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BENEFITS OF A GREENER URBAN ENVIRONMENT

Greening the city to adapt to climate change and improve liveability

Laura Kleerekoper
23rd of November 2017
Mini symposium - HvA

CREATING TOMORROW

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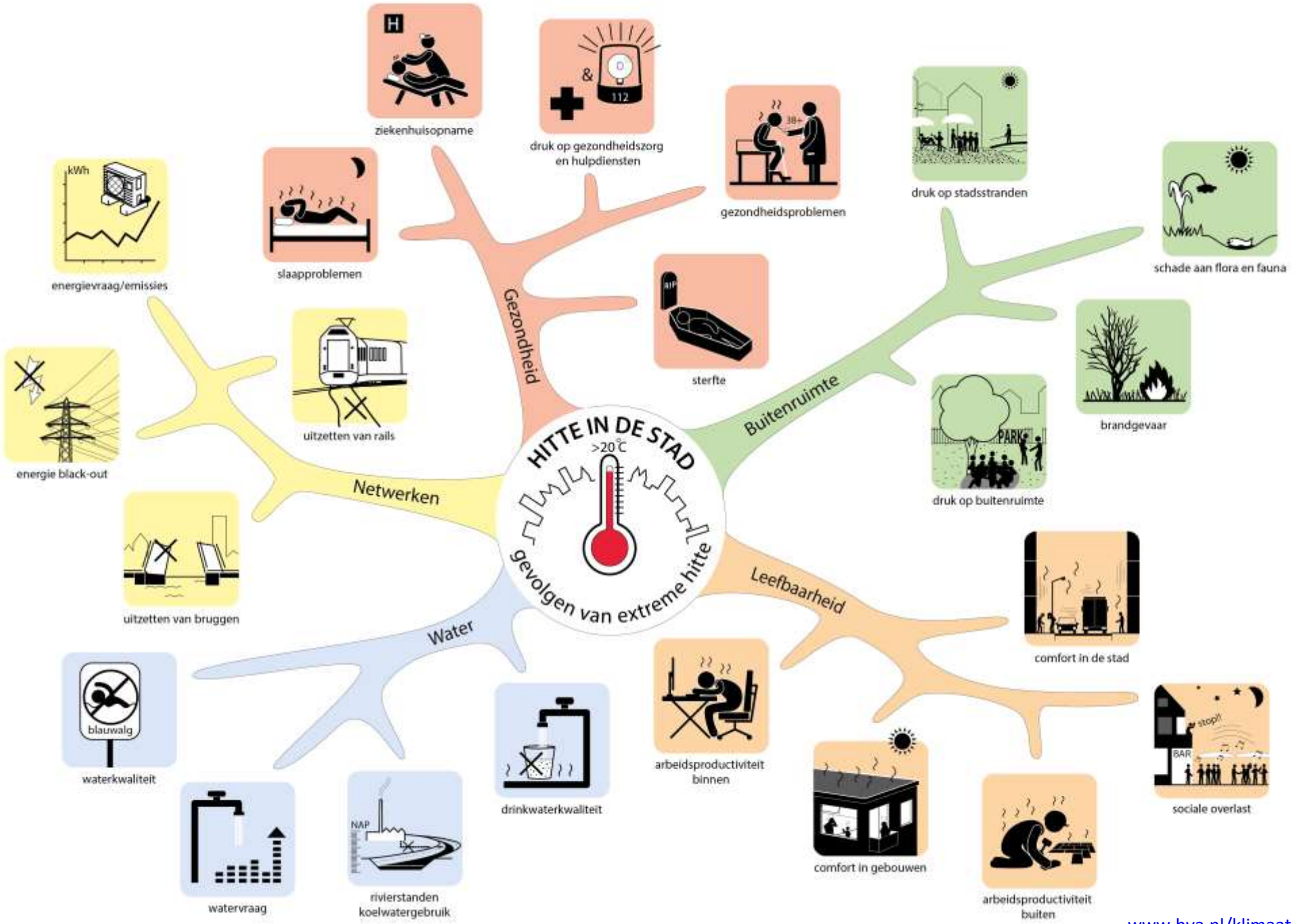
English Google Aangep.

