



# The Green City

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**The Green City strives for a more attractive and healthy environment.**

**We aim to encourage 'greener thinking' by:**

**providing information, discussing successful examples from the daily practice and sharing new scientific insights.**



# Pillars of The Green City:

1. Health
2. Economy
3. Biodiversity
4. Climate
5. Social Cohesion
6. Trends & Research



# Pillar 1: Health





# We are facing a problem

- ❖ Air pollution caused by fine particles
- ❖ This pollution is regarded as the worst contamination in urban atmosphere
- ❖ Risks for public health



Trees and shrubs  
can bind small  
particles and  
nitrogen dioxide



# Green as filter

- ▶ Ozon, nitrogen dioxide ( $NO_2$ )
- ▶ Flat and wide leaves of deciduous trees
- ▶ PM10 (*Fine dust*)
- ▶ Conifers
- ▶ Rough, hairy and sticky leaves of deciduous trees

## Fact:

The major outdoor air pollutants (nitrous oxides ( $NO_x$ ), particulates (PM10/PM2.5) and volatile organic compounds such as benzene) come from industry and traffic. Long-term exposure to these substances leads to lung problems and cardiovascular disease. Although air quality at most locations in the Netherlands complies with standards, this does not mean the risk is eliminated entirely. There is no safe lower limit, and concentrations can rise considerably in areas close to busy roads and intersections. Indoor air quality is often poor; large numbers of people in a relatively small space frequently cause  $CO_2$  levels to rise significantly. Volatile organic compounds from construction materials (such as formaldehyde and benzene) may also be present.



# Green and Healthcare

Greenery in and around nursing homes and clinics is beneficial for the climate inside and outside the organization and has a positive effect on the patients' state of mind and ability to recover

## Facts:

- ▶ Plants in waiting rooms reduce stress.
- ▶ Plants in ward rooms reduce feelings of anxiety and pain, and lower the use of painkillers; less recovery time in bed has also been reported.
- ▶ Greenery visible through the window of hospital rooms helps reduce the length of hospital stays (by nearly a day).
- ▶ Patients in an American hospital recovering from gall-bladder surgery who had a view of trees from their room used weaker painkillers than those whose view was of a brick wall.



# Pillar 2: Economy



## **The value of real-estate increases in green surroundings**

### **Proven Success:**

The presence of greenery in the immediate vicinity of houses increases their value by 4-15%, depending on local conditions.

Reserving ten per cent of urban areas for varied greenery provides plenty of habitat for butterflies and bees.



# Health costs will reduce when hospitals are built in a green environment

## PROVEN SUCCESS:

- In-bed recovery time is 20% shorter for patients whose view includes greenery.
- Nursing homes that include greenery will triple their volunteer count.
- Patients staying in green environments use 30% less painkillers.
- ‘I just feel less unwell’, said one cancer patient receiving treatment in the ‘chemo garden’.



# Pillar 3: Biodiversity



**A variety of plants, trees and shrubs in the city stimulates biodiversity.**

**The more variation in vegetation, the more variation in animal life it will attract.**

**Fact:**

Just 10% vegetation in urban areas can provide a good habitat for butterflies and bees, provided there is enough diversity and food, and the areas are spread out through the city like a network.



