GREEN ROOFS AS A STORMWATER MANAGEMENT SOLUTIONS

Who we are

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Knauf Insulation

Knauf Insulation
Green Solutions

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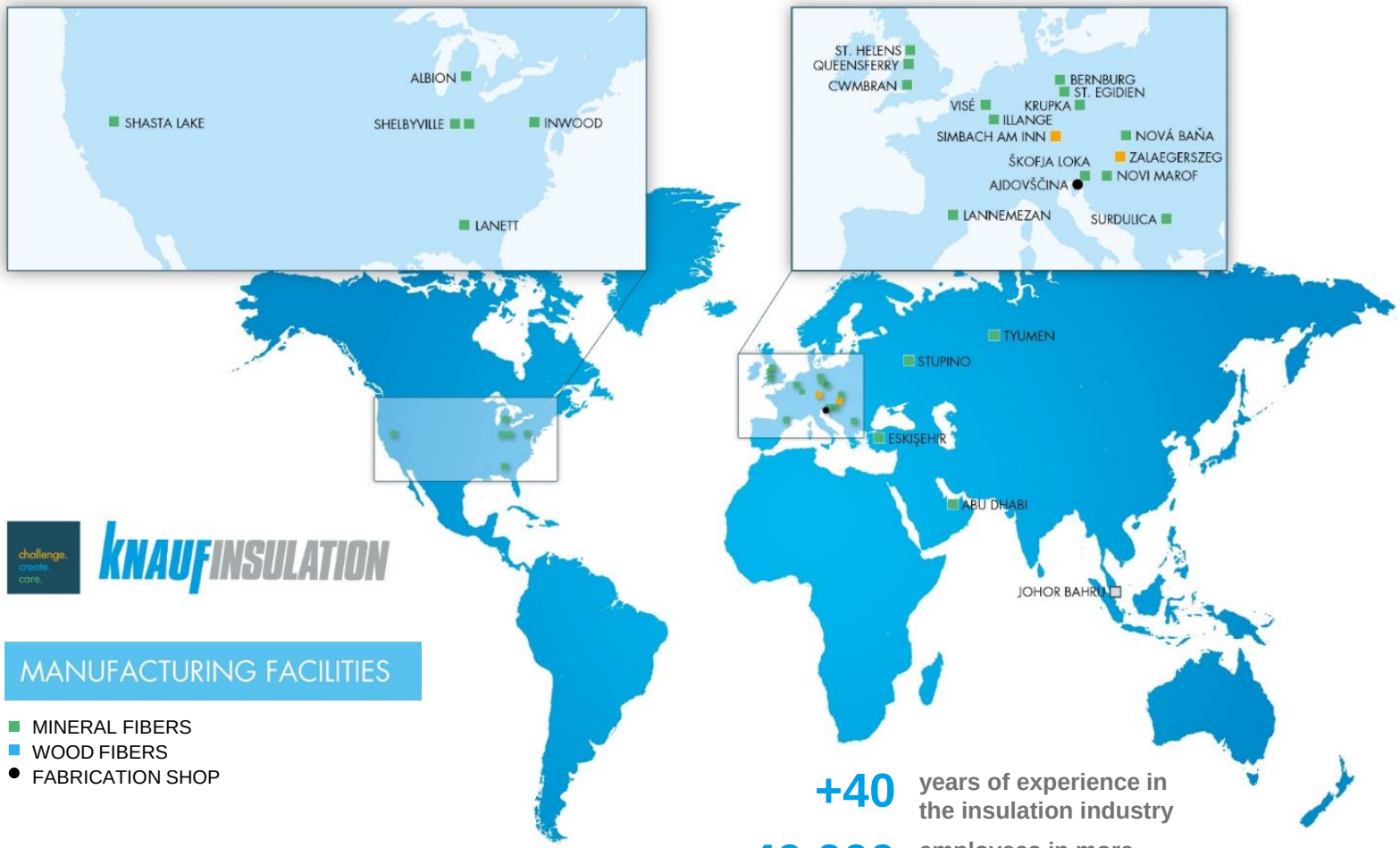
Who we are

Established in 1932, Knauf is a family-owned multinational manufacturer of building materials and construction systems.

Originally, a producer of conventional gypsum materials, now delivering systems and complete solutions for buildings worldwide.



+40 years of experience in the insulation industry

+40,000 employees in more than 90 countries

300 manufacturing sites worldwide

+€12,5 bn turnover in 2021

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Urbanscape® Green Solutions

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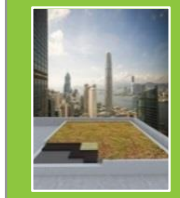