KENNISCENTRUM TECHNIEK

HOME ONDERZOEK PROJECTEN PUBLICATIES OVER CONTACT

Feedback

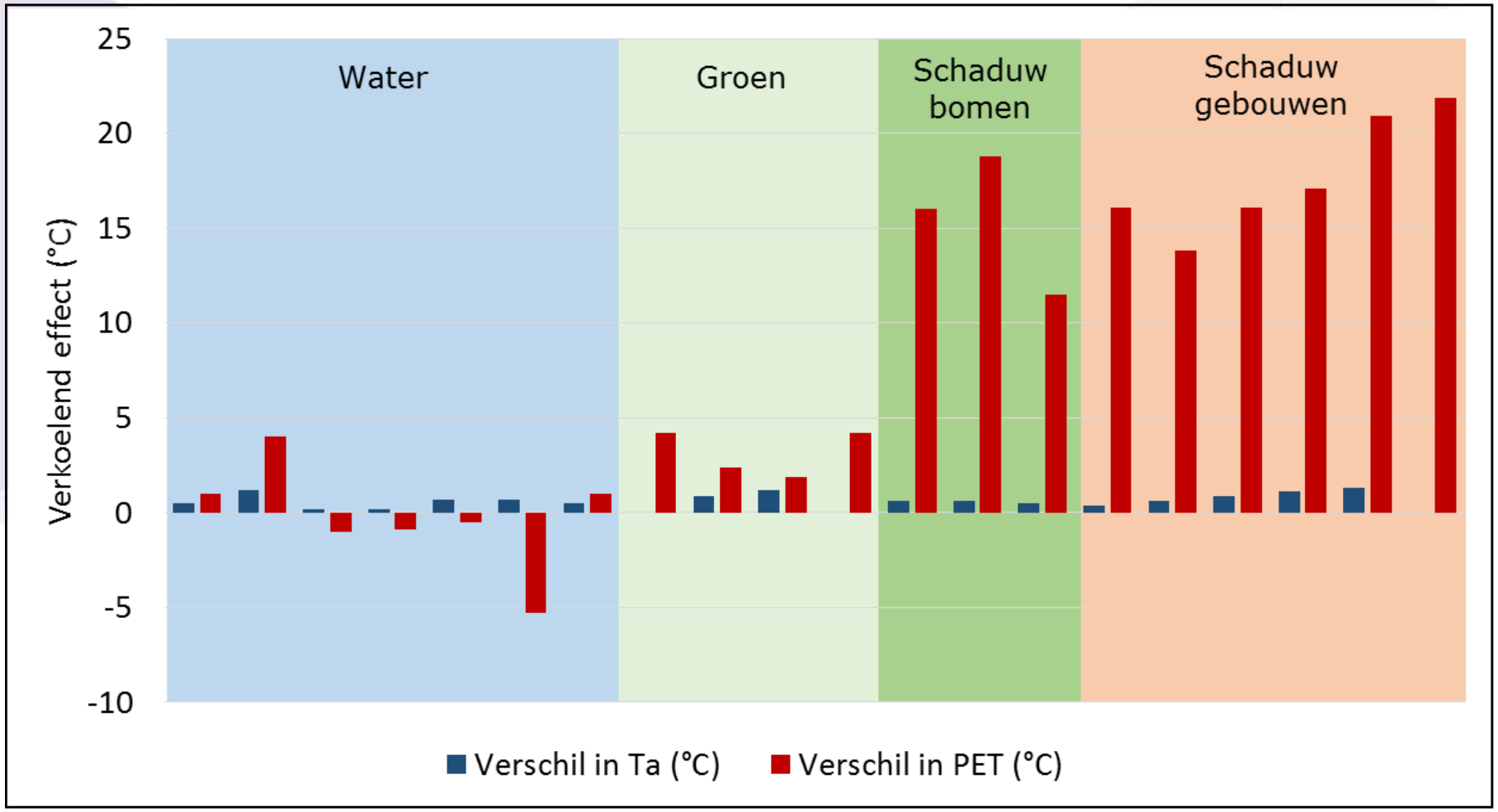
RESEARCH: CLIMATE RESILIENT CITIES



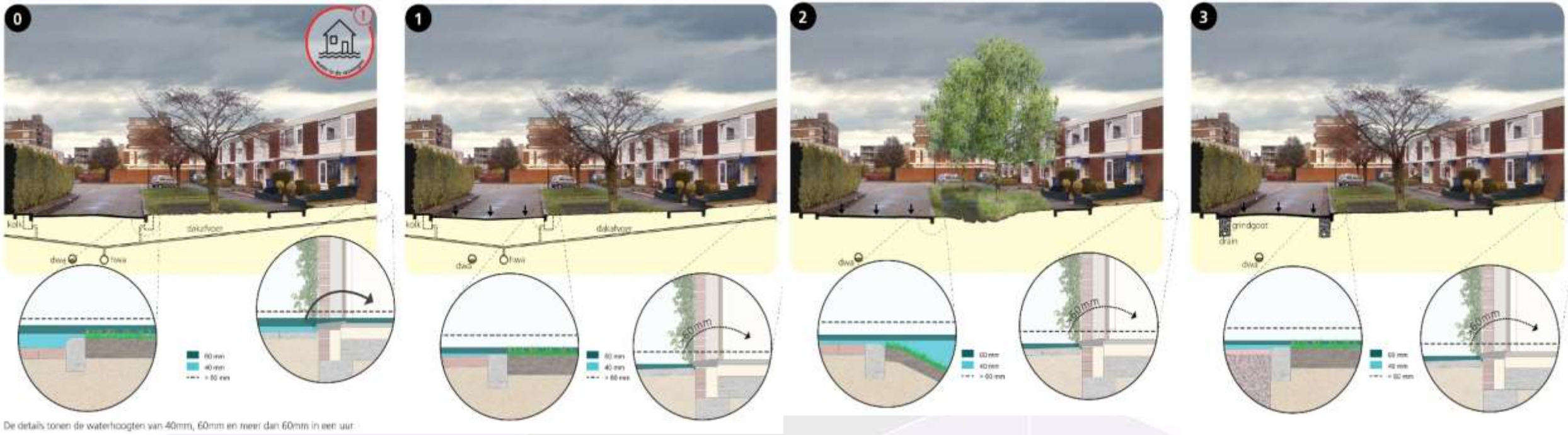
www.hva.nl/klimaatbestendigestad

RESEARCH: HEAT MEASUREMENTS

COOLING EFFECT OF WATER, GREEN EN SHADOW



RESEARCH: WATER RESILIENT STREET DESIGNS



De details tonen de waterhoogten van 40mm, 60mm en meer dan 60mm in een uur