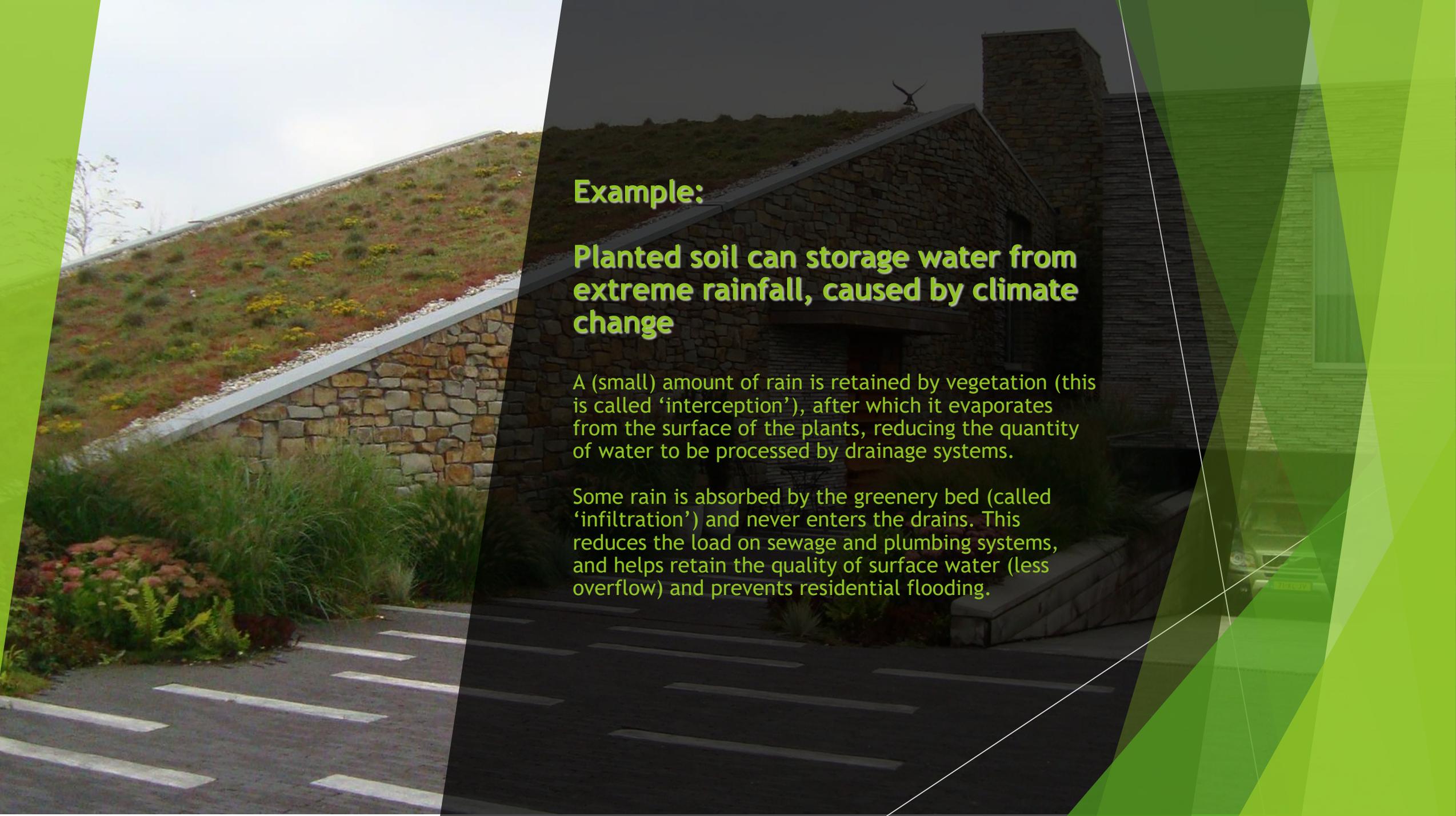
# Pillar 4: Climate

## More often heavy rainfalls

The Royal Netherlands Meteorological Institute (KNMI) has drawn up four potential climate-change scenarios for the Netherlands. All four show an increase in precipitation intensity and frequency of heavy rains, while the current climate conditions already cause plenty of flooding in streets, cellars, etc.

The Dutch Association of Insurers expects increases in damage of over 140%. In addition to material damage, these types of water emergencies can also cause injuries and even death, especially in inclined areas (e.g. South Limburg) where small waterways can easily swell into a turbulent deluge.

Expanding green zones in urban areas improves water management and reduces the adverse effects of peak rainfall.