Green Roofs

Living Green Walls

Landscaping

Horticulture

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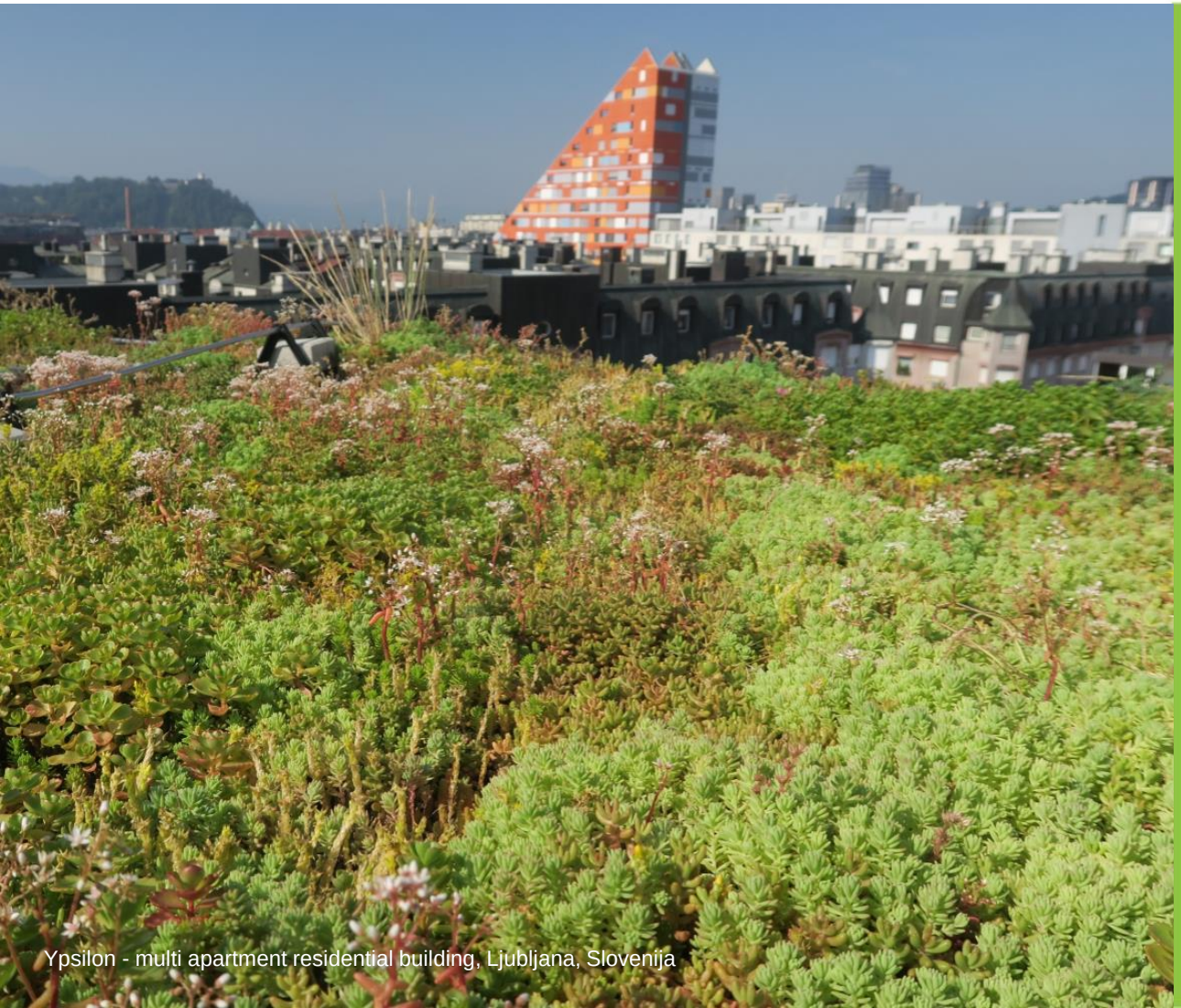


Ypsilon - multi apartment residential building, Ljubljana, Slovenija

Urbanscape® Green Roof

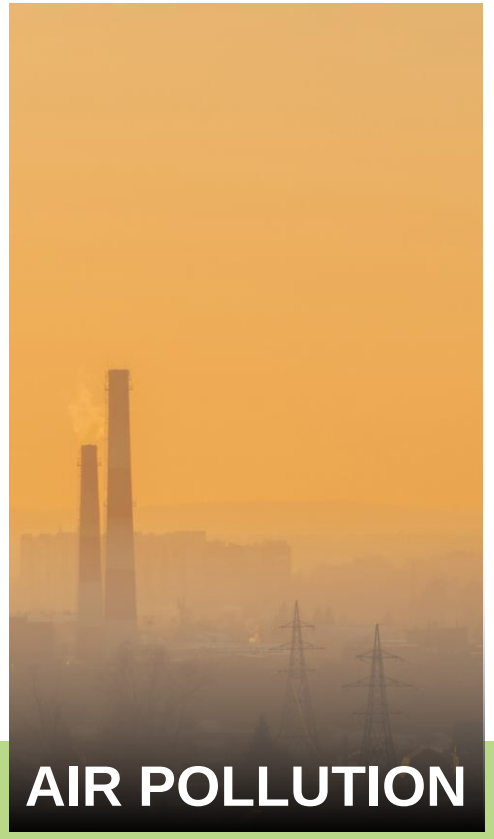
Urbanscape® Green Roof System concepts go beyond the meaning of contemporary architecture and give a new value to the role of buildings within urban planning.

They are designed not only to bring back the natural element in the urban environment but also to provide solutions for important issues such as urban heat island effect and stormwater management.

Nanterre residential buildings, France

Our mission: **Challenge. Create. Care.**

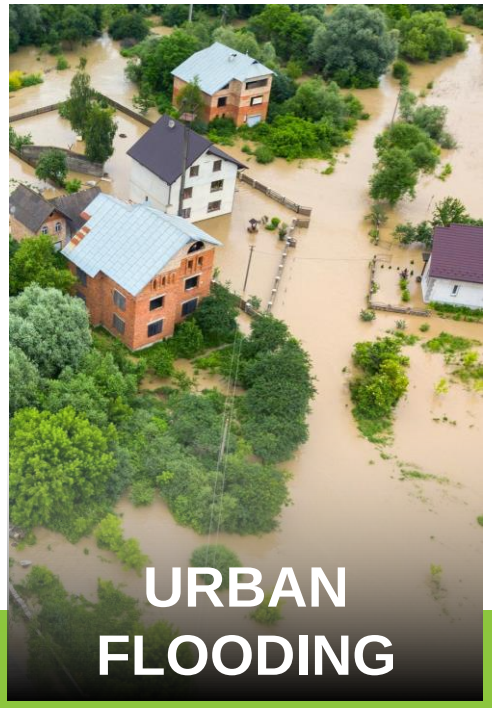
Big city challenges



AIR POLLUTION

About 90% of global citizens live in areas that exceed the safe level in the World Health Organization (WHO) air quality guidelines.

