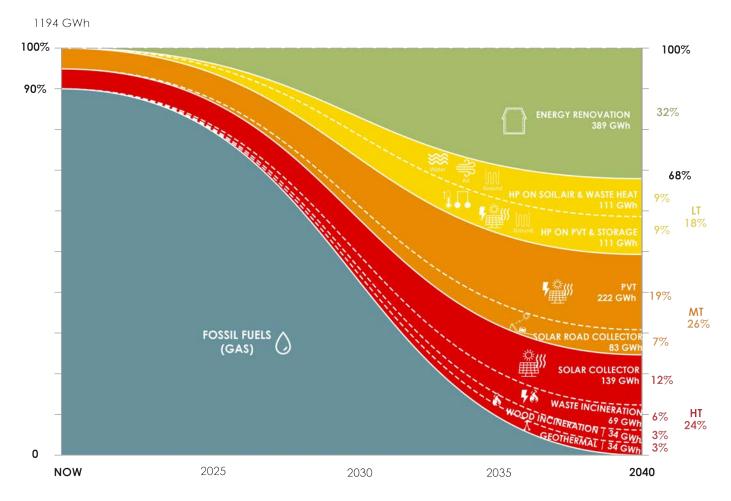
Temperature levels

Low-temperature Often in combination with heat pumps



 ${\bf Energy\ strategy:\ Siebe\ Broersma\ MSc, Technical\ University,\ Delft.}$

Heat balance scenario 2040



Energy strategy: Siebe Broersma MSc, Technical University, Delft.



Temperature levels

32% reduction

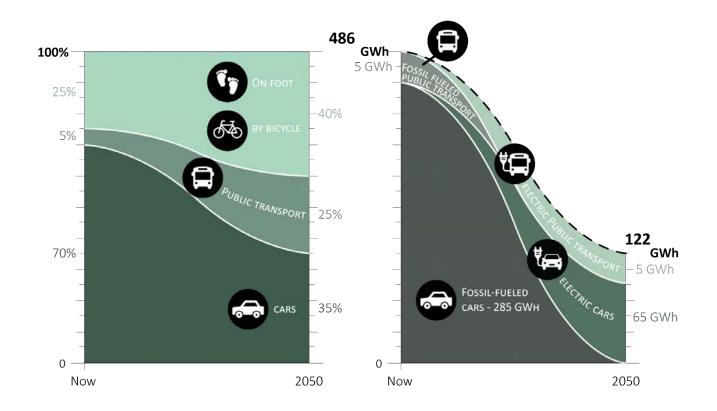
24% High-T for DHN

26% Mid-T

18% Low-T



Sustainable transport scenario





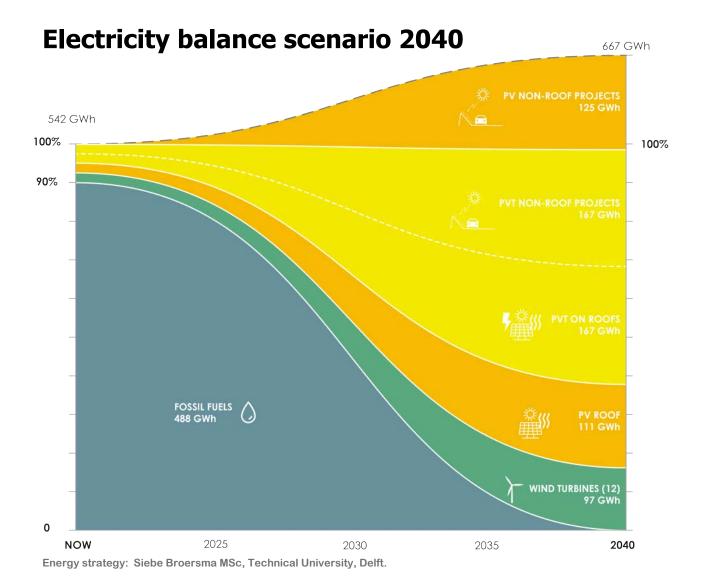
Main directions

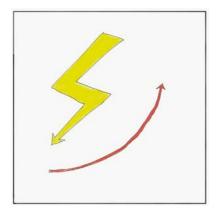
Modal shift

Electrification



Energy strategy: Siebe Broersma MSc, Technical University, Delft.





Production of power

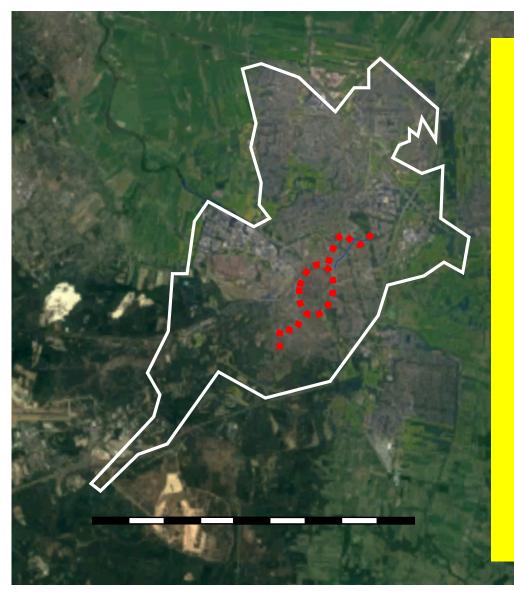
12 4MW Wind Turbines

20% of roof use

250 ha non-roof projects

Also co-generation (biomass + waste incineration)





Collective Heating HT

Build a collective **High-temperature (HT) District Heat Network**

for the city centre and other historic/old buildings

with 20,000 (res. eq.) connections;

1000 connections per year





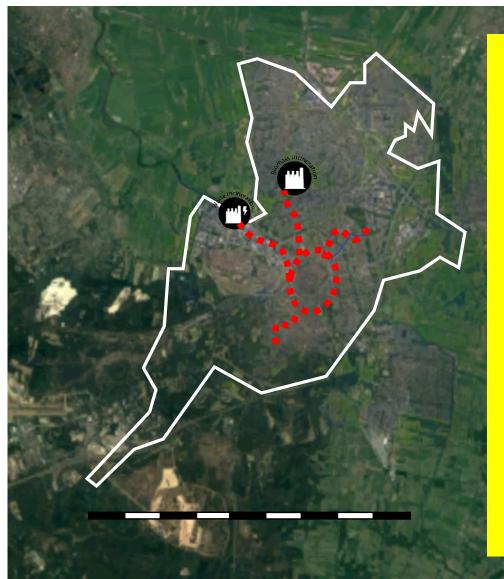
Biomass Heat and Power plant

Connect a biomass power plants to heat grid;

Based on the local waste wood only (35 GWh/yr)





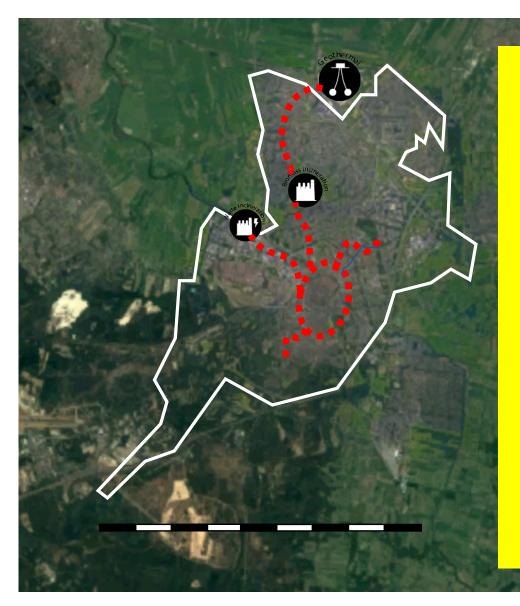


Waste incineration plant

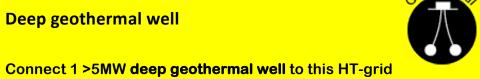
Connect 1 (small) waste incineration plant to this grid

Based on the 10% of local non-recyclable waste
70 GWh/yr



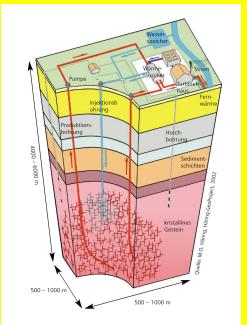


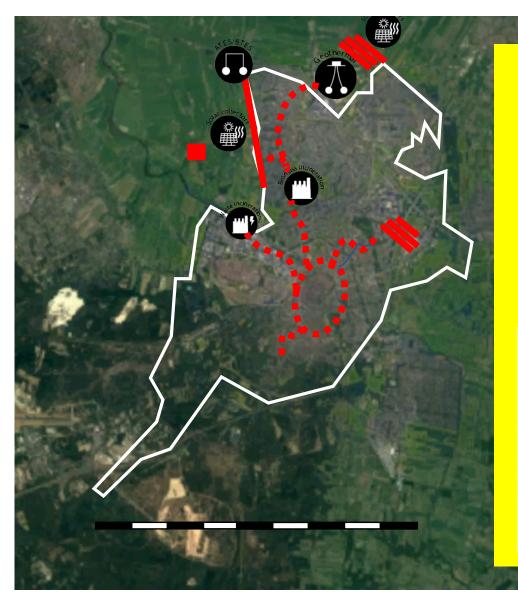
Deep geothermal well



Nord of Amersfoort

35 GWh/yr





Solar collector parks

Install 56 ha of solar collectors in non-roof project (along roads, the highway, railways, etc.) and connect to the HT-grid

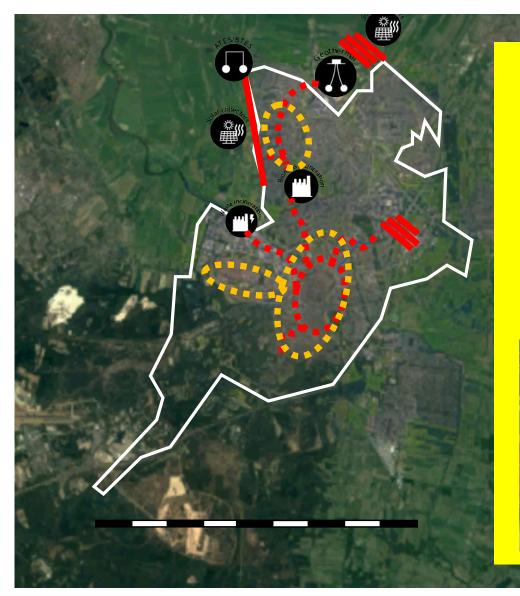
2,5 ha/yr = 17.000 modules

Facilitate 80 GWh of **HT/MT seasonal storage** in deep ATES systems

8 ATES wells/yr



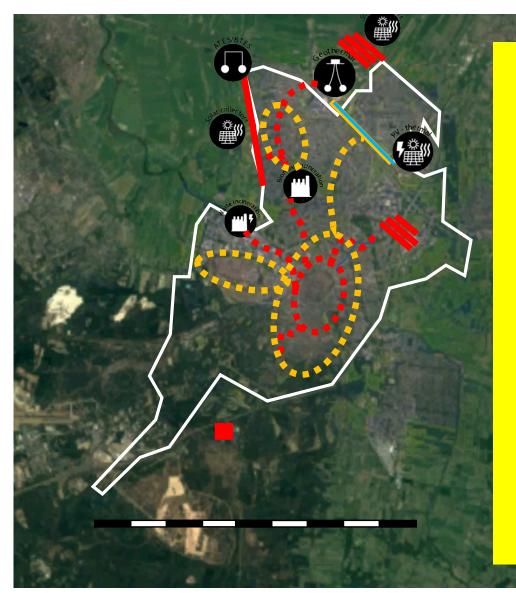




Collective Heating MT

Construct mid-temperature DHN with 18,000 connections around the city centre – Soesterkwartier - Hoogland this is also connected in a cascaded way to the HT net For DHW boosters are required