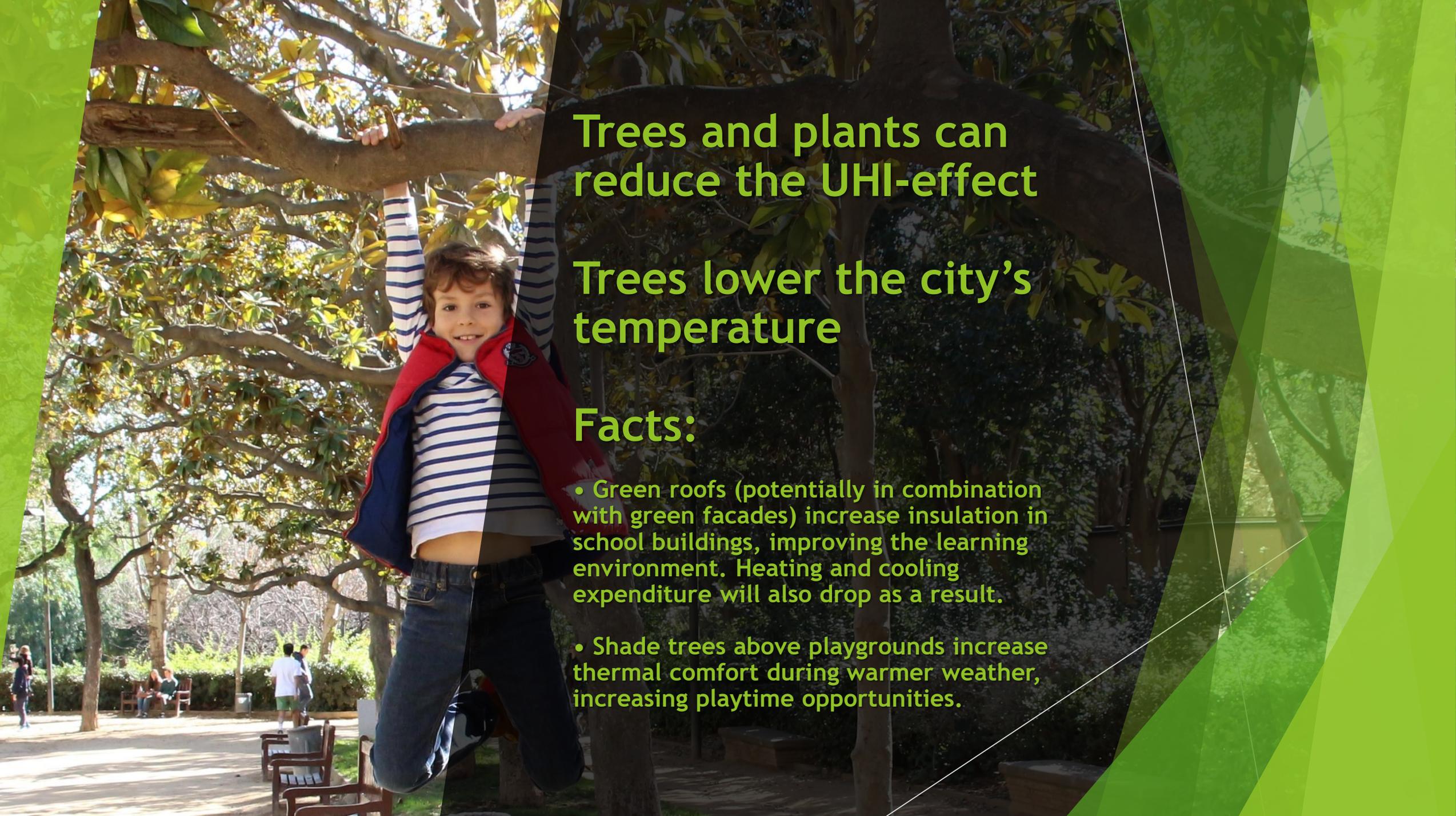


## Example:

### Planted soil can storage water from extreme rainfall, caused by climate change

A (small) amount of rain is retained by vegetation (this is called 'interception'), after which it evaporates from the surface of the plants, reducing the quantity of water to be processed by drainage systems.