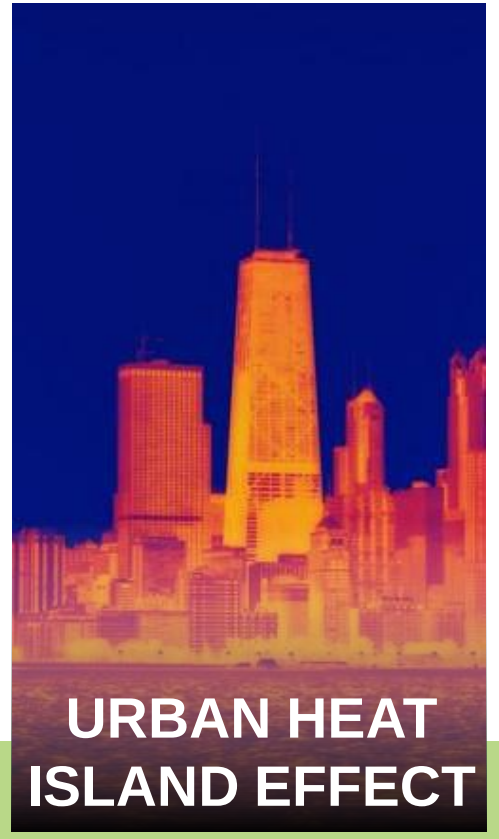
https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution



URBAN FLOODING

People migration to urban region have created dense opaque urban landscape which generates high volume of stormwater runoff and frequent flash flood episodes.

https://www3.epa.gov/npdes/pubs/usw_b.pdf



URBAN HEAT ISLAND EFFECT

On average, urban heat islands are 5 to 7°C warmer during the day, and can increase temperatures by as much as 22°C at night. If actions aren't taken to slow climate change, heat-related deaths from 2031 to 2050 could be 57% higher than they were from 1971 to 2000.

https://www.epa.gov/heatislands/climate-change-and-heat-islands

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STORMWATER URBAN FLOODING

Floods and flooding the streets in Steyr, Austria

Reasons for flooding

- urbanization
- mismanagement of drainage systems
- deforestation
- aged infrastructure

Flooding not only causes infrastructural damage but will also have a negative impact on living standards.

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STORMWATER MANAGEMENT

Flood due to heavy rainfall at Neckargemund at the Neckar river in southern Germany

Impacts of incontrolled stormwater runoff

- flooding - damage to public and private property
- erosion
- aesthetics - dirty water, trash and debris, foul odors
- threatens public health and safety

The cities are threatened more and more, because of long periods of drought, followed by sudden spells of heavy rain.

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WATER SAVING MANAGEMENT

Low water of the Rhine river in Cologne, drought in Germany

Why is it important to save water?

- only 2.5% of all the water in the world is freshwater
- we only have real access to 0.0007% of the planet's water, that's all we have to feed and fuel over 6.8 billion people!
- the lack of clean water affects 1.8 billion people every year
- exponentially consumption of water is increasing day by day

"Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such."

(Excerpt from the recitals of the European Water Framework Directive)

