

# Green rooftops: an opportunity for urban biodiversity



**Rens de Boer**

Urban ecology consultant  
Rotterdam, the Netherlands



An aerial photograph of a modern building with a green roof. The building has a distinctive facade of vertical, ribbed panels. The roof is covered in greenery and has several outdoor spaces, including a staircase and a small courtyard. The surrounding area includes a road with cars, trees, and other buildings.

Stormwater  
runoff reduction

Building cooling

Human health &  
well-being

Biodiversity

Air cooling

Air quality





















>25 cm



>180 kg/m<sup>2</sup>



>15 mm

bSR

Bureau Stadsnatuur



7-25 cm

80-180 kg/m<sup>2</sup>

5-15mm



3-7 cm

<80 kg/m<sup>2</sup>

2-5 mm





7-20% increase in PV efficiency (when done right)

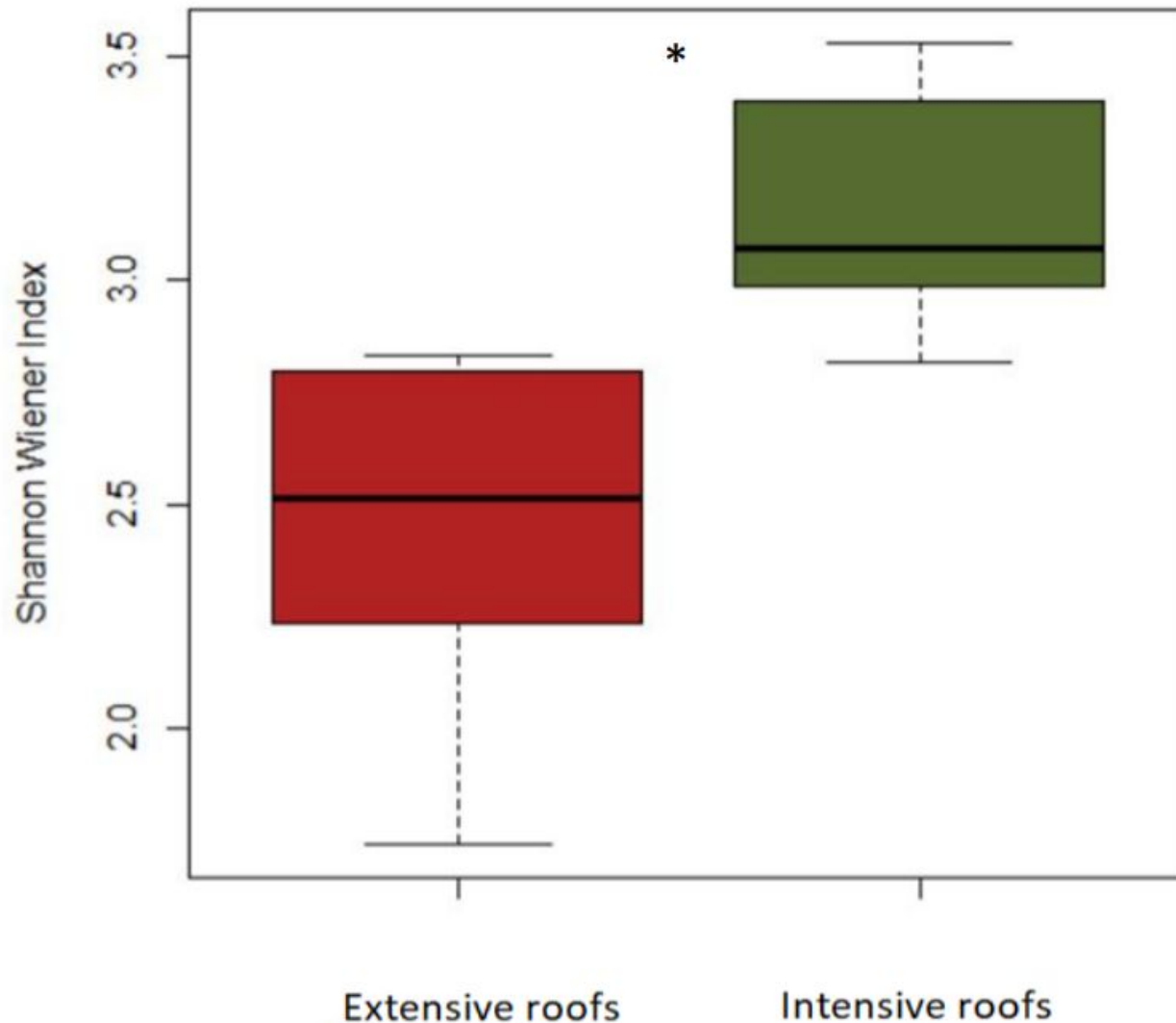


# Ecological quality of green roofs

- Assessing biodiversity
- Identifying design factors contributing to biodiversity
- Focus on high roofs: 10 – 70 meter
- Urban context; 21 roofs in cities in the Netherlands