Some rain is absorbed by the greenery bed (called 'infiltration') and never enters the drains. This reduces the load on sewage and plumbing systems, and helps retain the quality of surface water (less overflow) and prevents residential flooding.

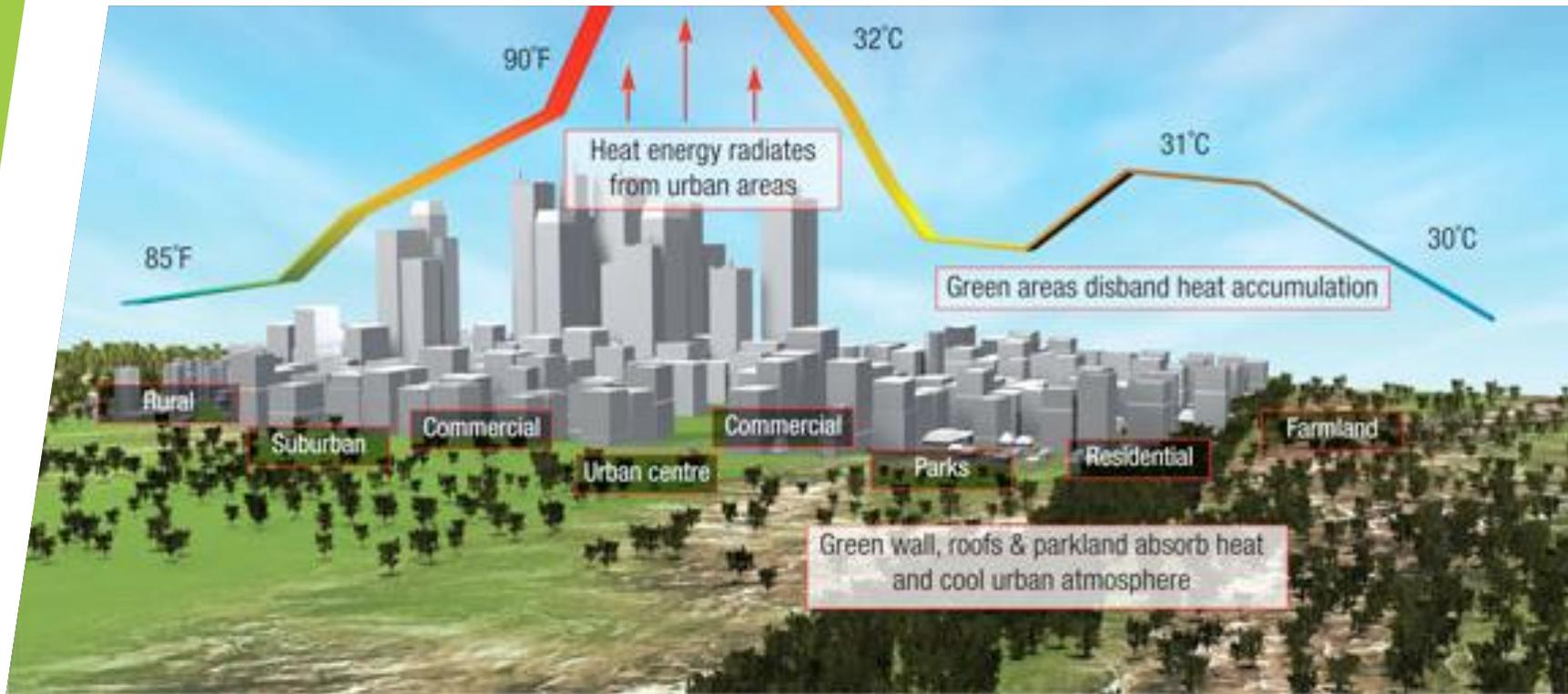


**Trees and plants can reduce the UHI-effect**

**Trees lower the city's temperature**

**Facts:**

- Green roofs (potentially in combination with green facades) increase insulation in school buildings, improving the learning environment. Heating and cooling expenditure will also drop as a result.
- Shade trees above playgrounds increase thermal comfort during warmer weather, increasing playtime opportunities.