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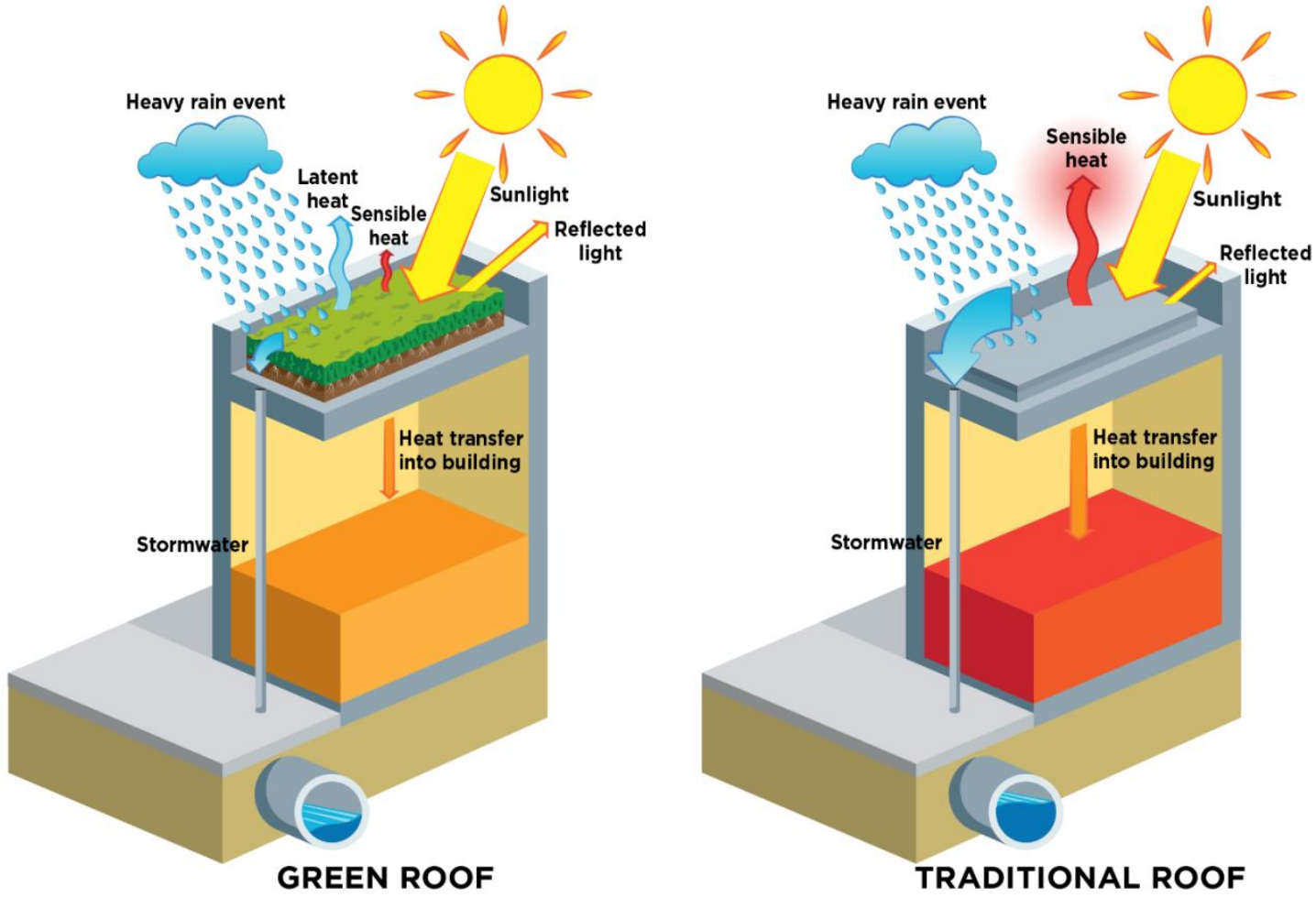
Green roof vs. Traditional roof



U.S. Environmental Protection Agency. (2018). Estimating the environmental effects of green roofs: A case study in Kansas City, Missouri. EPA 430-S-18-001. www.epa.gov/heat-islands/using-greenroofs-reduce-heat-islands.

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Greening the planet

Knauf insulation Experience Center, Škofja Loka, Slovenija

Urban planners & architects are turning cities into **sponges** to save property and make projects more attractive and profitable.

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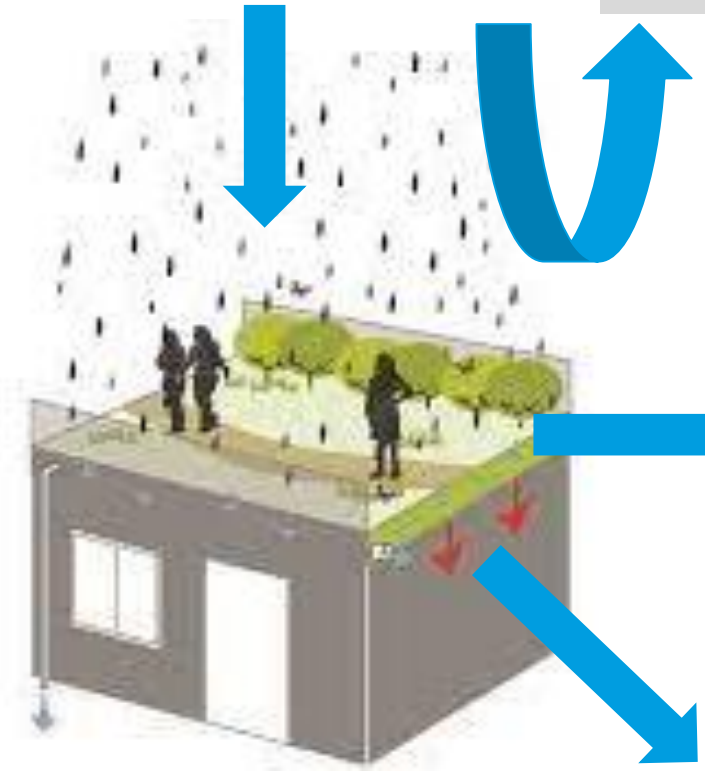
Green Roof and Water management

Plants soak up water

Evapotranspiration



Rainwater is detained in the growing media and water retention layers

Excess water flows to drain

Questions

1. **Water input / output** –
   How much water stays / drains away from Green Roof?
2. **Availability of water for the plants** –
   with some growing media we increase availabilitiy of water with dissolved nutrients, implication of better growth
3. **Water output quality** –
   What is the quality of the runoff?