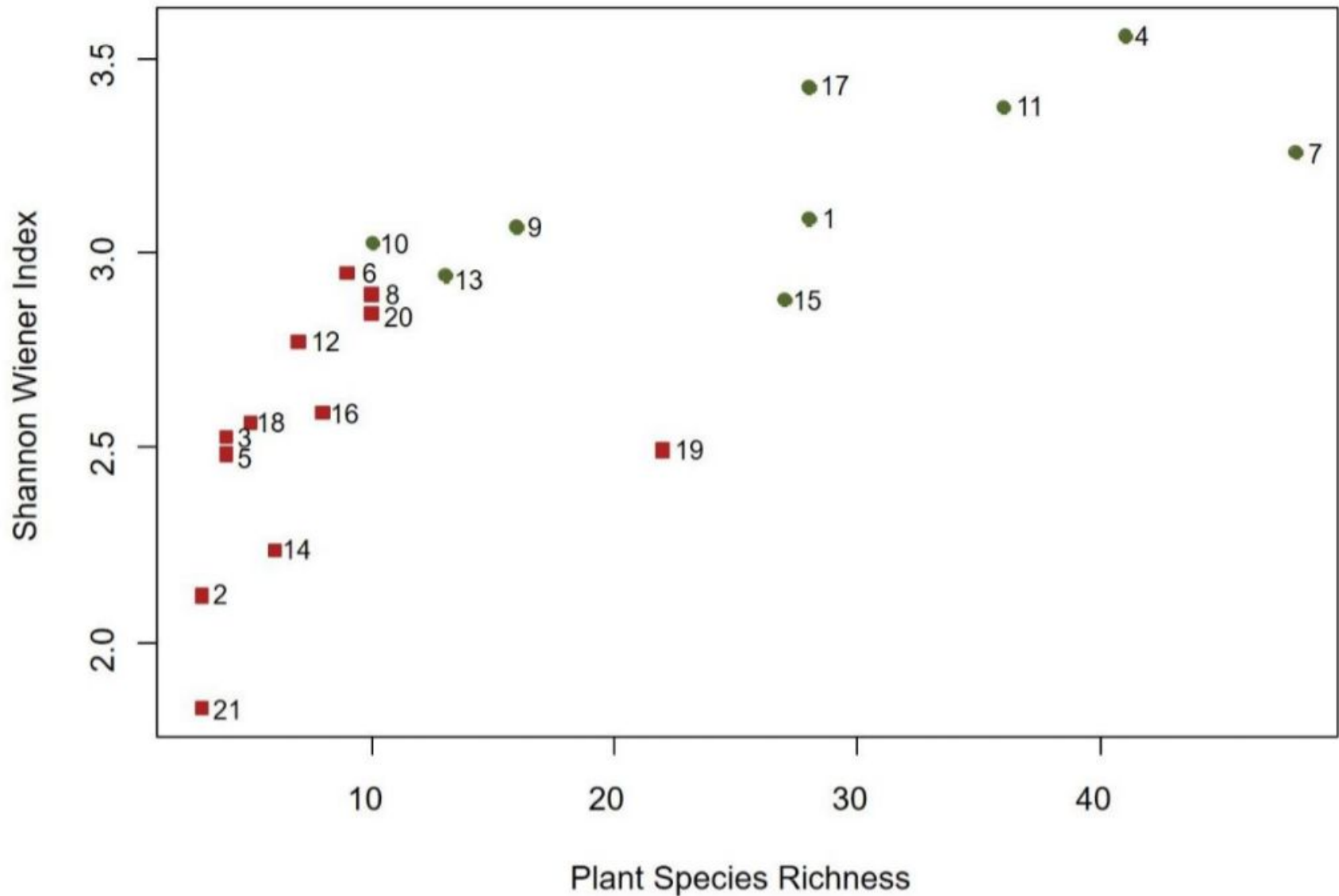


# Insect diversity is higher on intensive roofs



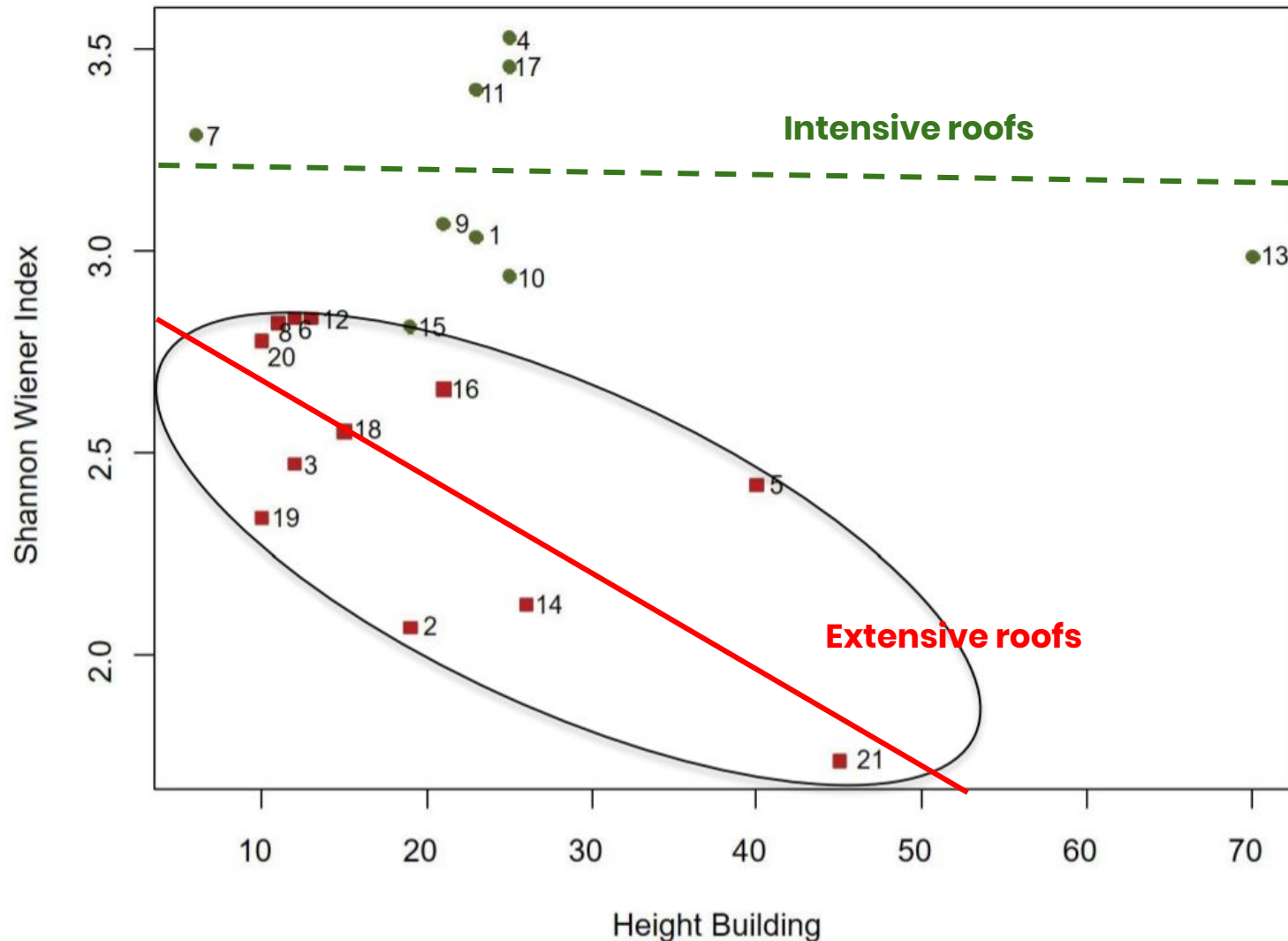


# Plant species richness = insect species richness





# Height matters (sometimes)





# Green roof quality is:

- Thick substrate layer (>25 cm)
  - High plant species diversity
  - Variety in microclimates (relief, plant structures, objects)
  - Locally adapted (soil, plant material)
- 
- Large water buffering capacity
    - improves performance when hot for both ecology and cooling



# Green roofs on a city scale

- Effects for building owners/users:
  - building cooling, recreation, health, CSR
  - **Private benefits**
- Effects for urban resilience
  - Stormwater buffering, air quality, temperature, UHI mitigation, biodiversity, CO2 reduction
  - **Public benefits**



# Roof greening strategy

Local government subsidies for green roofs  
(in Netherlands: ~ 15 municipalities, water boards)

Green rooftops as a prerequisite in real estate development (e.g. in Basel, Denver)

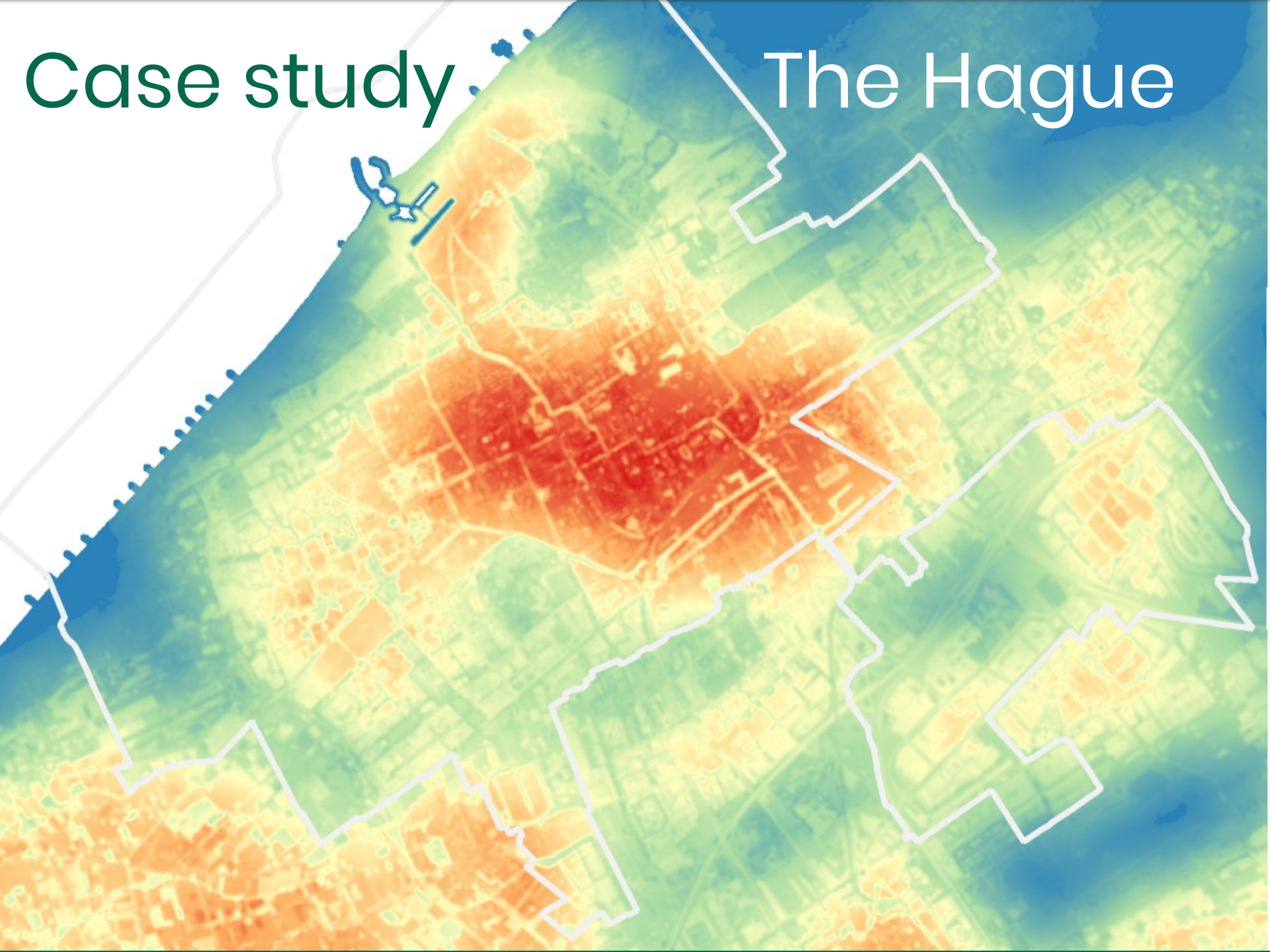
High abundance of cheap & easy *Sedum* systems with limited benefits