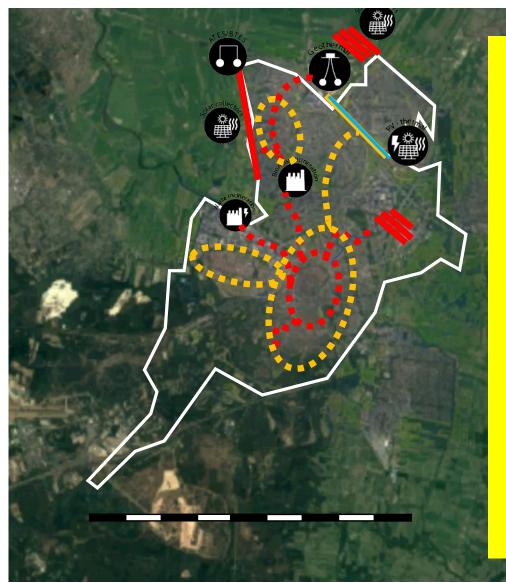
PV- Thermal parks

Install 48 ha of **PV-Thermal parks** and connect to the MT heat grid or to individual projects.

along the highway and other roads

15,000 modules/yr



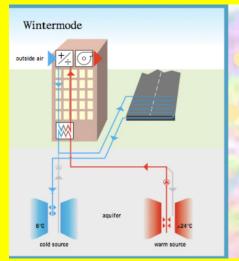


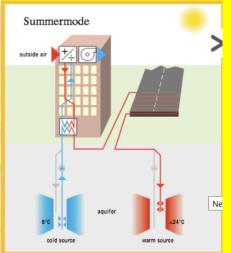
Road Solar Collectors + storage

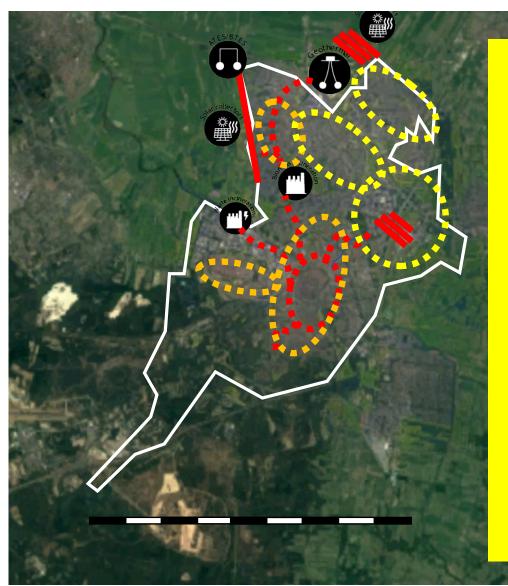


Integrate **road solar collectors** in 28 ha of asphalt (1.5 ha/yr = 1km)

Facilitate 165 GWh of mid-temp seasonal storage capacity in ATES, BTES or tanks in/below buildings (15 ATES/BTES/yr)







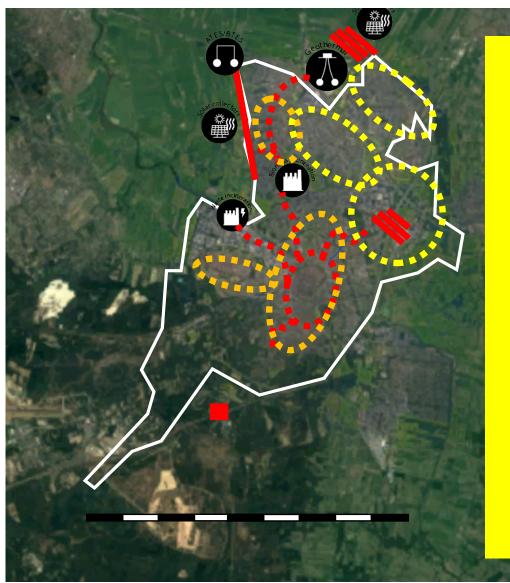
Collective Heating LT



Construct **low-temperature** heat grids for 15,000 res.eq. connections

connect 750 residential equivalents per year





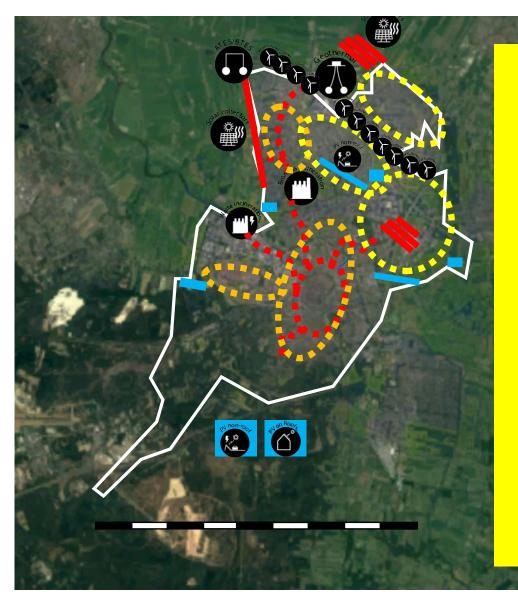
PVT on roofs



15,000 modules/yr)

connect these to the LT and MT heat grids





Renewable electricity production

Install 12x 4MW wind turbines a.s.a.p. along the A1

Install 135 ha op PV modules on roofs

And 135 ha's of PV modules in parks, along roads, railways on noise barriers and above bicycle lanes

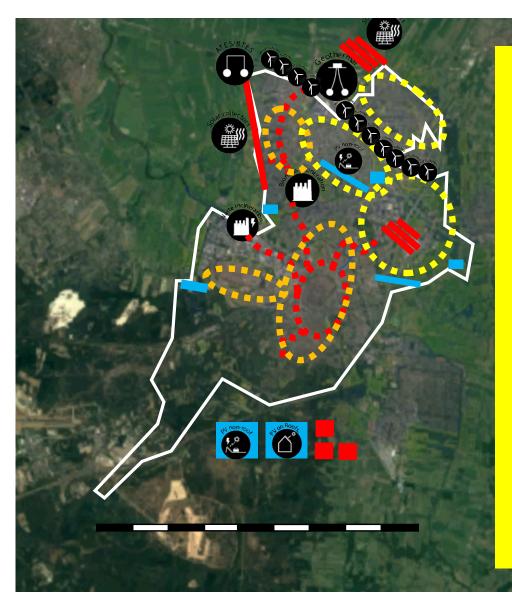
120,000 modules a year (160 per working day)









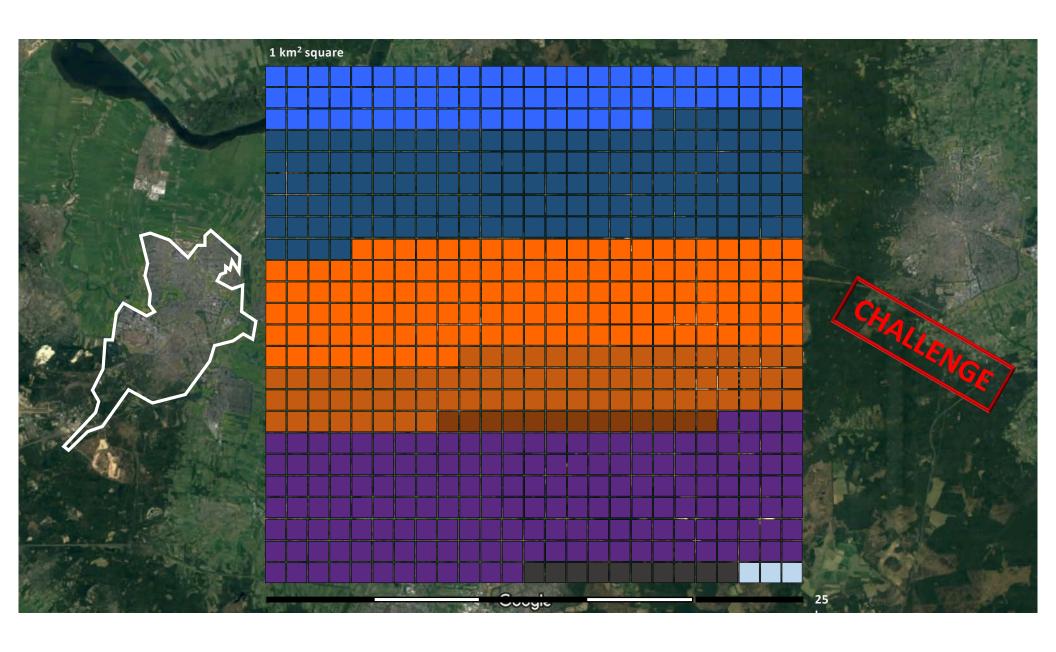


All electric buildings

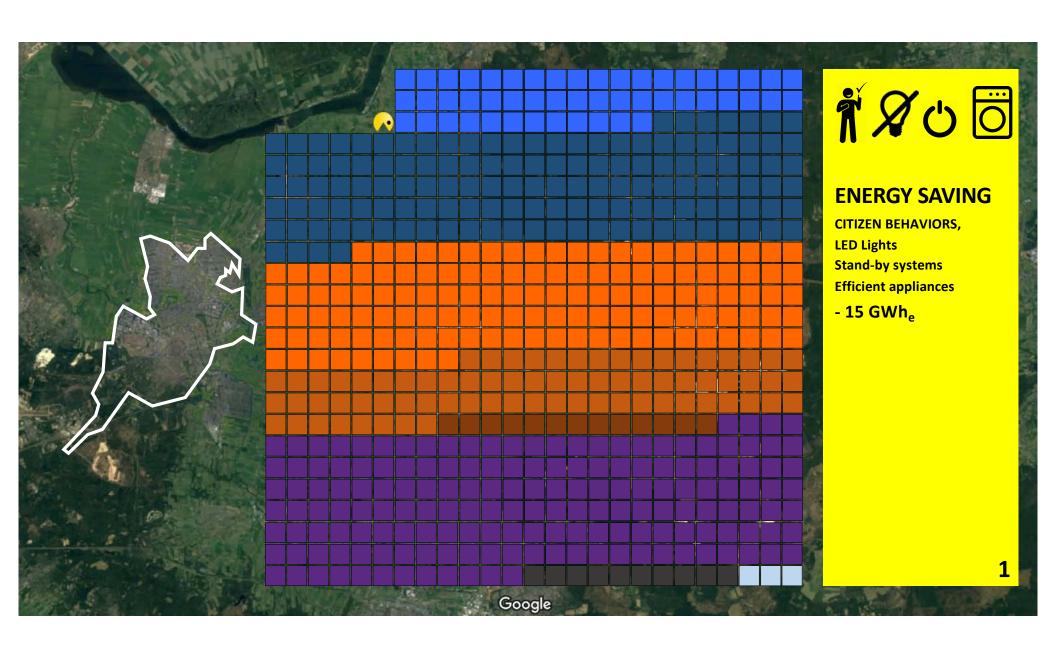
40,000 res. eq. will individually become all electric with the help of heat pumps and the described energy renovations and installed PV