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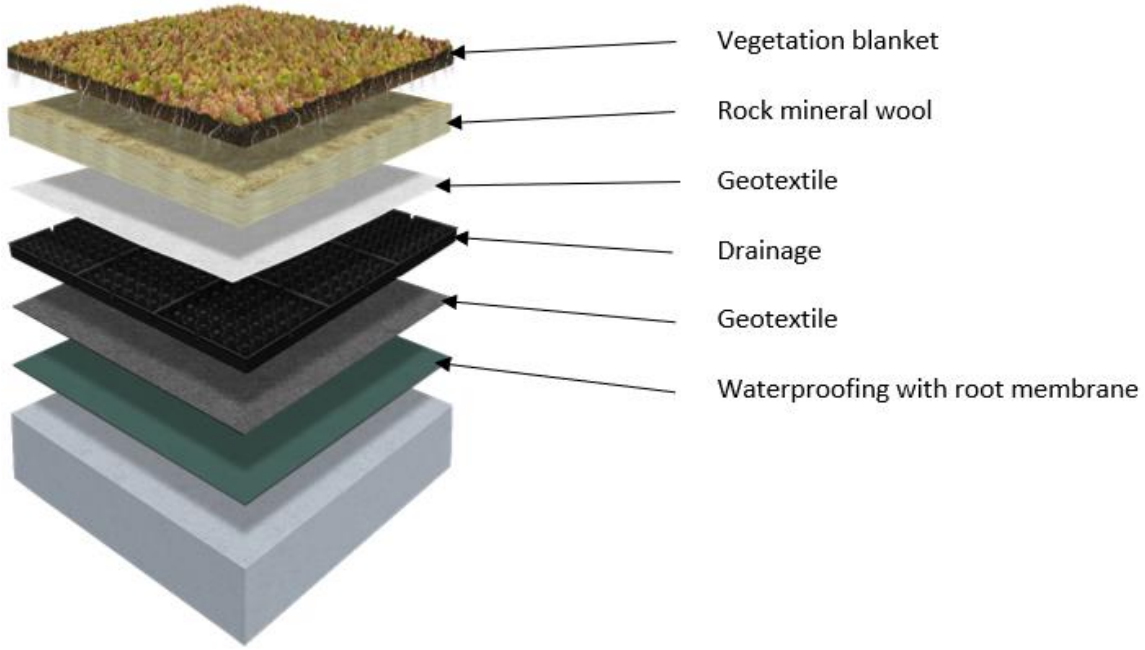
ROCK MINERAL WOOL based Green Roofs

- There are many factors to be taken into account when constructing a green roof for a specific building and location.
- Different characteristics of Intensive vs. Extensive Green Roof systems, in terms of WHC, weight, ...
- The extensive green roof system with rock mineral wool:
  - Lightweight,
  - easy-to-install system,
  - high water retention capacity,
  - designed for green roofs in urban areas to cope with strong stormwater.
  - installed on lightweight constructions
  - thinner and lighter system the same water absorption and detention



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RMW benefits

- Lightweight material
  - density 1/10 or less than substrate
- Excellent water-holding capacity:
  - approx. 7x the weight of the material
- Fire resistant material
- Easy access to water for plants
- Reduced system thickness
- Additional filter layer
- Easy to install

Benefits which can transfer to green roof systems

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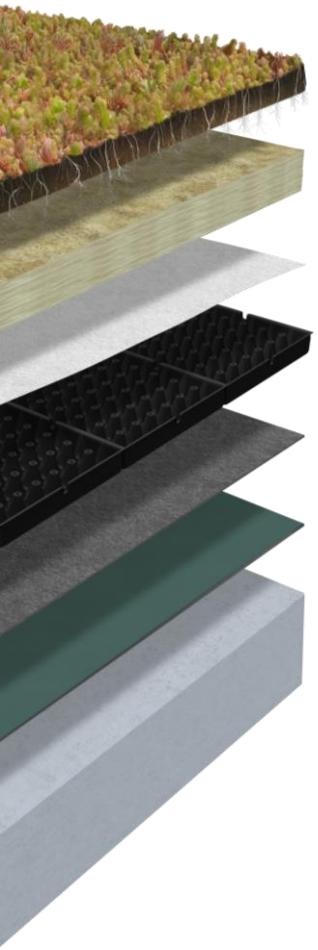
PET tool – case study Berlin



- Location: Berlin, Germany
- Yearly rain quantity in Berlin: 579 mm
- Flat roof with green roof system
- Irrigation: YES
- 2 Green Roof Systems