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NEIGHBOURHOOD TYPOLOGIES

Garden city - tuinstad hoogbouw

Cauliflower neighbourhood - Bloemkoolwijk

Pre-war city block - Vooroorlogs bouwblok

PRE-WAR CITY BLOCK

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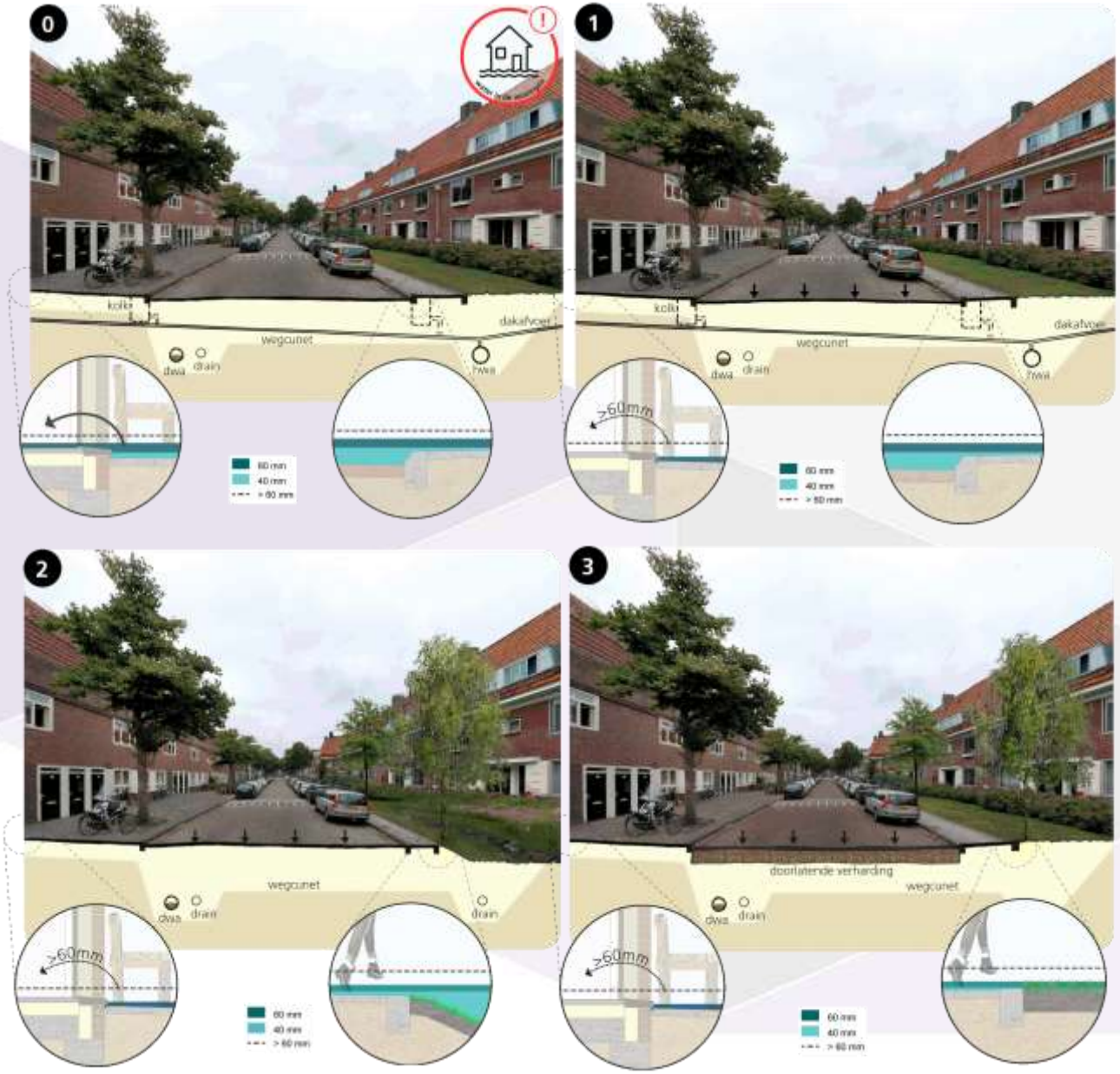
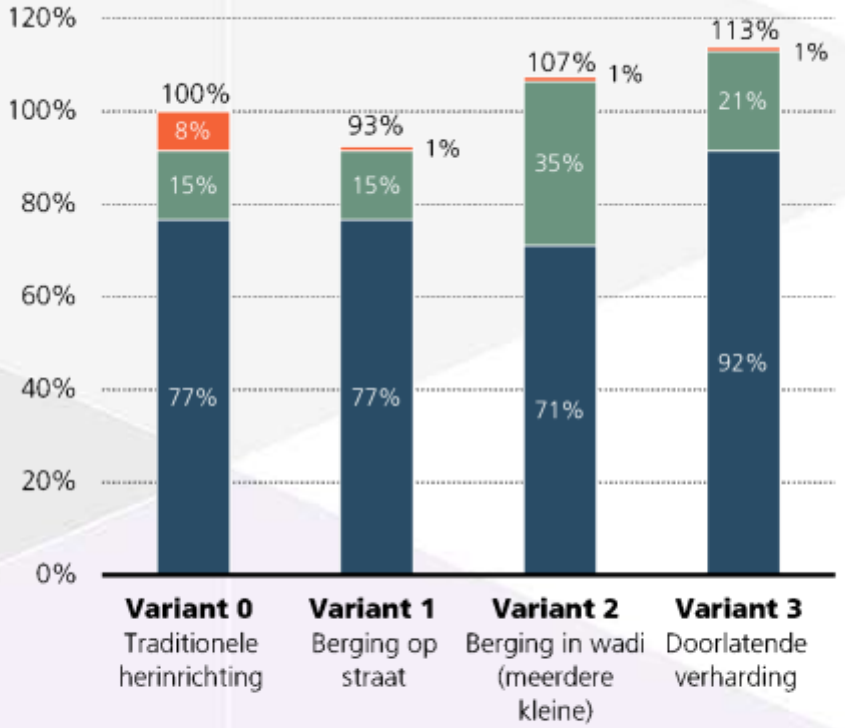


Kosten vooroorlogs bouwblok



RESEARCH: BENEFITS OF GREEN

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WHY GREEN?

10-15°C lower comfort temperature under a row of street trees

summer-winter

Trees prevent heating of the urban environment

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WHY GREEN?

Image from rainproof.nl

Image from rooftoprevolutions

A higher percentage of green (parks, gardens, facades, roofs) contributes to a rainproof city

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WHY GREEN?