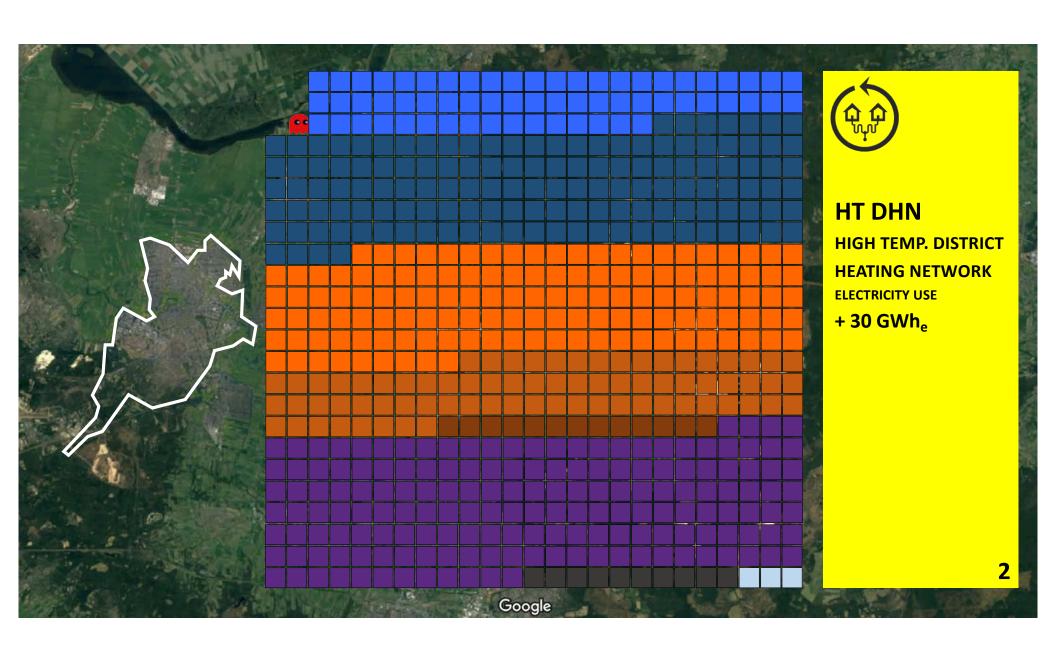
150,000 modules a year = 600 per day (1 for 250 persons)