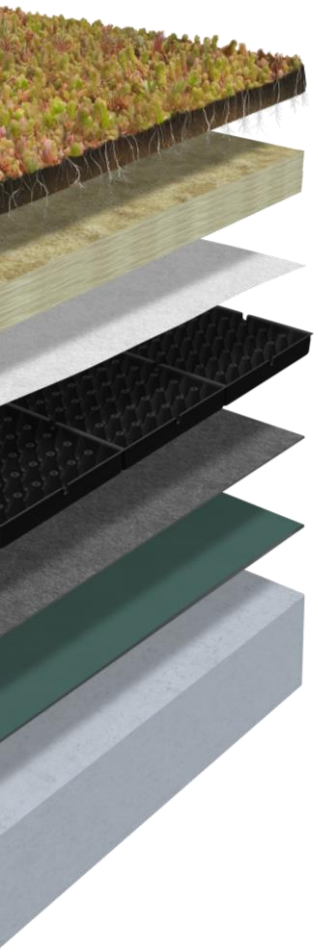
"Classical" System

- Sedum blanket
- Drainage

GR System with RMW

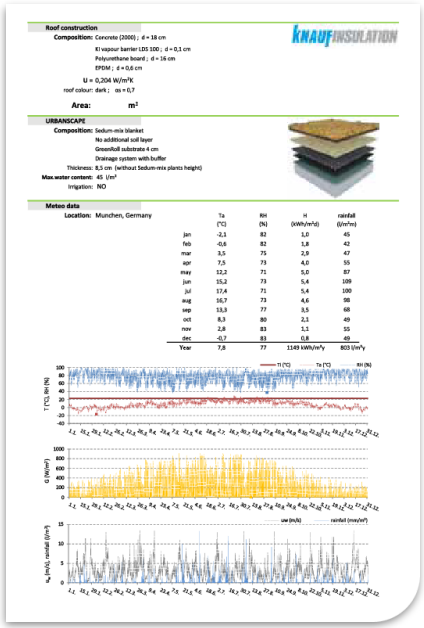
- Sedum blanket
- RMW
- Drainage

PET tool for Urbanscape®

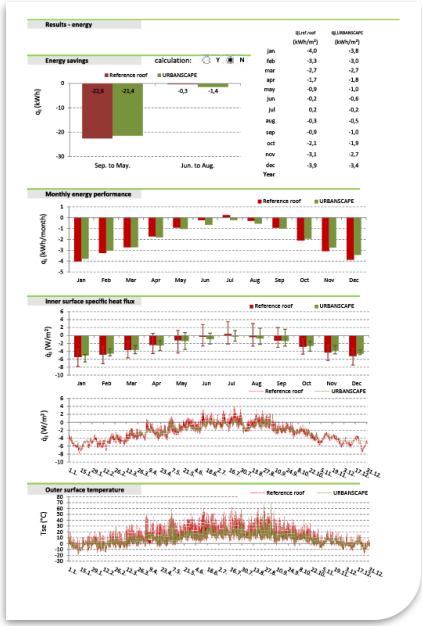


The PET tool is an important part of technical support offered to stakeholders by Knauf Insulation Green Solutions. This software tool optimises the green roof design process, assisting with energy and water management performance and the evaluation of the comparative advantages of green roofs compared to ordinary or existing flat roofs without vegetation.

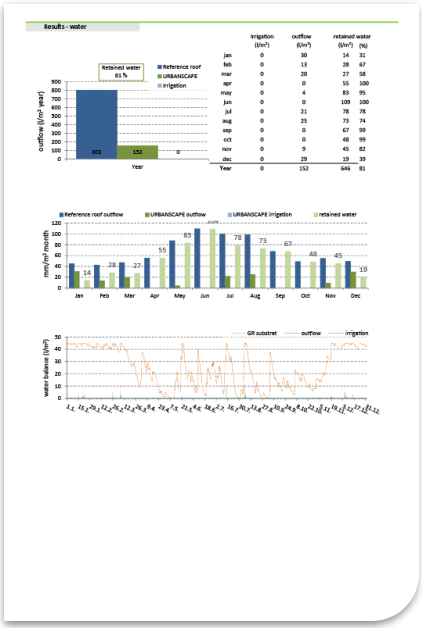
System page with climate data



Energy efficiency page



Stormwater page



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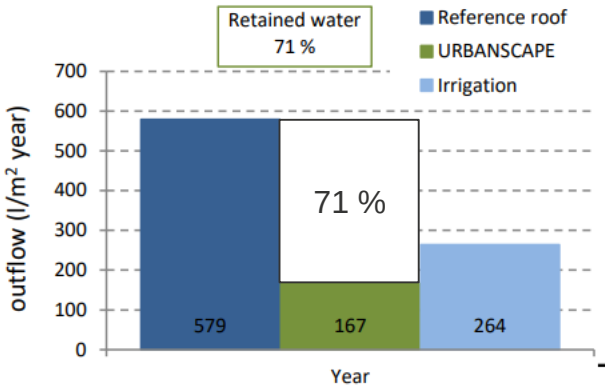
PET Tool – Water management

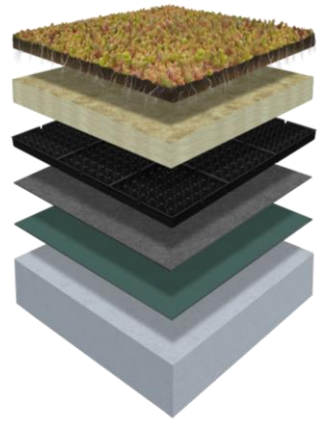
- Green roof build-up (top to bottom):
  - Sedum blanket
  - Drainage with buffer 25

Berlin, Germany

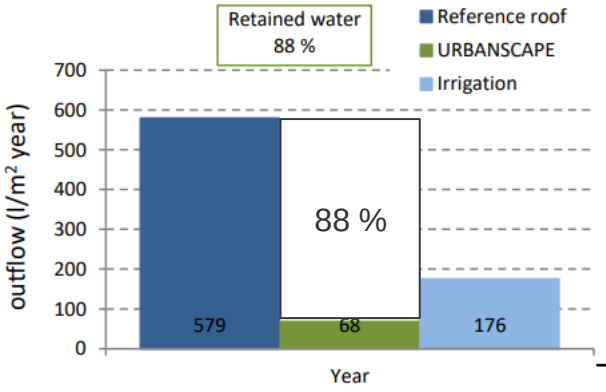


	Irrigation (l/m²)	outflow (l/m²)	retained water (l/m²)	(%)
jan	0	23	18	43
feb	0	7	25	76
mar	5	10	24	69
apr	29	5	34	87
may	38	3	48	92
jun	48	26	49	65
jul	58	15	41	72
aug	53	15	46	76
sep	24	12	35	74
oct	10	4	35	88
nov	0	14	32	69
dec	0	31	19	37
Year	264	167	406	71

Every month outflow



- Green roof build-up (top to bottom):
  - Sedum blanket
  - Rock Mineral Wool
  - Drainage with buffer 25



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jan	0	23	18	43
feb	0	7	25	76
mar	0	10	24	69
apr	14	0	39	99
may	27	0	52	99
jun	41	9	66	88
jul	41	0	57	100
aug	41	0	60	99
sep	14	0	47	99
oct	0	0	39	98
nov	0	0	46	99
dec	0	19	31	61
Year	176	68	504	88