**Do we find green rooftops in places where they're needed?**

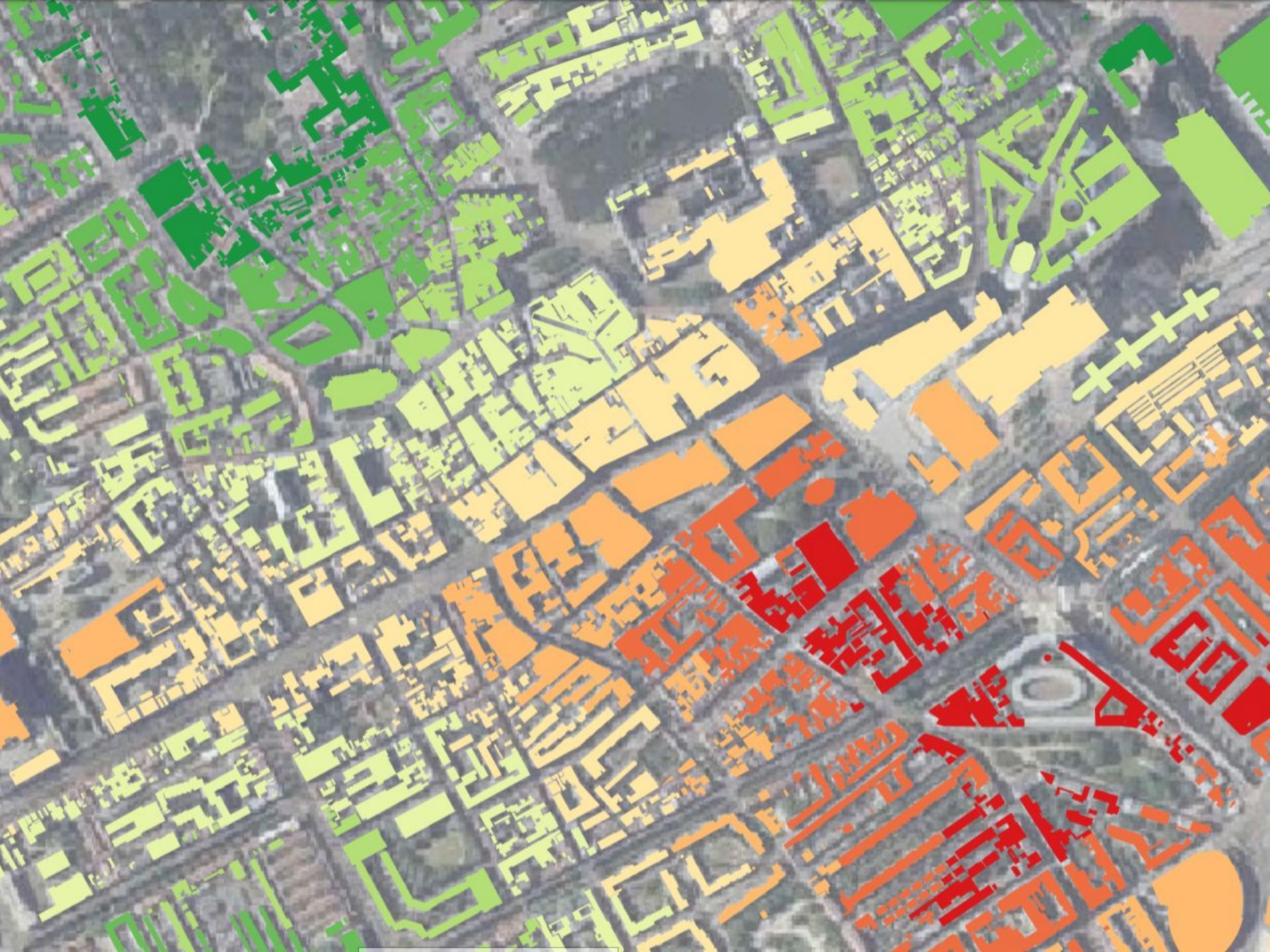


Case study

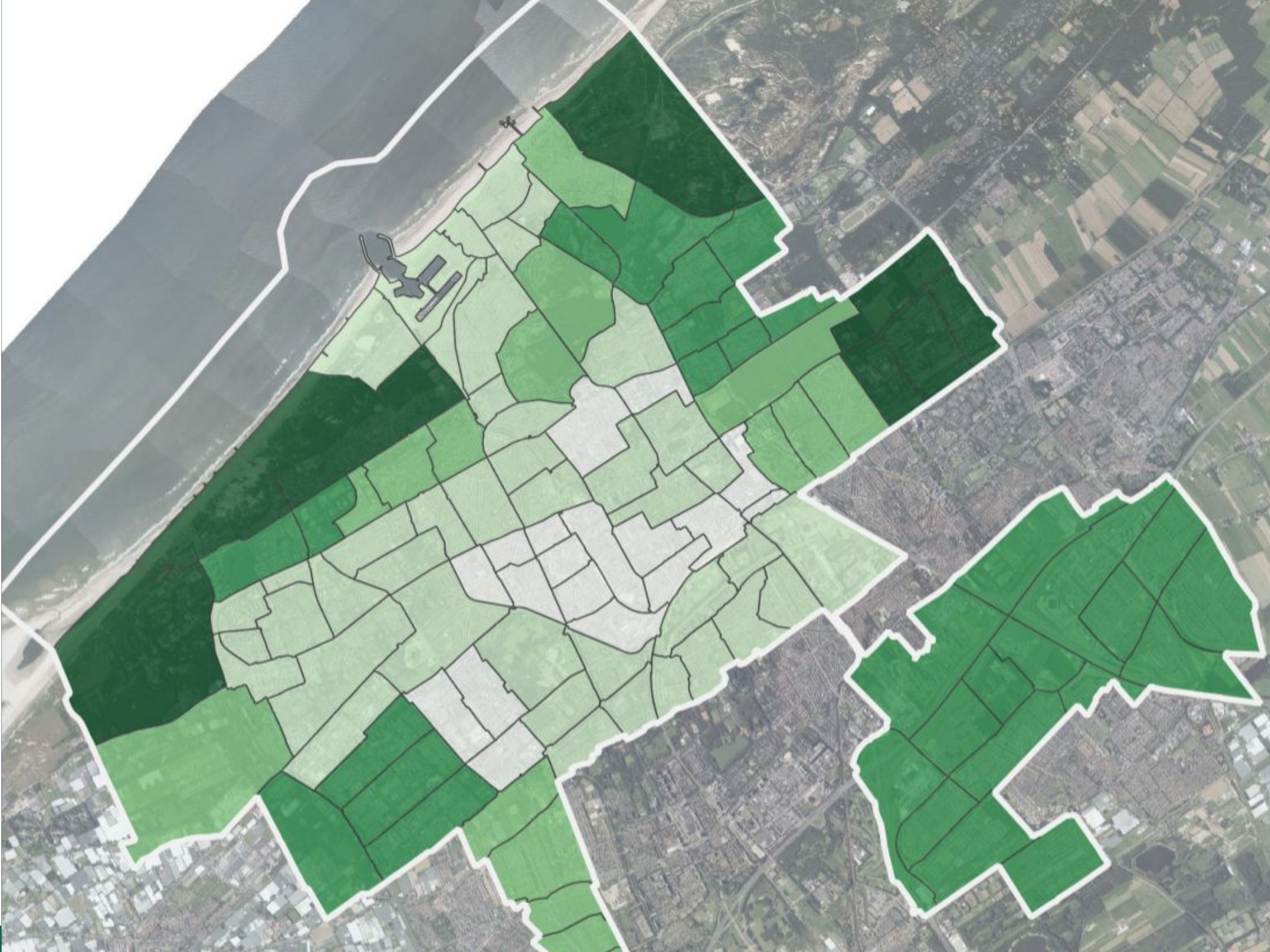