# Urban heat island effect



# Pillar 5: Social cohesion



**Public parks as meeting  
place for the old and  
the young**

**Gardening together in  
neighborhoods...**



# Pillar 6: Trends & Research



**Examples of urban greening:**

**“Functional aspects”**

**“vertical gardens”**

**“green roofs”**

**“guerilla gardens”**

**“e-commerce delivery”**



## **The Green Agenda (2015 >)**

**The Green City has a leading and facilitating role in this research program. It brings together entrepreneurs from the green industry and knowledge institutes and facilitates them in developing green concepts and earning models. In doing so, we collaborate with Royal FloraHolland.**



## **Publications The Green Agenda Factsheets;**

'Green & General'

'Green & Recovering'

'Green & Learning'

'Green & Working'

'Green & Living'

Update, Flowerbulbs and Perennial Plants



## **Projects The Green Agenda**

### **Ecosystem services of plants**

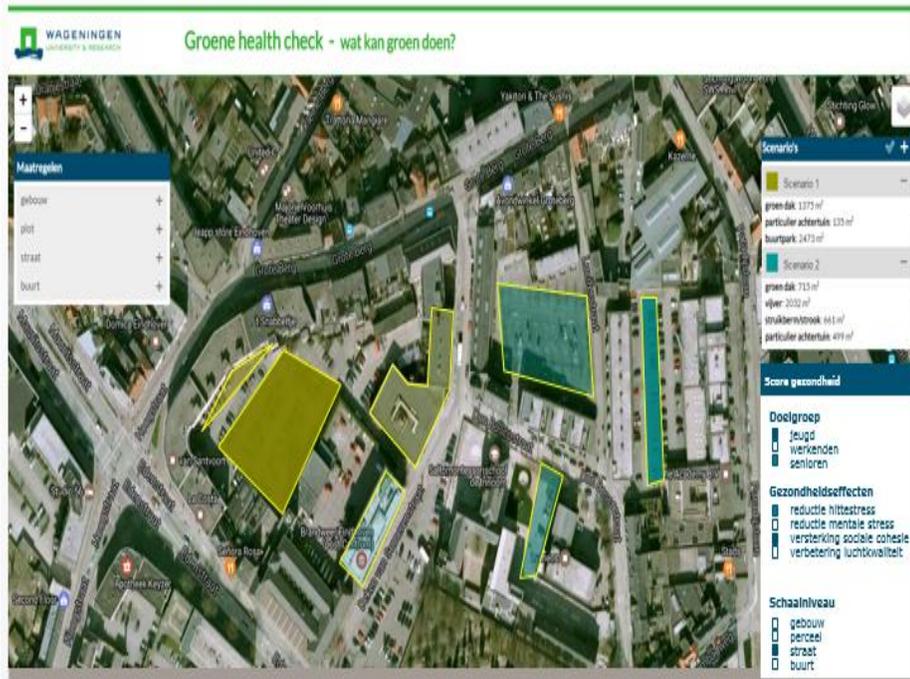
**The project ‘Ecosystem services of plants’ develops instruments that allow the advantages of green to be better taken into consideration in the decision making process**

# Green & Health

## Projects The Green Agenda

### Green health check

**This project develops a tool that includes a spatial system that demonstrates the added value of green. City planners, decision makers, real estate agencies.**



## Projects The Green Agenda

### Green healthy hospitals

**This project maps the effects of green in and around hospitals on the health and well-being of patients, personnel and visitors**





# THE GREEN CITY

LIVE  
WORK  
CARE

**Thank you for your  
attention!**