59 % less outflow

PET Tool – Water management

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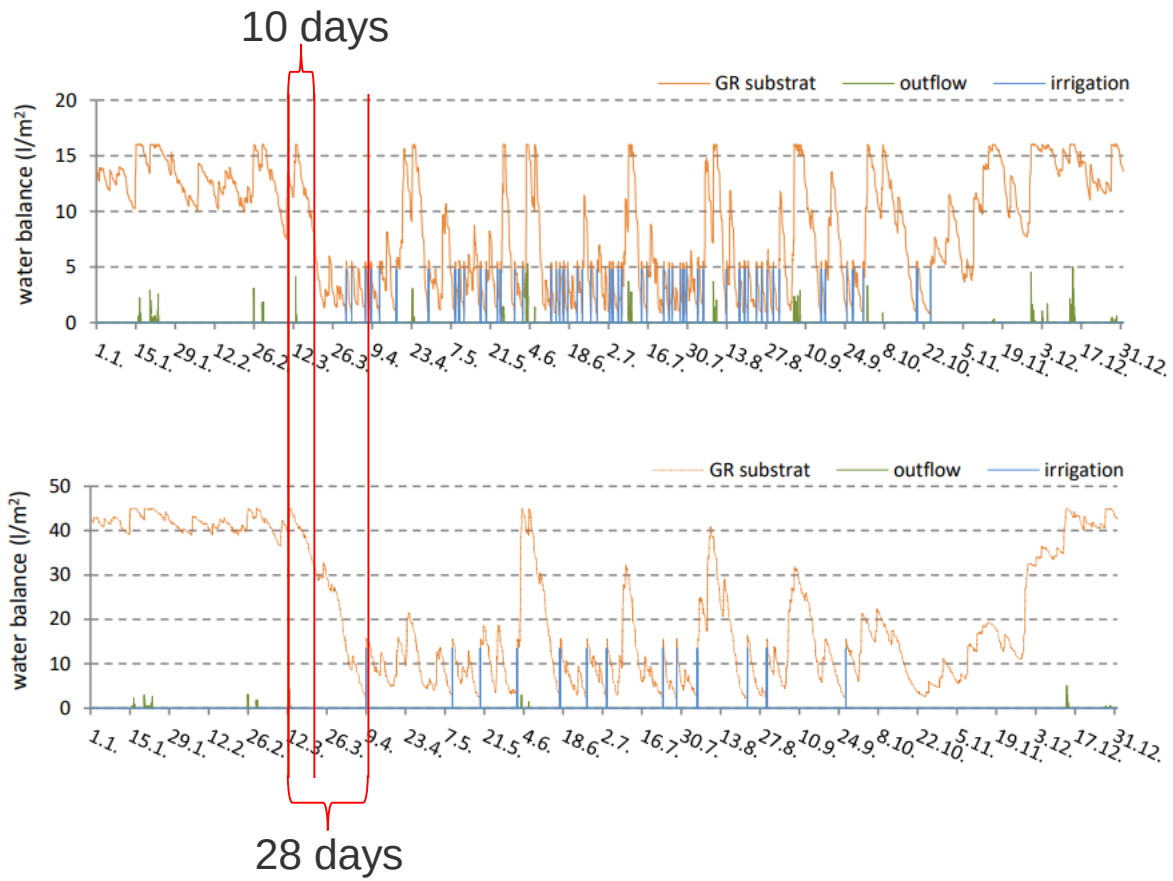

EUREKA project

- Long project name: **Green roofs for retaining stormwater with an online modeling application**

- Key goals is the development of a **new product** „Green Roof for advanced storm water management with associated web application for smart modeling of green roofs for storm water management with raintwater retention system.

- The value of project co-financing: 292.369,79 EUR

- Start of project: 01. 09. 2020
- End of project: 31. 08. 2023

The investment is co-financed by the Republic of Slovenia and the European Union from the European Fund for Regional Development.

EUREKA project

Photo: Green Roofs for advanced Stormwater management, located in Maribor, Slovenia (left) and Bunnik, the Netherlands (right).

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REPUBLIKA SLOVENIJA
MINISTRSTVO ZA GOSPODARSKI RAZVOJ IN TEHNOLOGIJO

30 yearsof EUREKA innovation across borders

EVROPSKA UNIJA
EVROPSKI STRUKTURNI IN INVESTICIJSKI SKLADI
NALOŽBA V VAŠO PRIHODNOST

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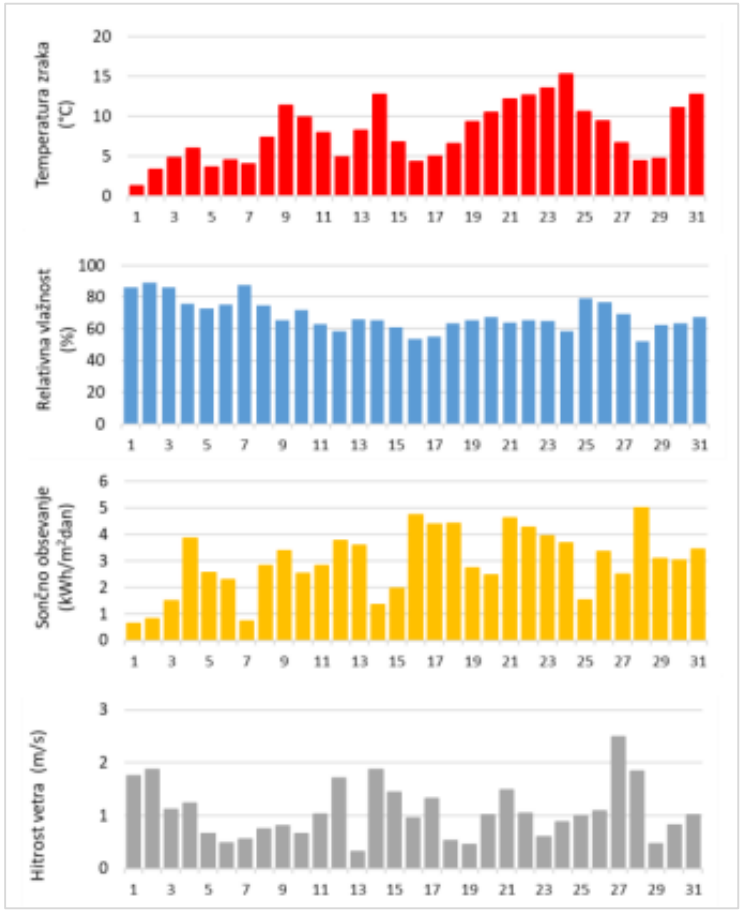
EUREKA project