There are many more benefits of green

- Comfort
  - Improvement of comfort in the city
  - Improvement of comfort in dwellings and buildings
- Health sector
  - Effect on health problems
  - Mortality
  - Hospital care
  - Decreased sleep quality with indirect consequences
  - Effect on mental health
  - Effect on air quality, particulate matter
- Energy
  - Lower energy demand for cooling
  - Lower energy demand for heating
  - CO2 emission capture
- Water
  - Water storage and infiltration
  - Water demand for cooling
  - Improvement of surface water quality
- Infrastructure
  - Green and sound
  - Decrease of car use
- Economy
  - Higher labour productivity
  - Value increase real estate
  - Business climate/tourism/identity
- Environment
  - Green roofs extend durability of roofs
  - Habitat for flora and fauna
  - Element of the circular city
- Social
  - Green and safety
  - Recreation
  - Social cohesion

RESEARCH: BENEFITS OF GREEN

BENEFITS OF GREEN FOR 10 CASESTUDIES

TEEBstad.nl (**T**he **E**conomics of **E**cosystems and **B**iodiversity)

1. Health

2. Energy demand

3. Value real estate

4. Recreation

5. Social cohesion

6. Water treatment system

- Compare to our monetarization method
- Literature review
- What do we find plausible?
- What are relevant benefits?

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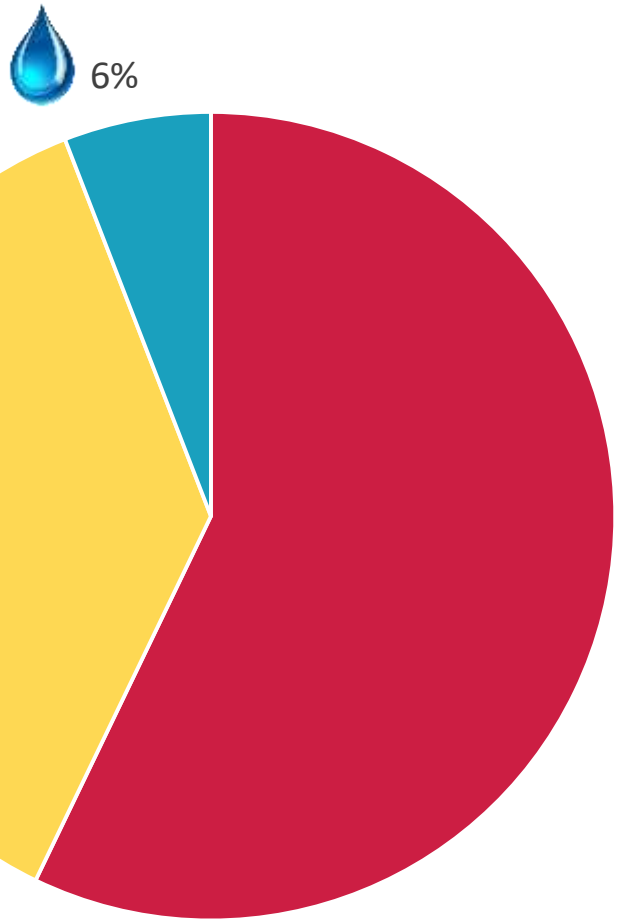
DISTRIBUTION OF BENEFITS



THEME HEALTH

1% additional green implies 1 patient less at the doctor per 1000 inhabitants

1a. Health costs

Yearly health costs per patient are on average: €868,-

1b. Labour productivity that would otherwise be lost due to absenteeism: € 4.230,- per year

Participation rate is 0,67

1c. Health costs in relation to pm (particulate matter)

Kg pm ≠ concentration pm

THEME REAL ESTATE VALUE

Sources: 5-12% increase with a green street design compared to a brick sealed street