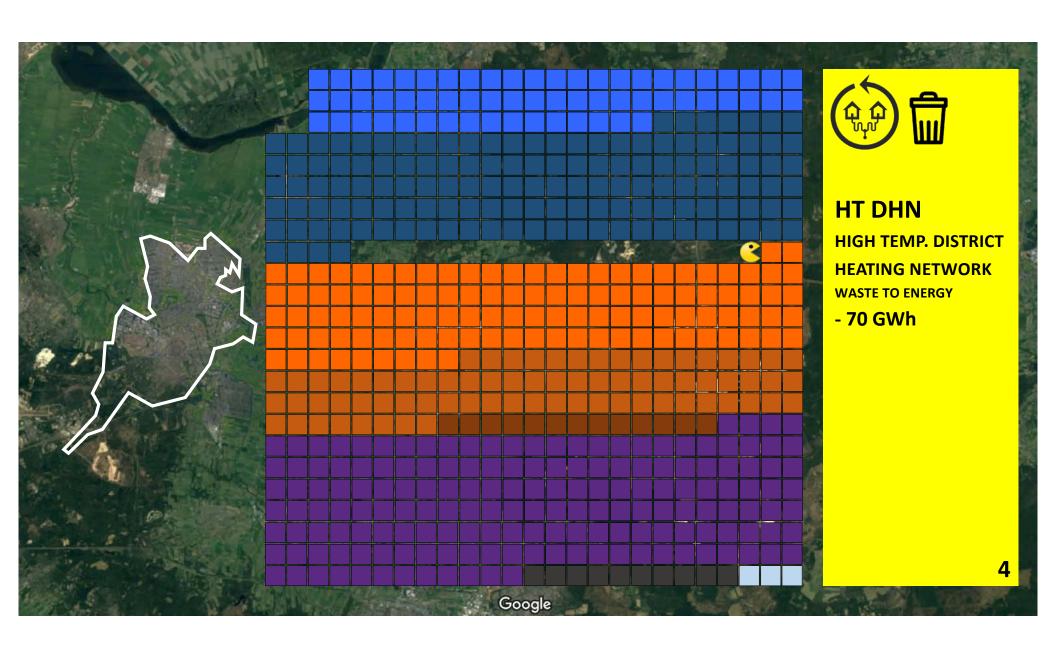




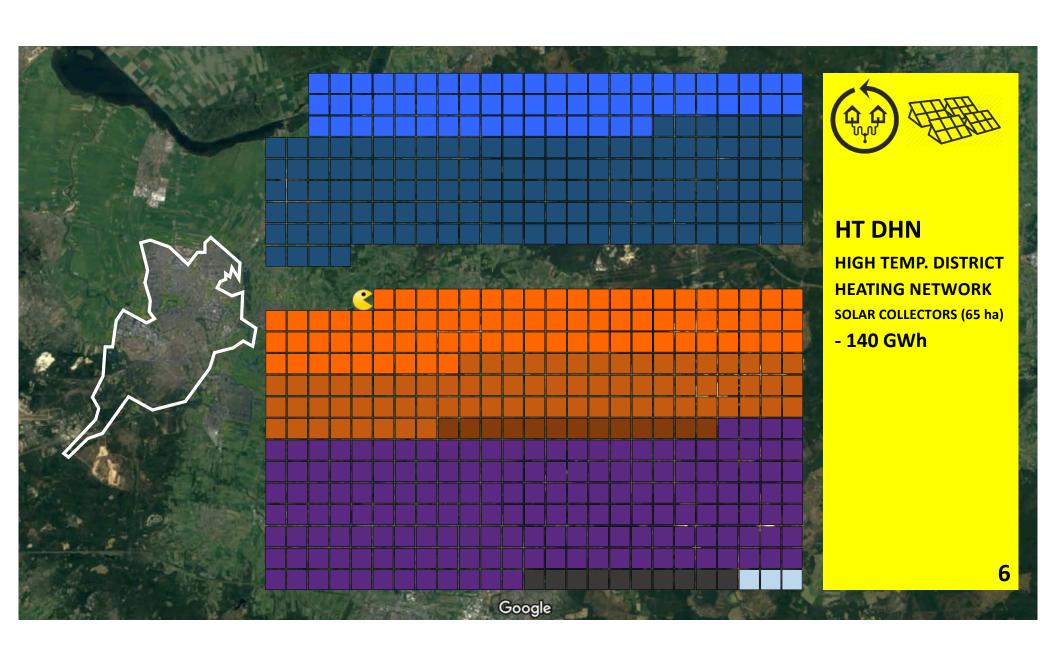


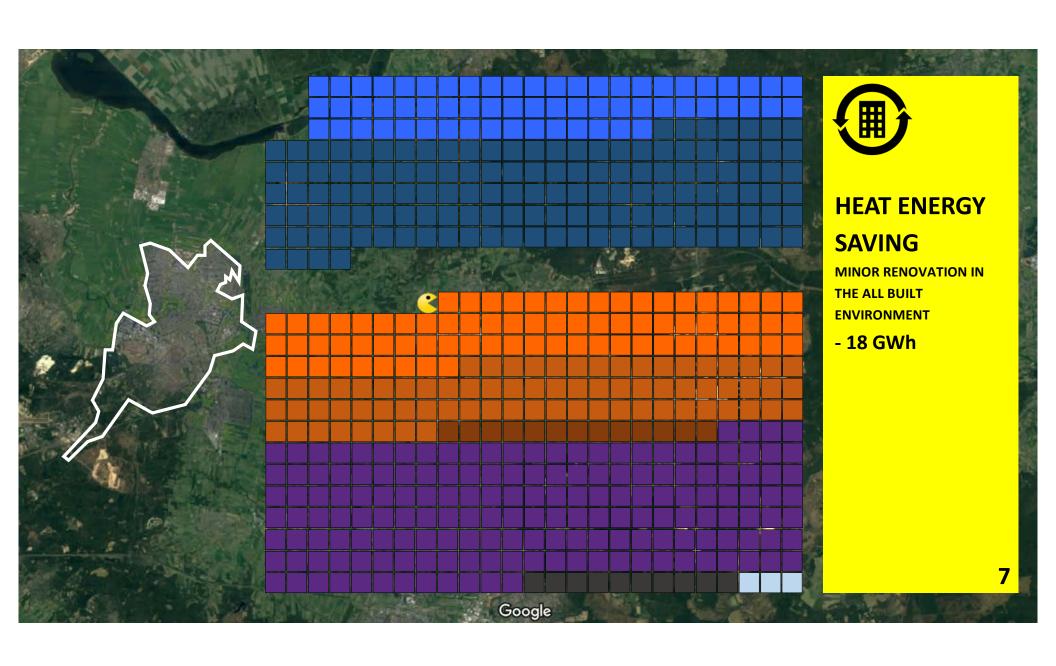


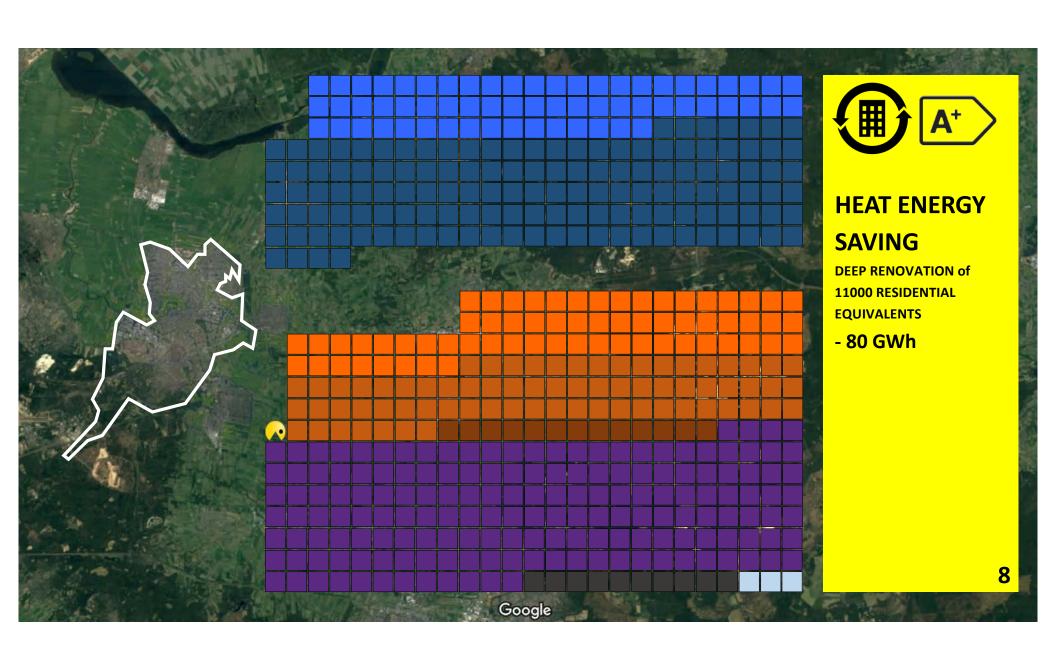




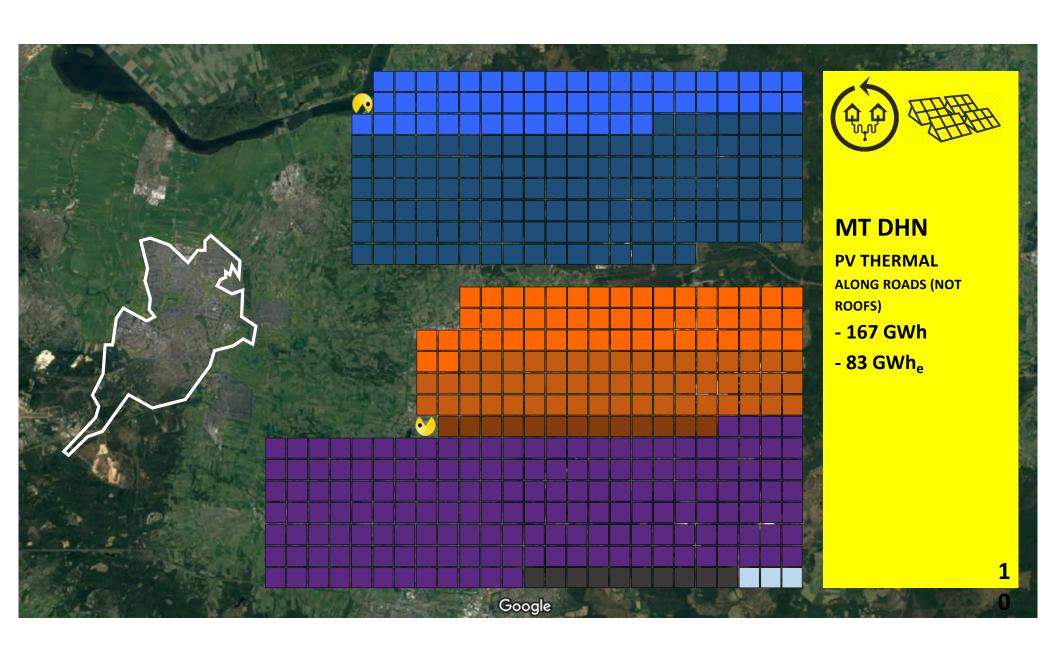


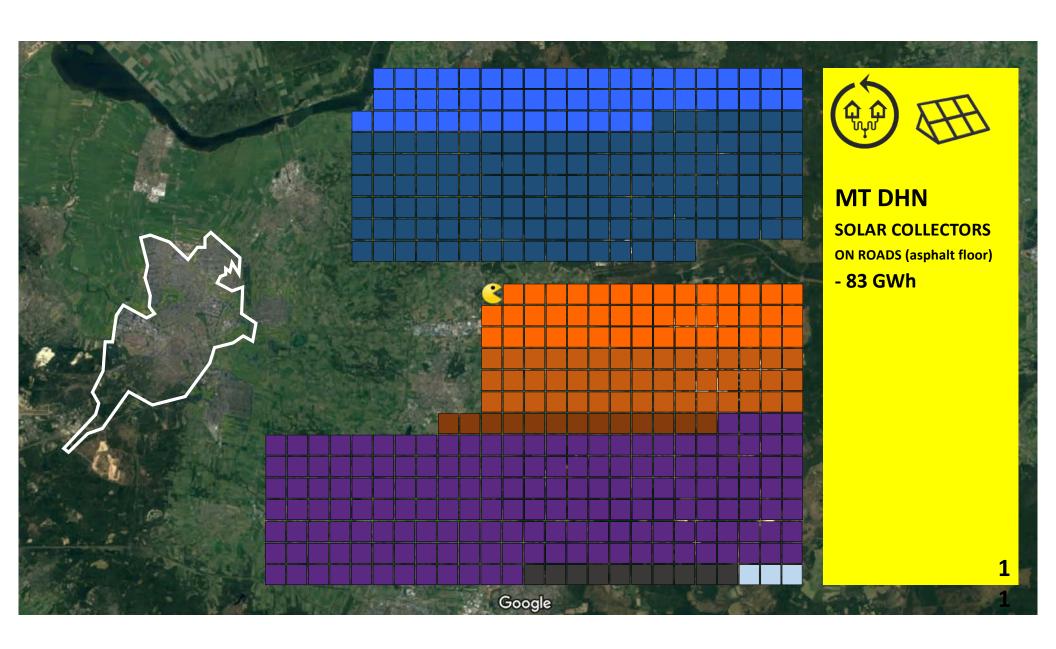


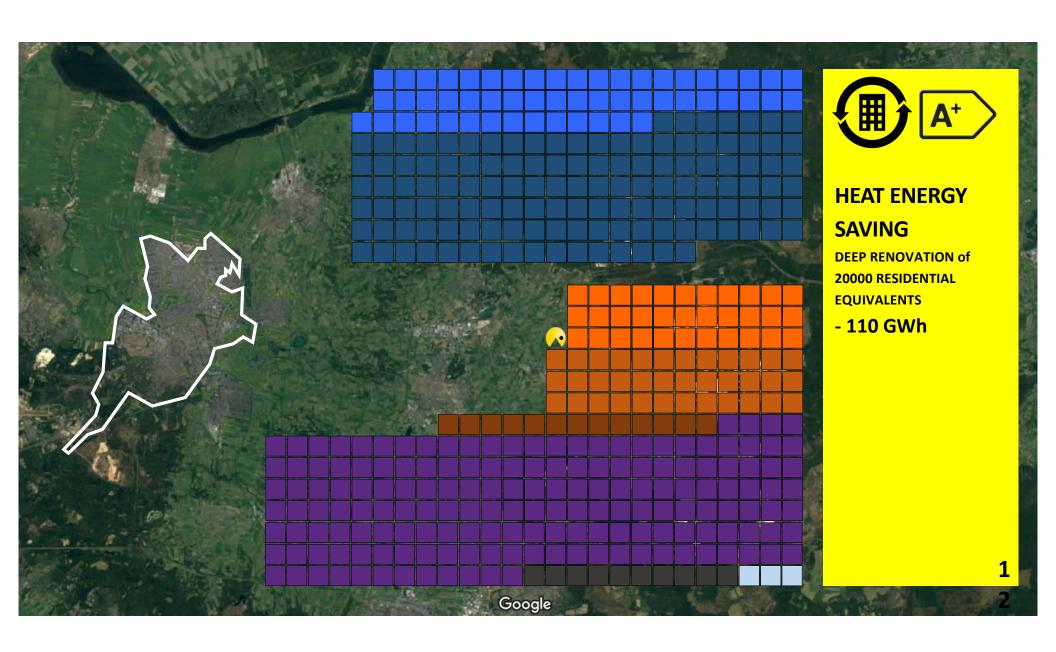


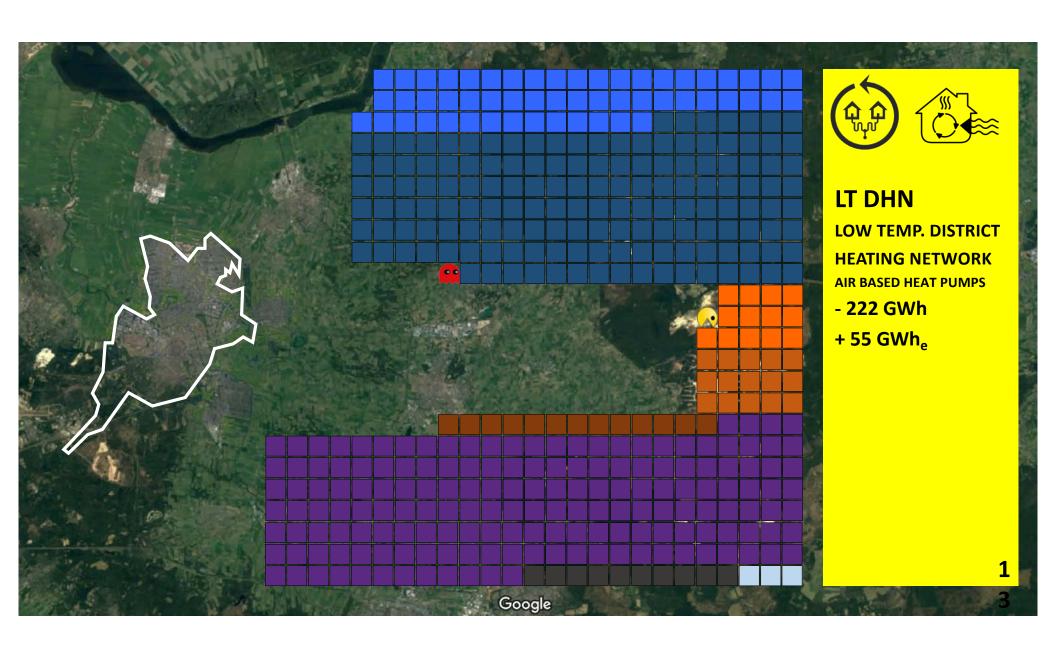


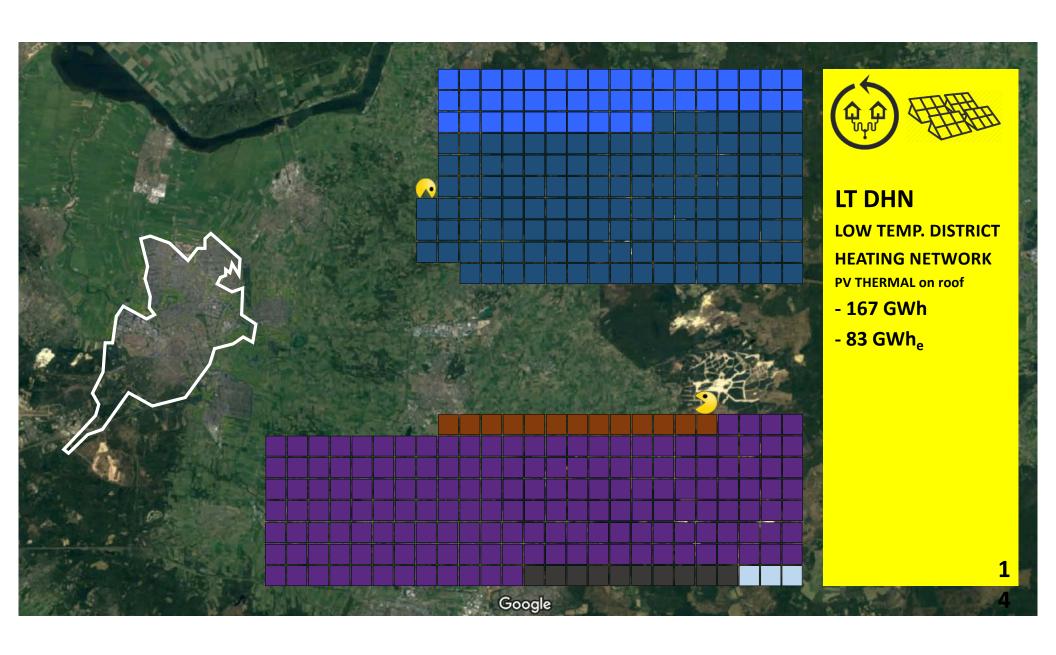


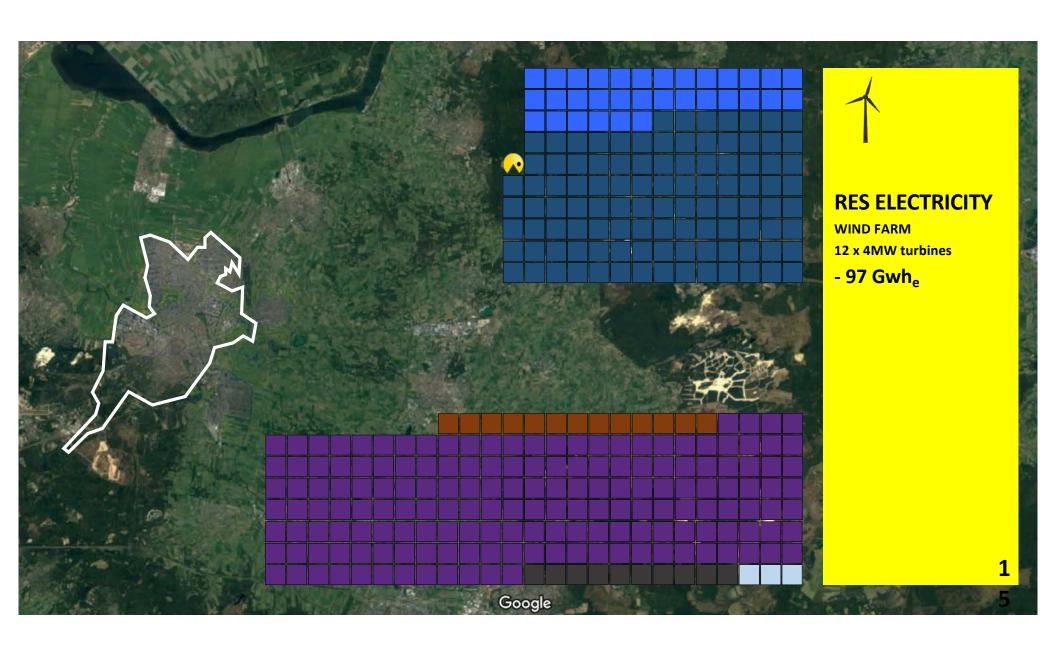