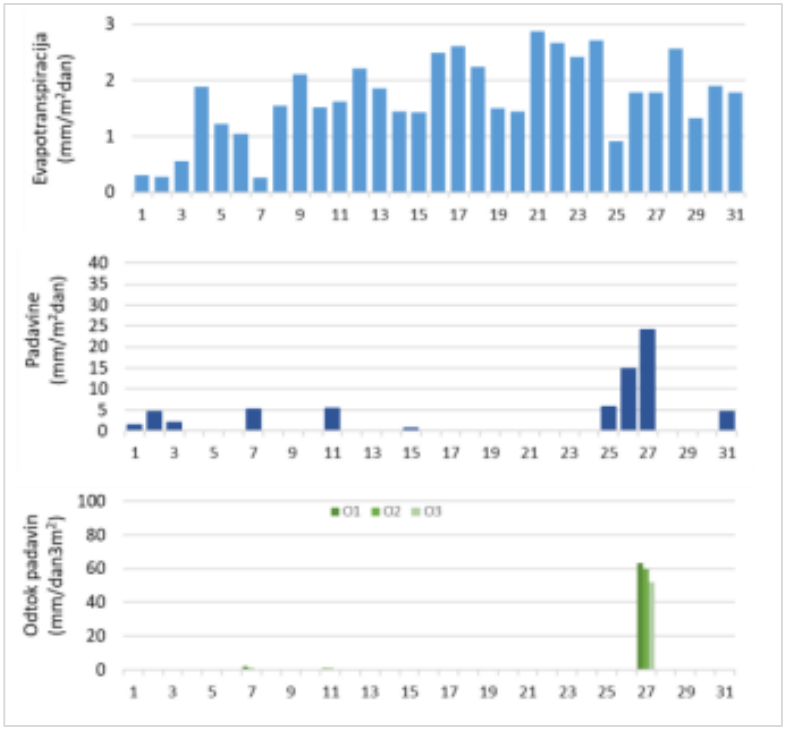
Photo: Platforms with Green Roofs for advanced Stormwater management, located in Maribor, Slovenia (left) and Bunnik, the Netherlands (right).

EUREKA project

Online measurements – weather stations and platforms:

- Temperature
- Relative humidity
- Sun radiation
- Wind speed
- Evapotranspiration
- Precipitation
- Water runoff





EUREKA project

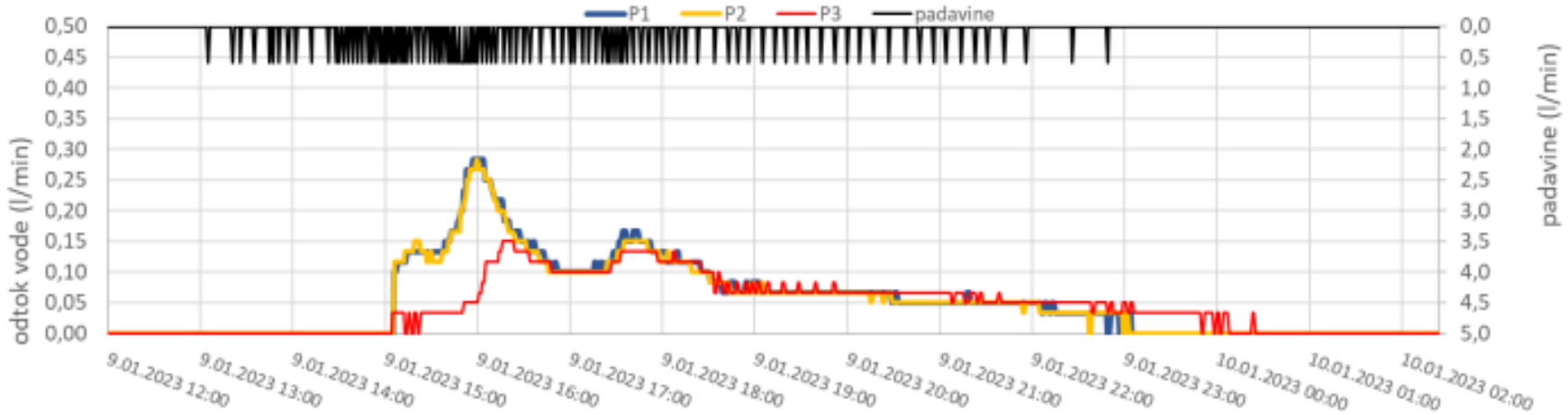


Photo: Dynamics of rainfall and runoff from platforms

Thank you for your attention!

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