The Hague



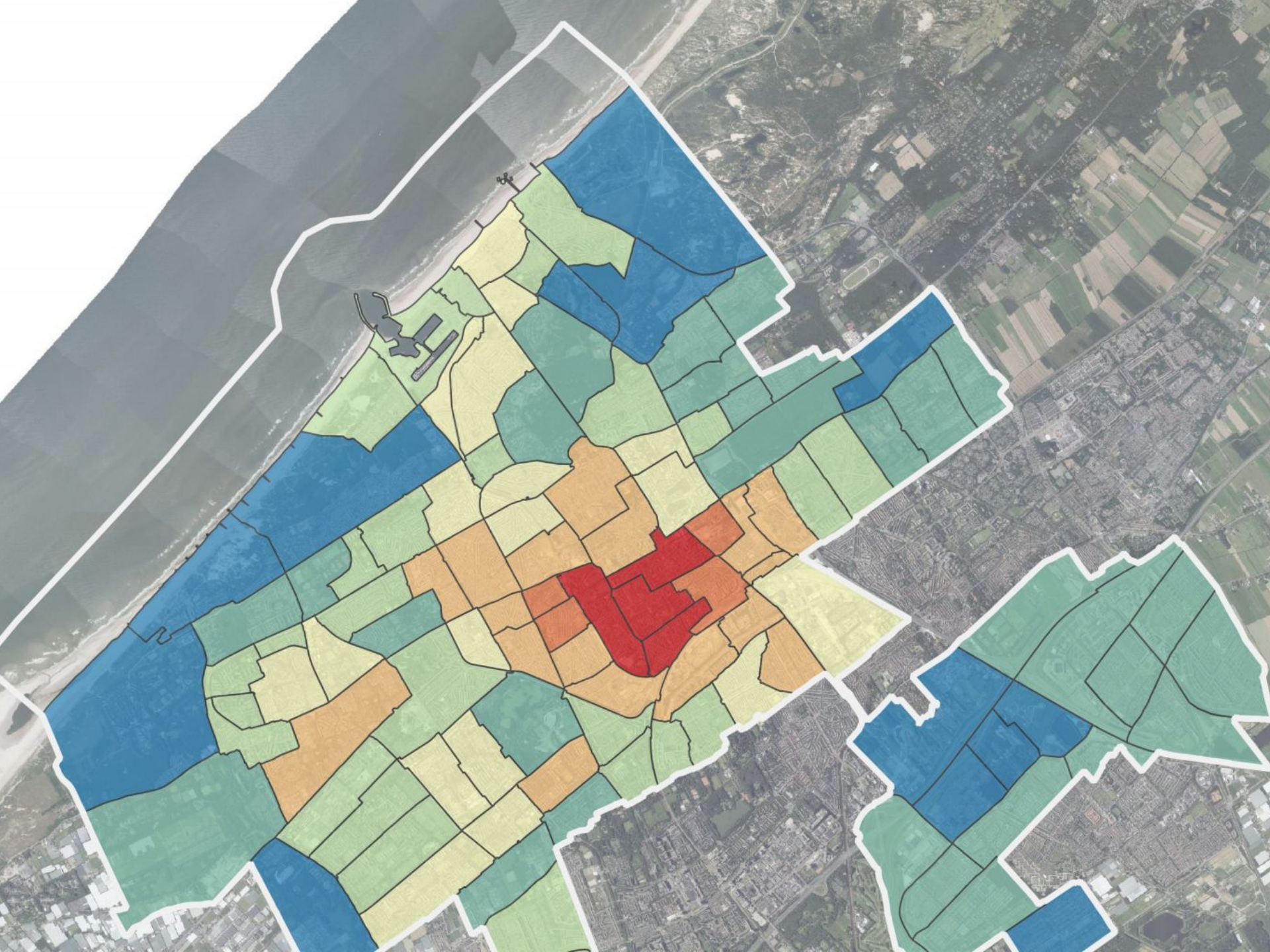










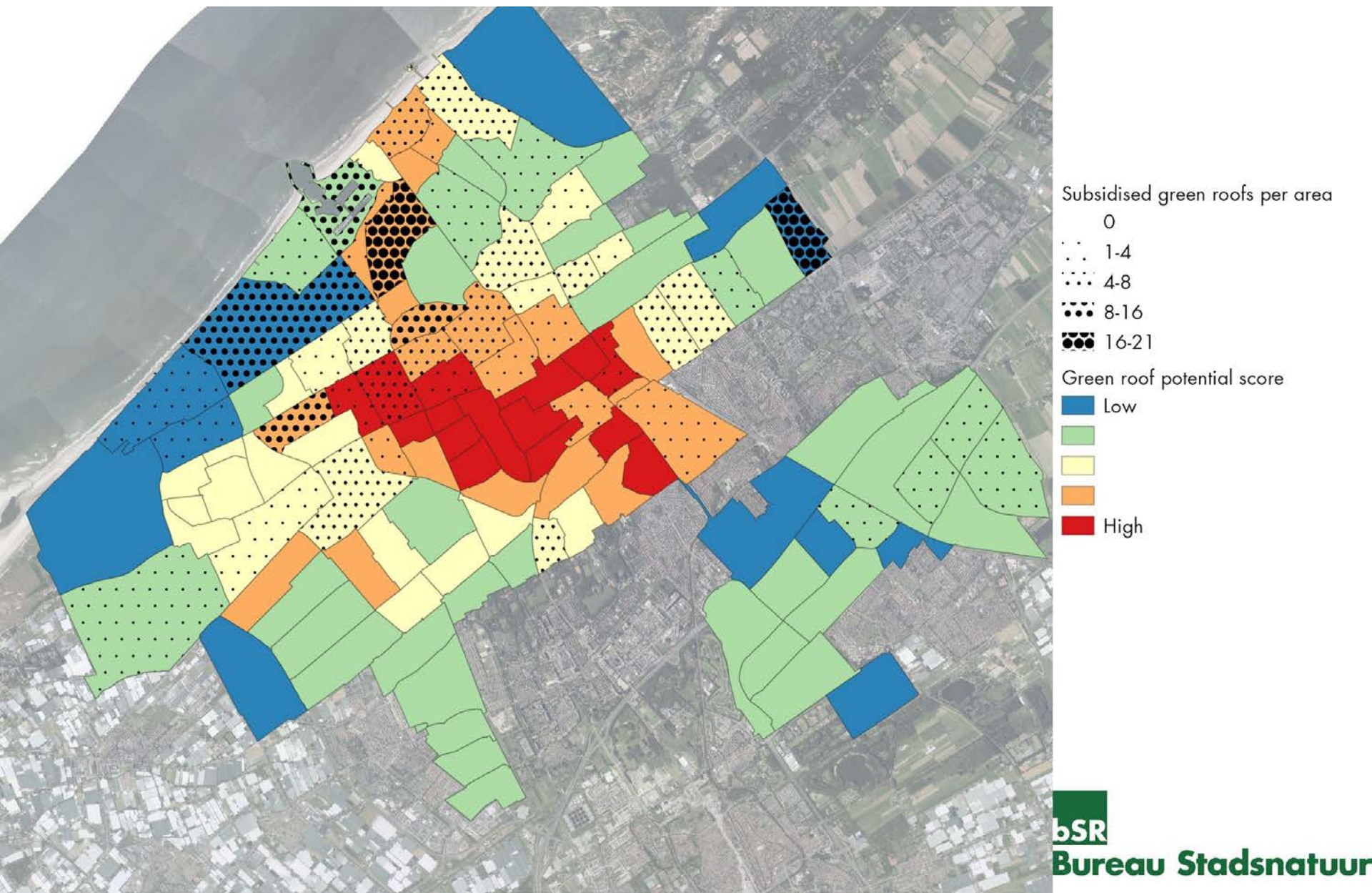