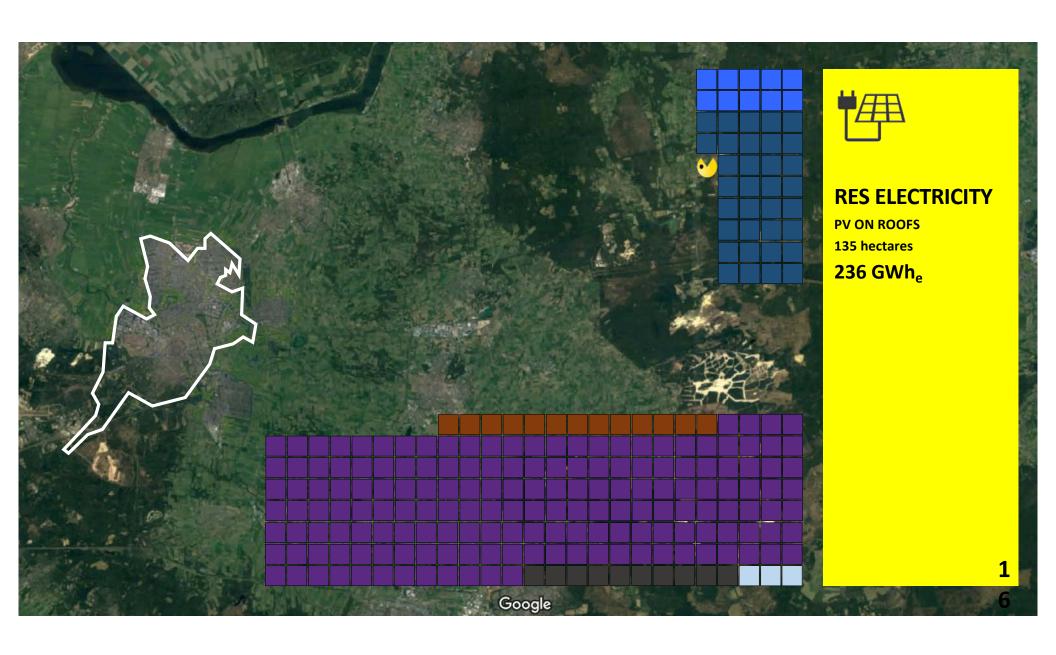


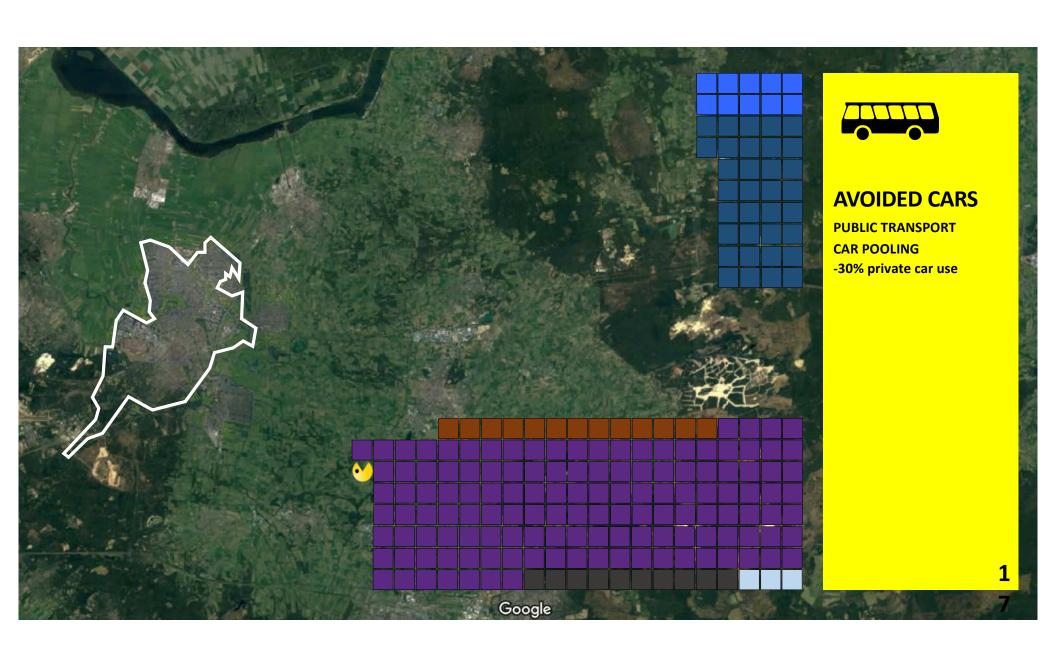


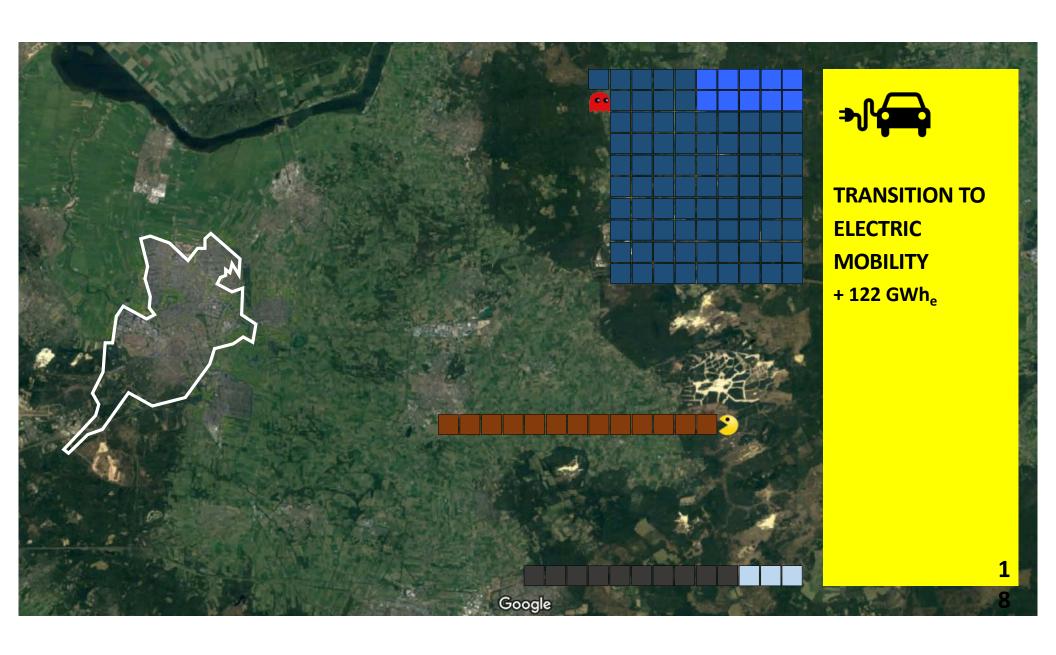




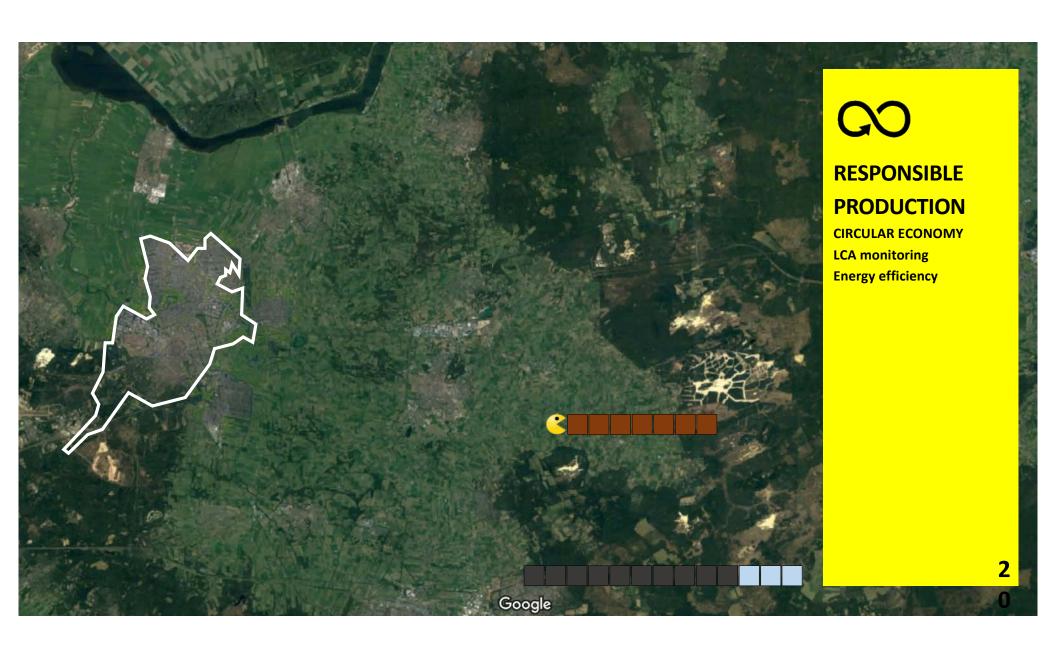




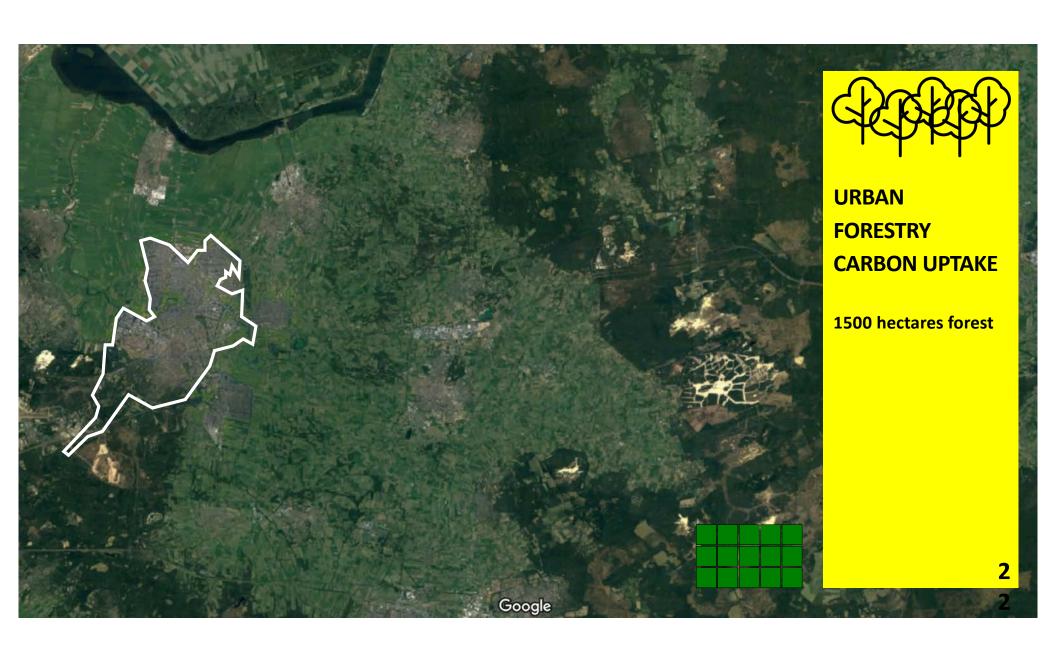




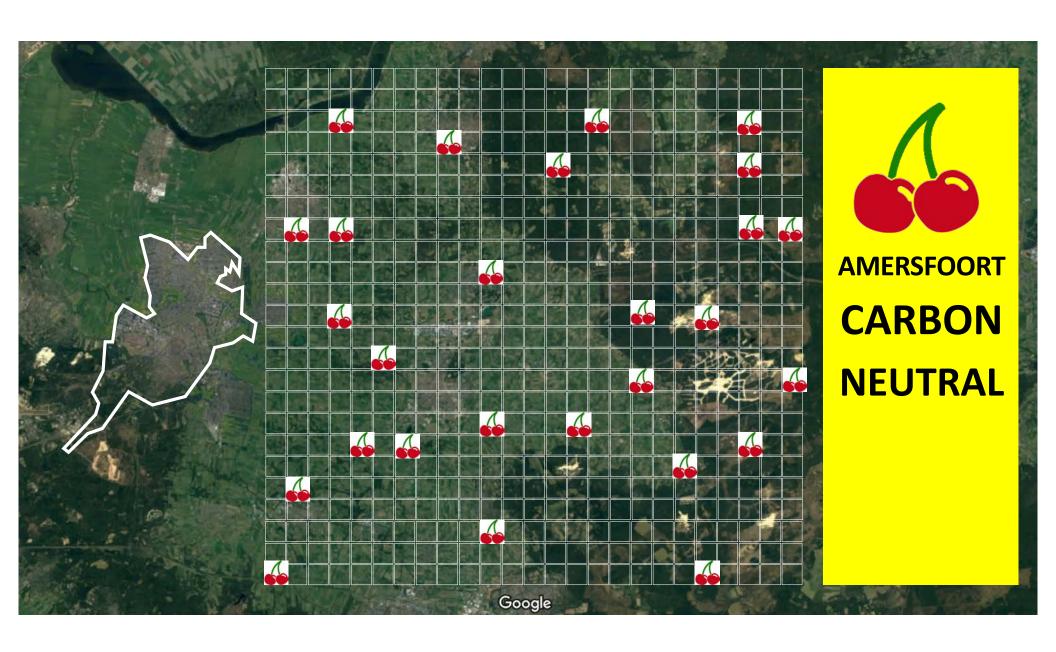














Greg Keeffe CityZEN Strategy Binnenstad







Urban Design: City team

Greg Keeffe Professor of Architecture + Urbanise
Dr Andy Jenkins. Research Fellow



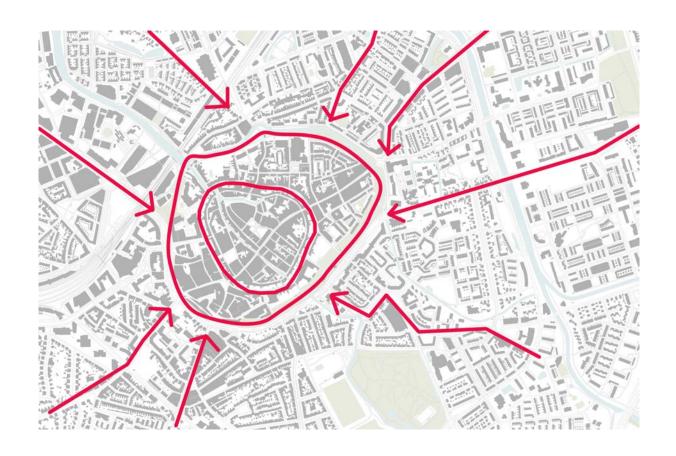