➔ assumption: 5% one-time value increase

➔ Benefits through taxes on real estate value

WOZ belasting (ca. 0,75% per year): the national government

OZB belasting (ca. 0,15% per year): municipalities

THEME WATERBALANCE

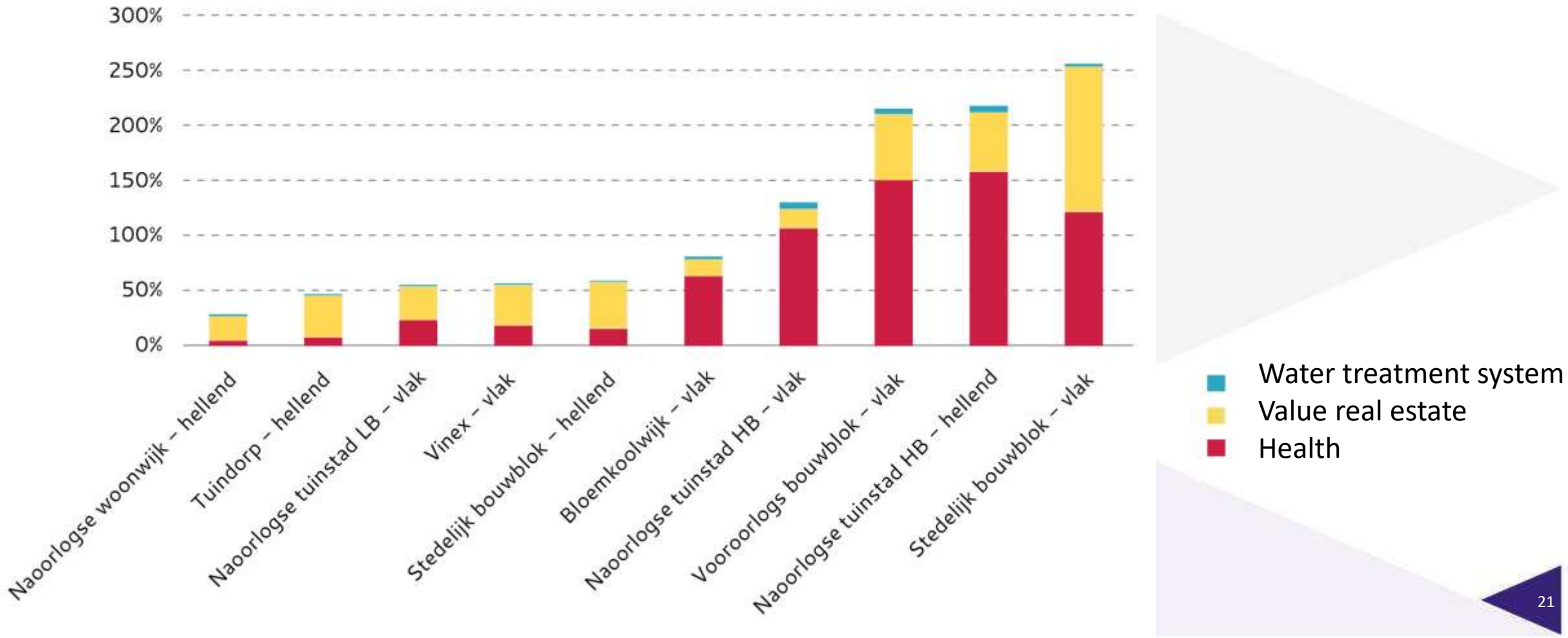
Decrease of water discharge from green surfaces, trees or bioswale:

1m^2 green saves out €0,25 on sewage treatment costs per year

The effect of a tree crown:

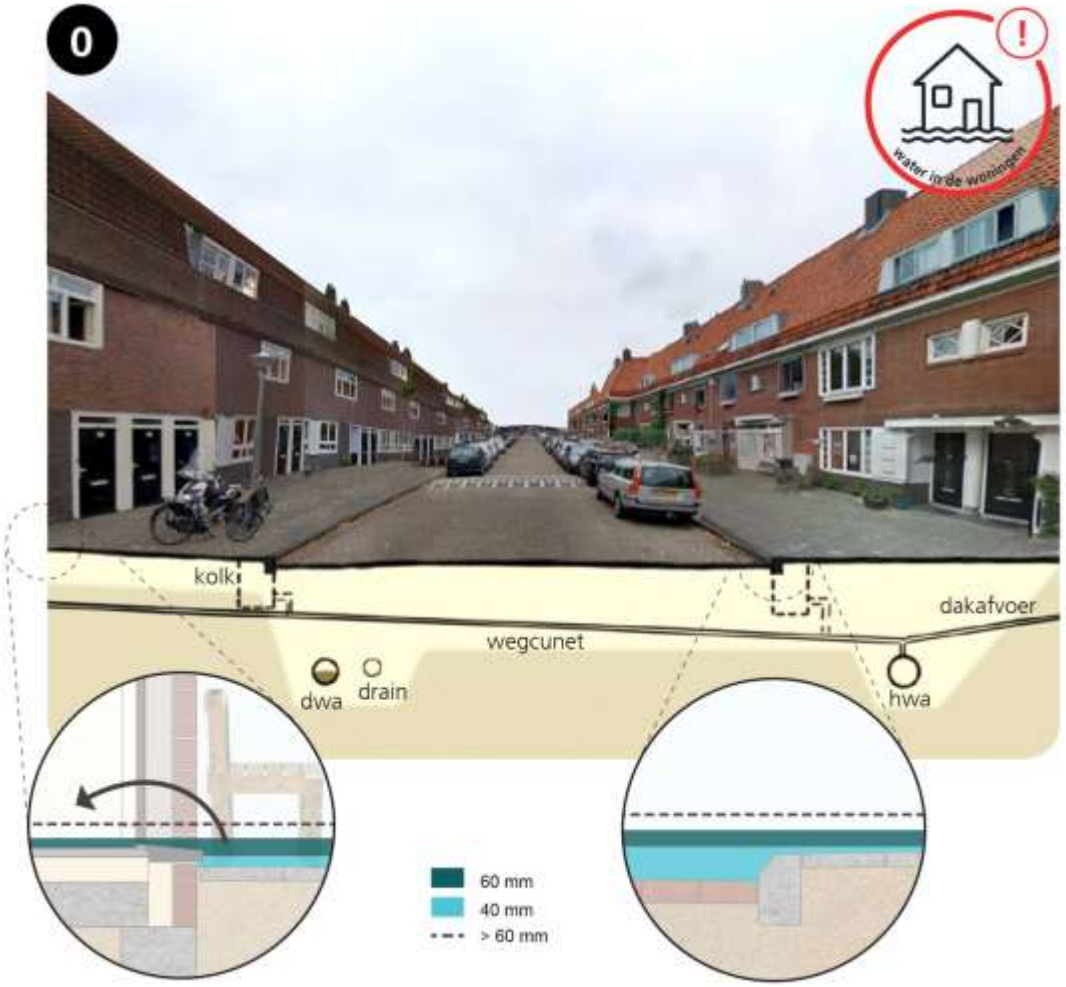
One tree intercepts 3000 litre per year ≈ €1,50/yr