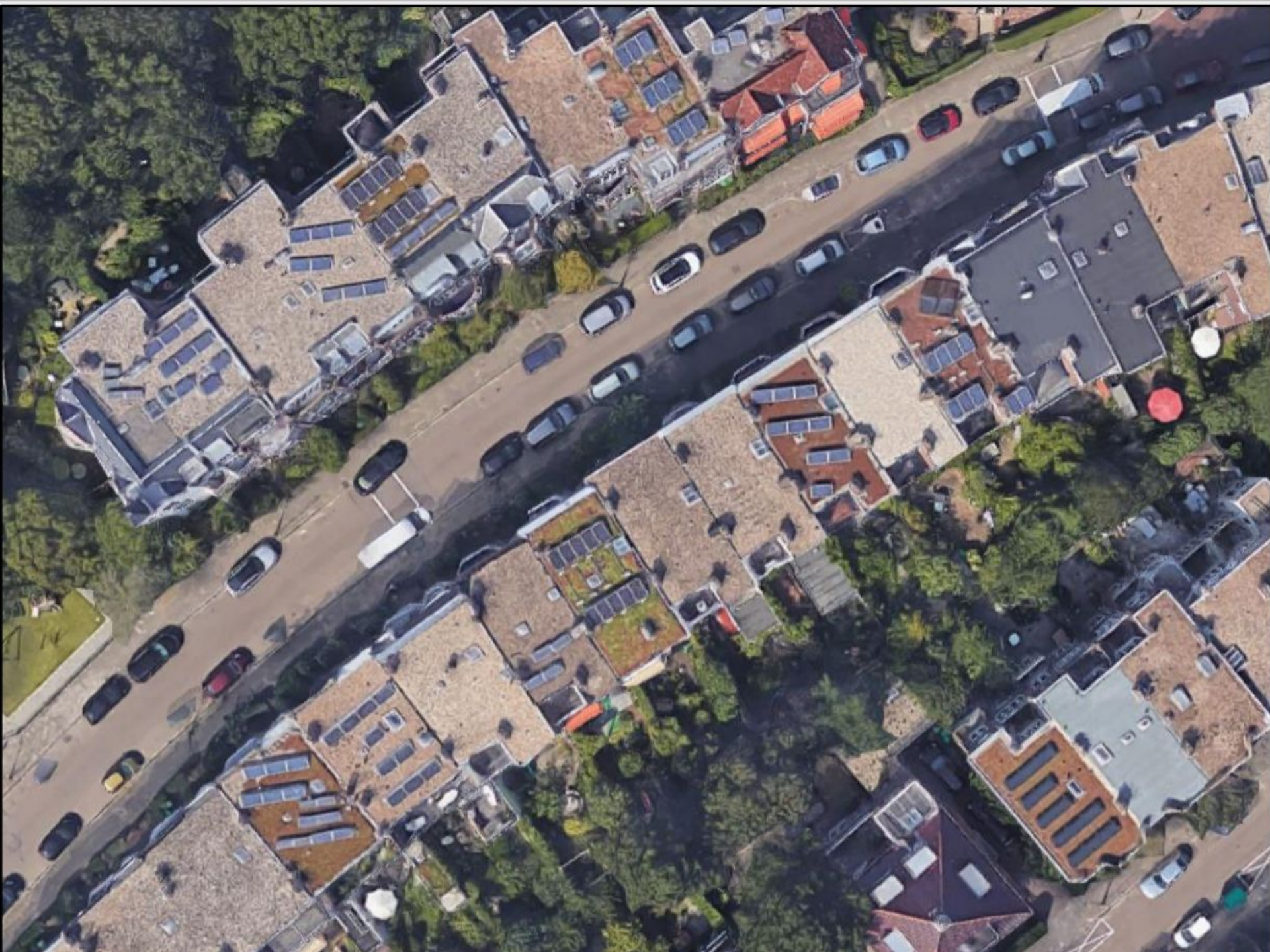
## Focus areas:

- Low amount of (public) green areas
  - Large distance of residential buildings to public green areas
- Severe UHI effect (partial effect of ↑)
- High % of ground surface covered by flat roofed buildings
- High vulnerability for pluvial floods

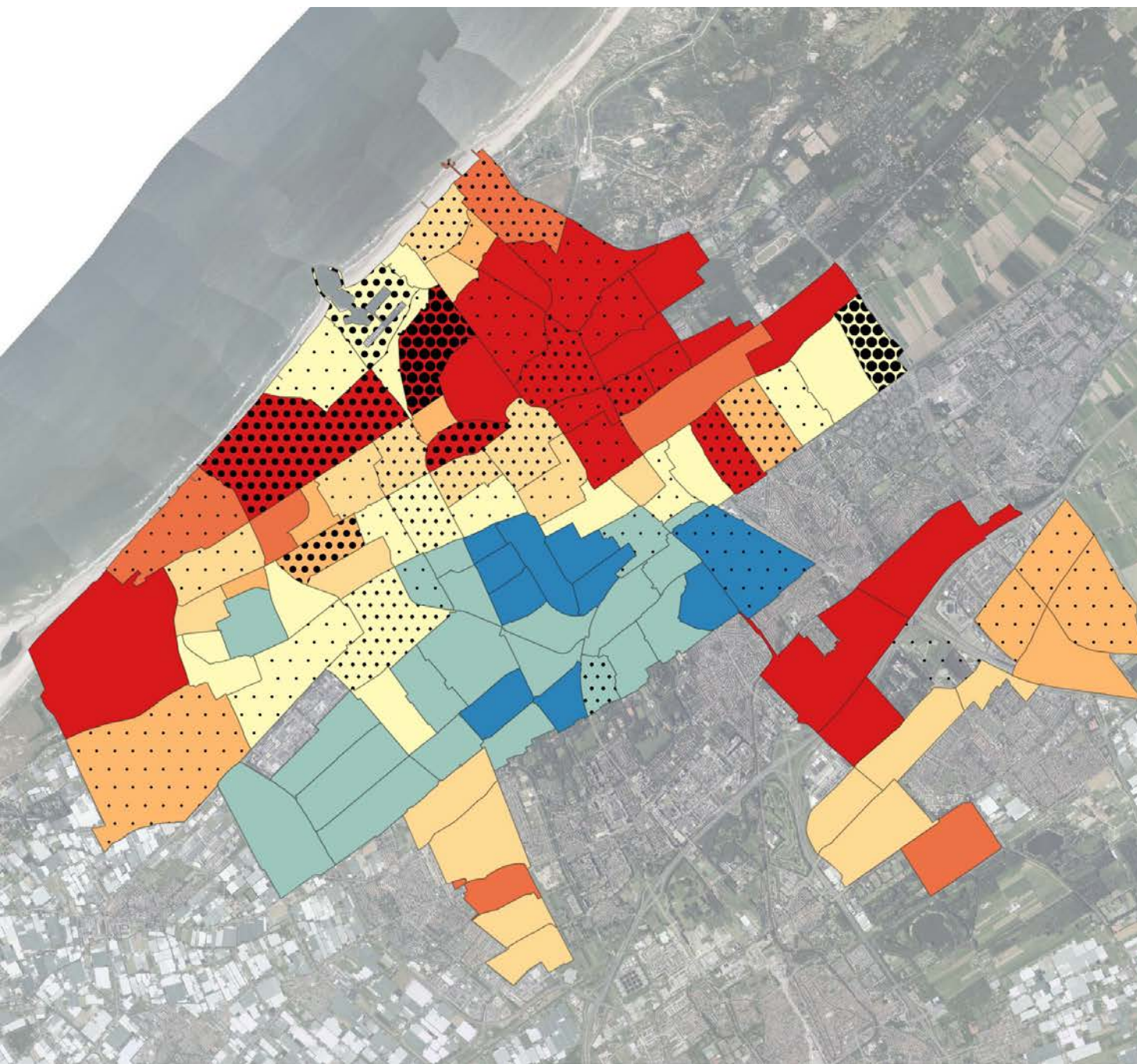
# Green roof subsidies per neighbourhood











Subsidised green roofs per area

- 0
- 1-4
- 4-8
- 8-16
- 16-21

Mean income per area

- < € 20K
- € 20K- 25K
- € 25K-30K
- € 30K - 35K
- € 35K - 40K
- € 40K - 45K
- > €45K



# Green roofs for impact

**Quality** – intensive green, thick substrate layer  
maximise water retention, cooling effect and biodiversity

**Scale** – Collective, not individual  
Large roofs for higher impact or higher density of smaller roofs

**Equitable** – Also available for rental houses  
Benefits of green roofs also for lower incomes



# Tools for scaling

- Differentiate funding for different green roof qualities
- Cooperate with social housing, home owners associations, commercial building owners
- Focus on local stormwater reduction
- Showcase best practices



Rens de Boer

[deboer@bureaustadsnatuur.nl](mailto:deboer@bureaustadsnatuur.nl)