Siebe Boersma Javier Montemayor Research Fellow

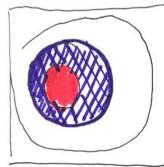
Masters Student

Think E

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Anneleen Vanderlinden

Urban Design: Macro Context: city form

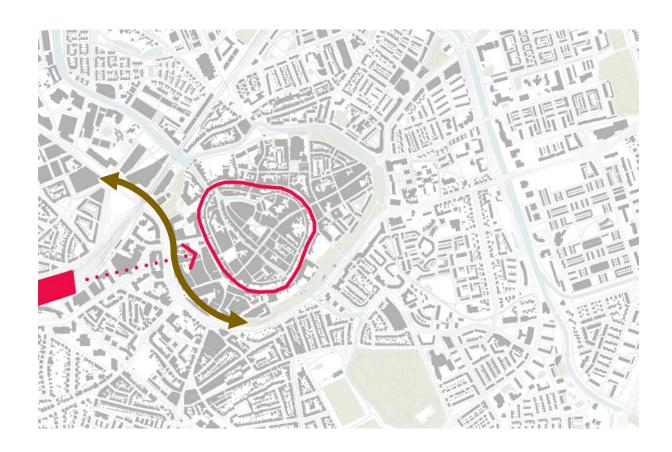


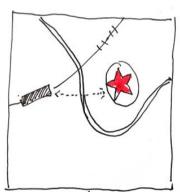


DEFENSIVE RINGS



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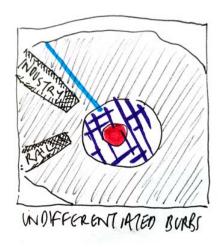


POOR ARRIVAL.