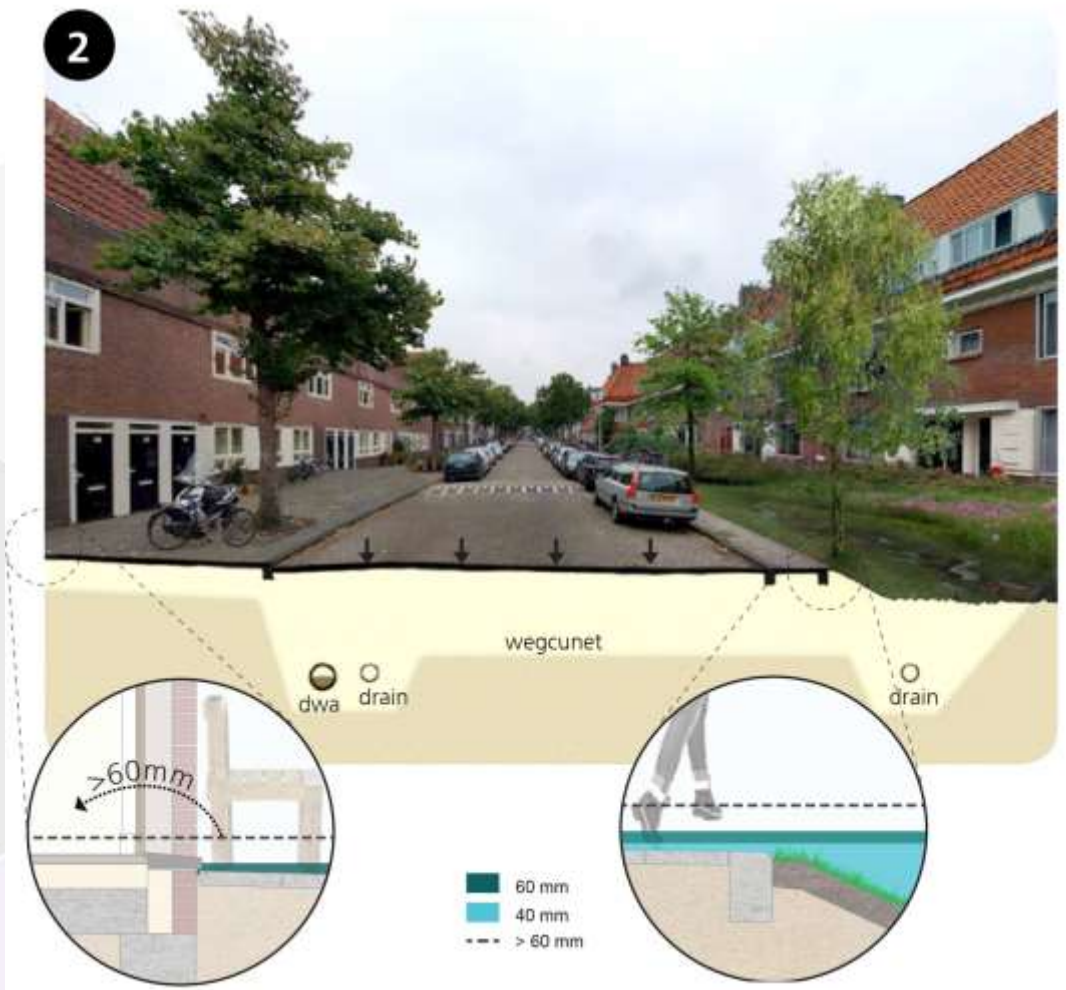
GREEN BENEFITS COMPARED TO TOTAL CONSTRUCTION COSTS



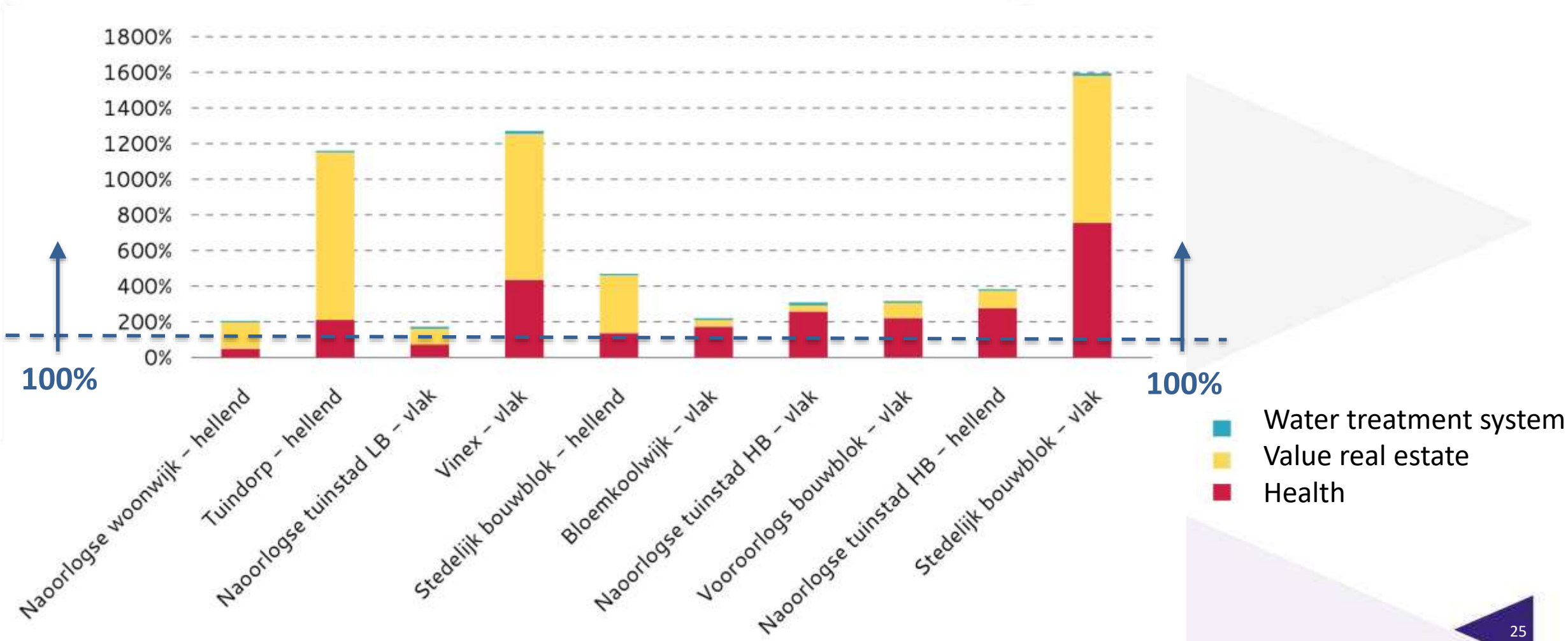
GREEN COMPARED TO NO GREEN

Pre-war building block – flat terrain





GREEN BENEFITS COMPARED TO GREEN COSTS



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a careful estimate of benefits

NOT (YET) INCLUDED ARE:

- Less energy consumption for cooling
- Capture of CO2 emissions
- Benefits of higher biodiversity
- Benefits of noise reduction by green
- Reduction of car use through green routes
- …

A GREEN STREET DESIGN RESULTS IN GOOD VALUE FOR MONEY

Griffioen

February

May

Perennial plants or flowering meadows also in bioswales

August

November

Images from Green to Colour

Different tree species are more resilient to change

Cool spots

Cool space within 300m from dwellings for 30 neighbourhoods

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SIA
Stichting Innovatie Alliantie

NEW RESEARCH PROJECT

How do we define the urban heat assignment in cities?

How do we define thresholds?

When is an urban area sufficiently resilient to heat?

How can we monitor and evaluate?

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