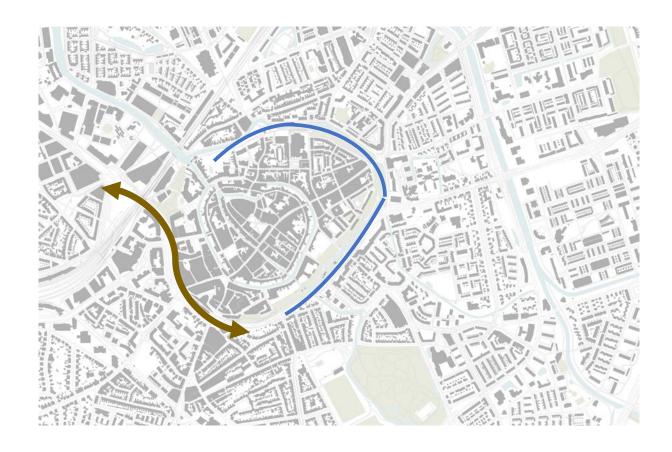


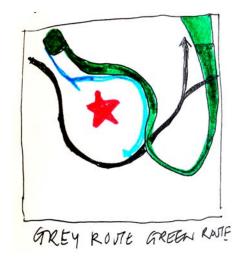
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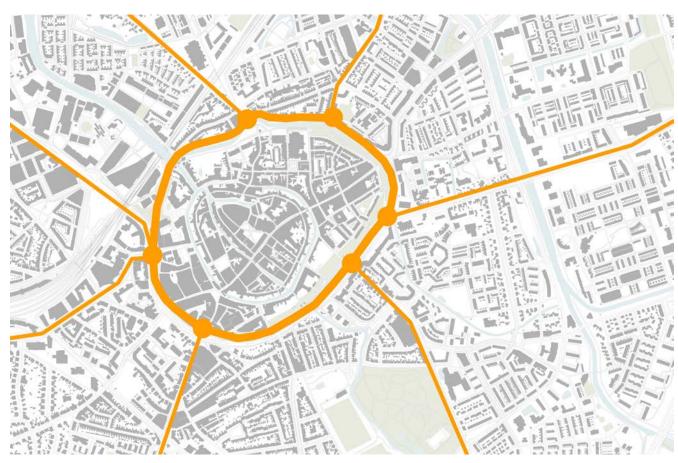


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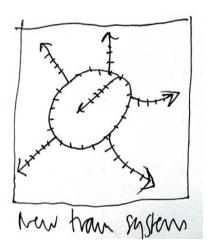




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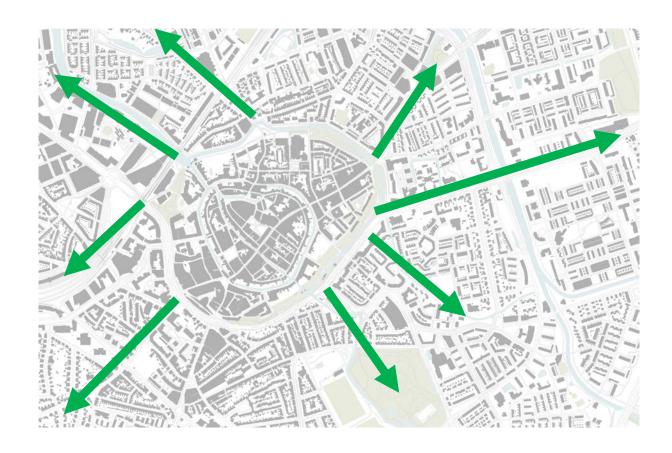
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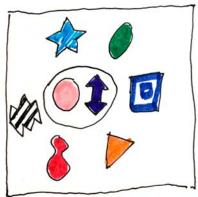


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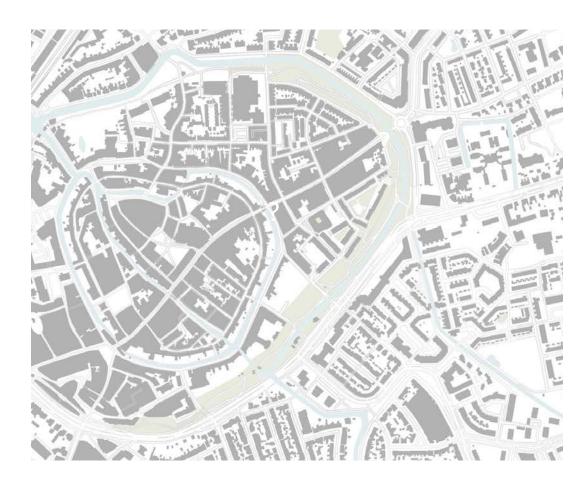




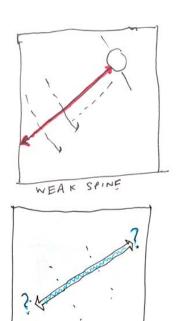


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Urban Design: Neighbourhood Context, Binnenstad



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No beginning, no end

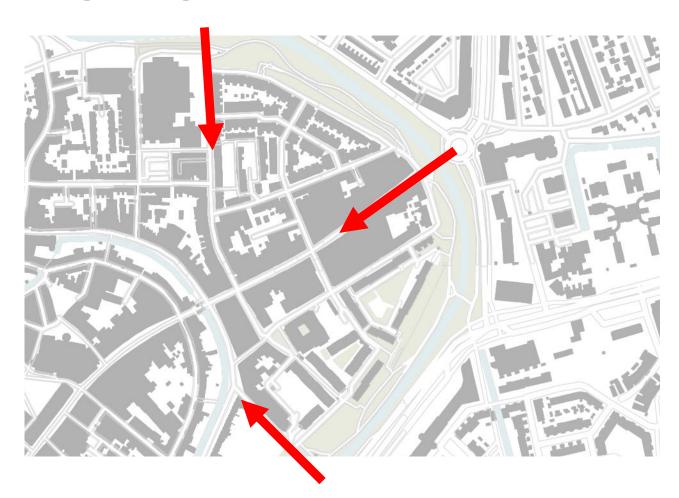
Urban Design: Neighbourhood Context

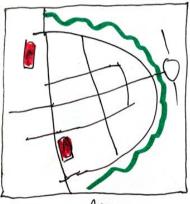




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Urban Design: Neighbourhood Context





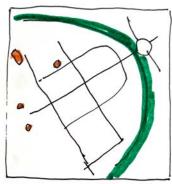
CAR SCAPE



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Urban Design: Context





FEW LANDMARKS

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Urban Design: Issues







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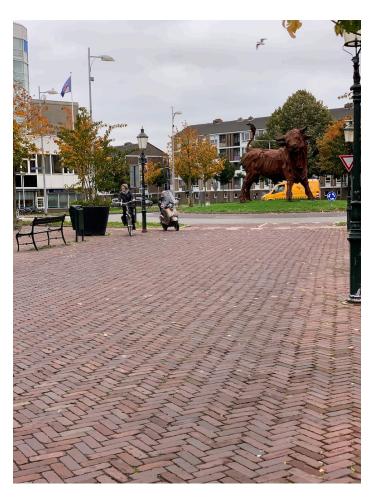
Urban Design: Issues





Urban Design: Issues







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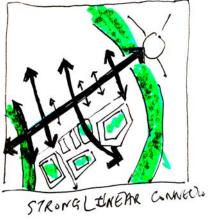


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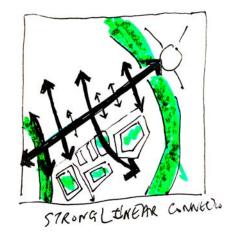




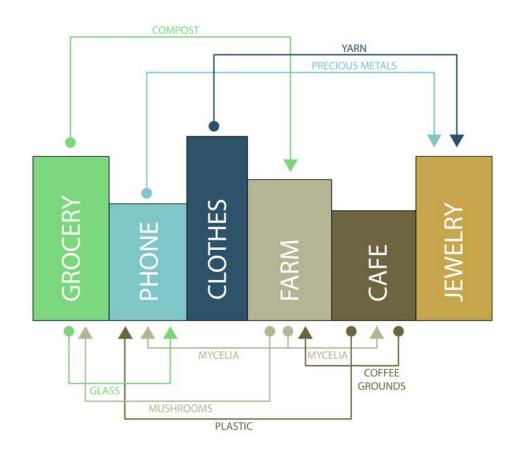
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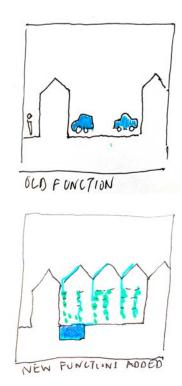




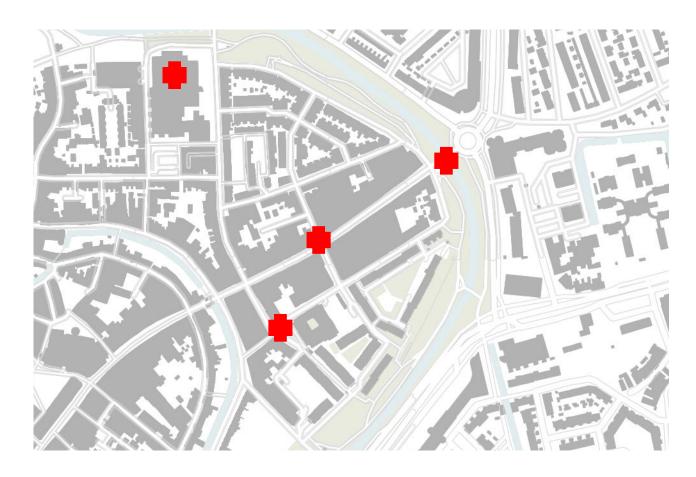


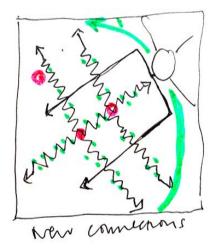
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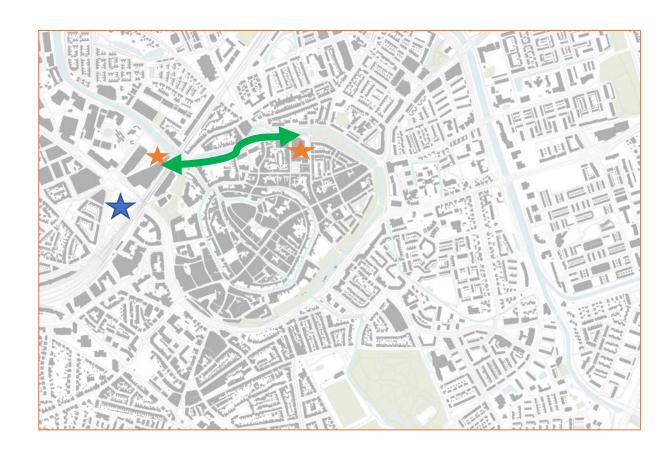


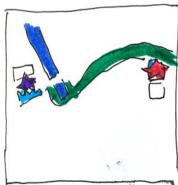
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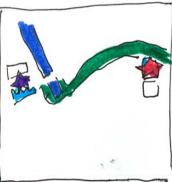


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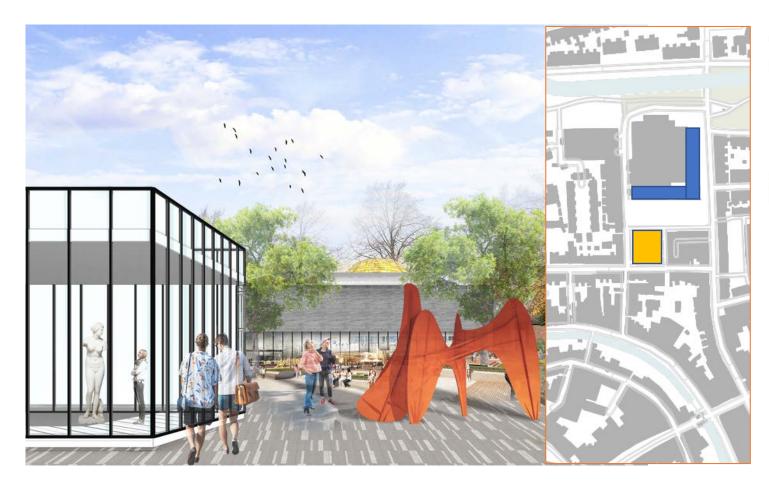
Urban Design: Macro solutions

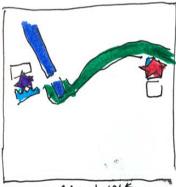




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Urban Design: Macro solutions



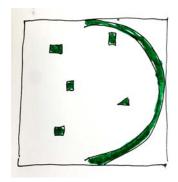


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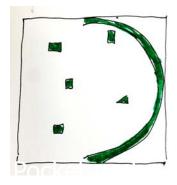


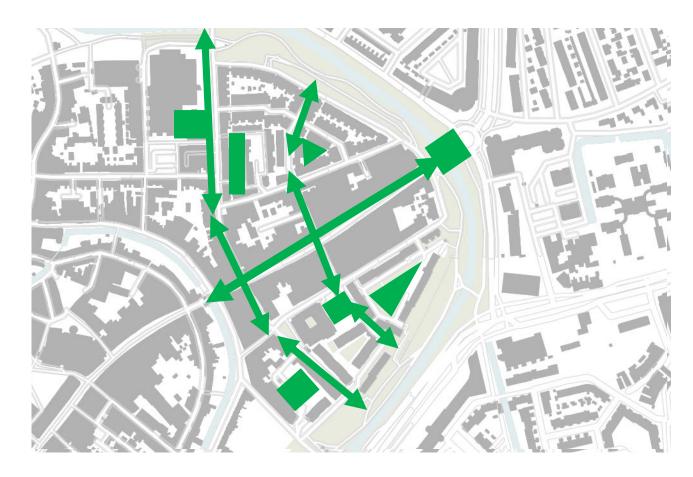


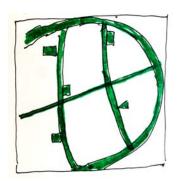


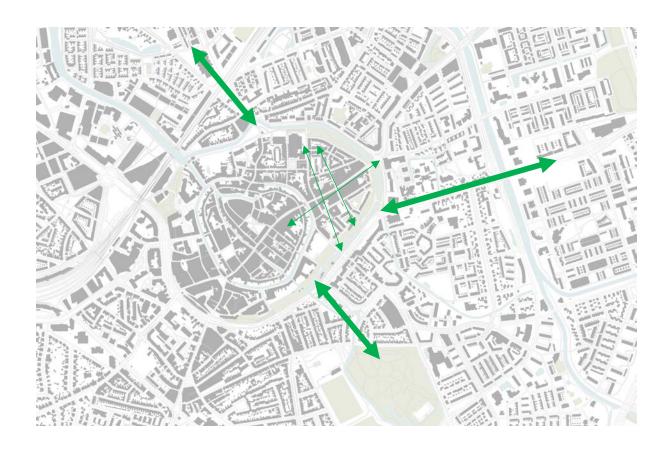


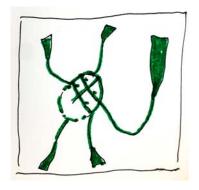








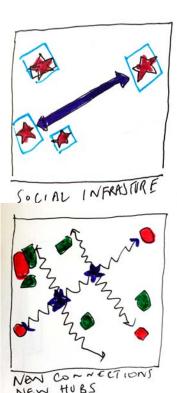




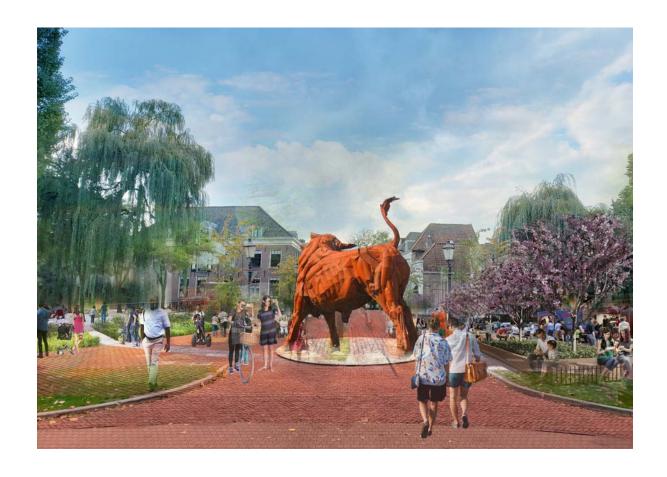


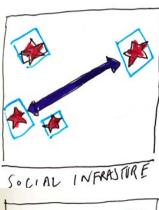
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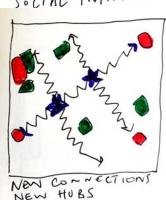




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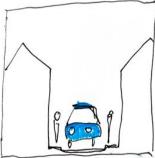




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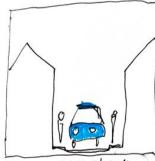


Harrow cross-street



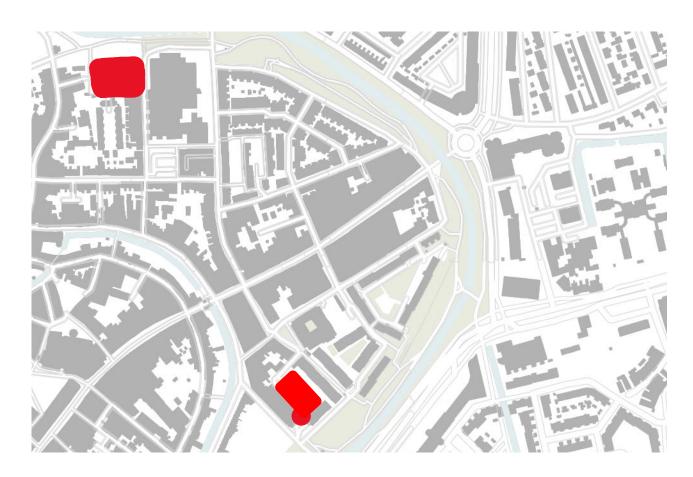


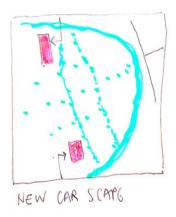
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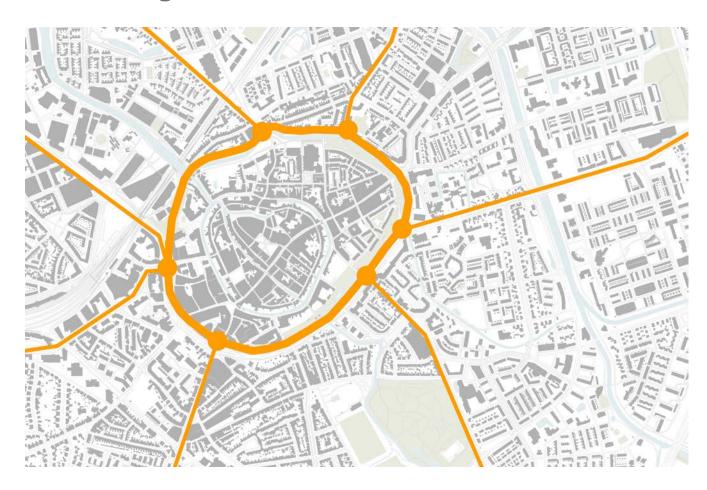


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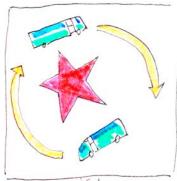






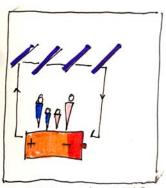






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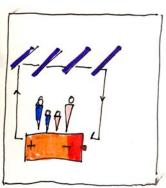


ENERGY LANDSCAPE ..



E MICRO MOBILITY.





ENERGY LANDSCAPE ..



E MICRO MOBILITY.



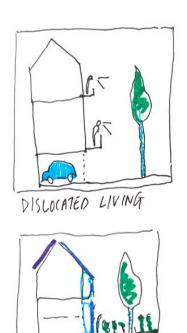






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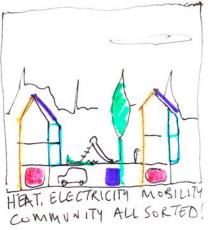




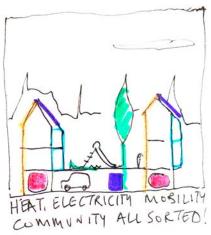
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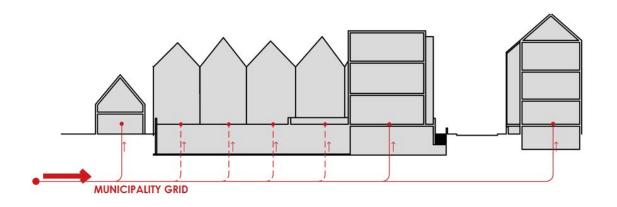


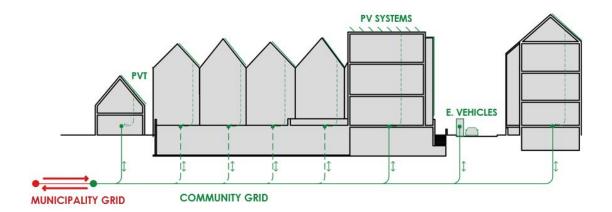




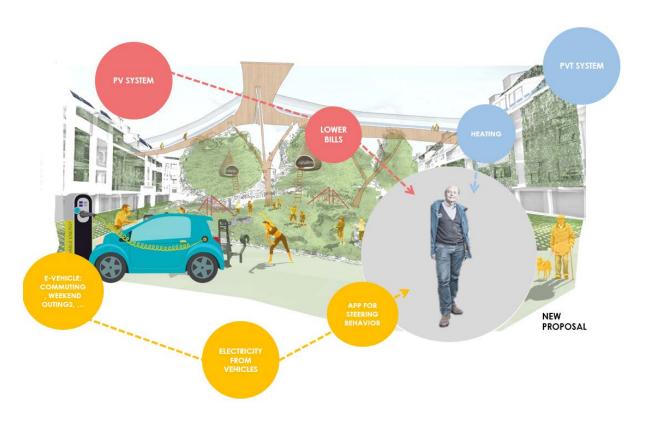








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City-zen Amersfoort Roadshow

Web: https://www.cityzen-smartcity.eu/nl/home-nl/







Roadshow Contacts:
Craig Martin – Roadshow Leader (e: c.l.martin@tudelft.nl)

Roadshow Team

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