

# EmiratesGBC Technical Workshops

## EGBC X KNAUF

### Green Sustainable Solutions – Landscaping, Green Walls, and Green Roofs with Case Studies

Note to online attendees:

Your microphone is muted – if you wish to submit a question, please use the questions box in the control panel.

10<sup>th</sup> March 2023

# Global Challenges

Urban heat island effect

Air pollution (CO<sub>2</sub>, PM particles ...)

Energy loss due to heating and colling of buildings

Rainwater detention & retention

Low biodiversity

Wellbeing



# UAE

Climate change - minimizing the impact of climate change

Clean air and noise pollution - contributing to safe and healthy living conditions

Water resources - efficient management and conservation of water resources

Biodiversity, habitats and cultural heritage - conserved for current and future generations

Green spaces and recreational areas will be developed and are expected to double in size. Nature reserves and rural areas are forecasted to constitute more than 60 per cent of the emirate's total land area. Several **green corridors** will be established to link service, residential and commercial areas.



# DID YOU KNOW?

Avg. global temperature on Earth is 1,1 °C higher than in 1980.

Temperature in °C	
0.6 °C	Extinction of amphibians
1.0 °C	Ice is melting, penguins are endangered
1.6 °C	50% of tundra disappears, moose, lynx and brown bear on extinction
2.2 °C	Extinction of all large mammals in Africa
2.6 °C	Loss of all tropical forests and all tropical forest inhabitants
4.0 °C	70% of all living things subject to extinction, desert across the whole region



\* Extracted from Ends of the World by Peter Brannen is published by Oneworld Publications, 2017

# Our Mission

From Grey to Green



# Proposal



# Proposal



# Green Wall on Garage



And more...



Outdoor solutions



Indoor solutions

...





# GREEN SOLUTIONS - RIYADH

## CASE STUDY

# Pilot Project

10,000 m<sup>2</sup>

Greening Ratio 1:1

## Target:

4000 m<sup>2</sup> Green Roofs  
500 m Green Walls  
5000 m<sup>2</sup> Landscaping – Grass  
100 nos Trees  
200 nos Shrubs

## Goals:

Lower temperature  
Reduced Pollution  
Energy Savings  
Water Savings  
ROI



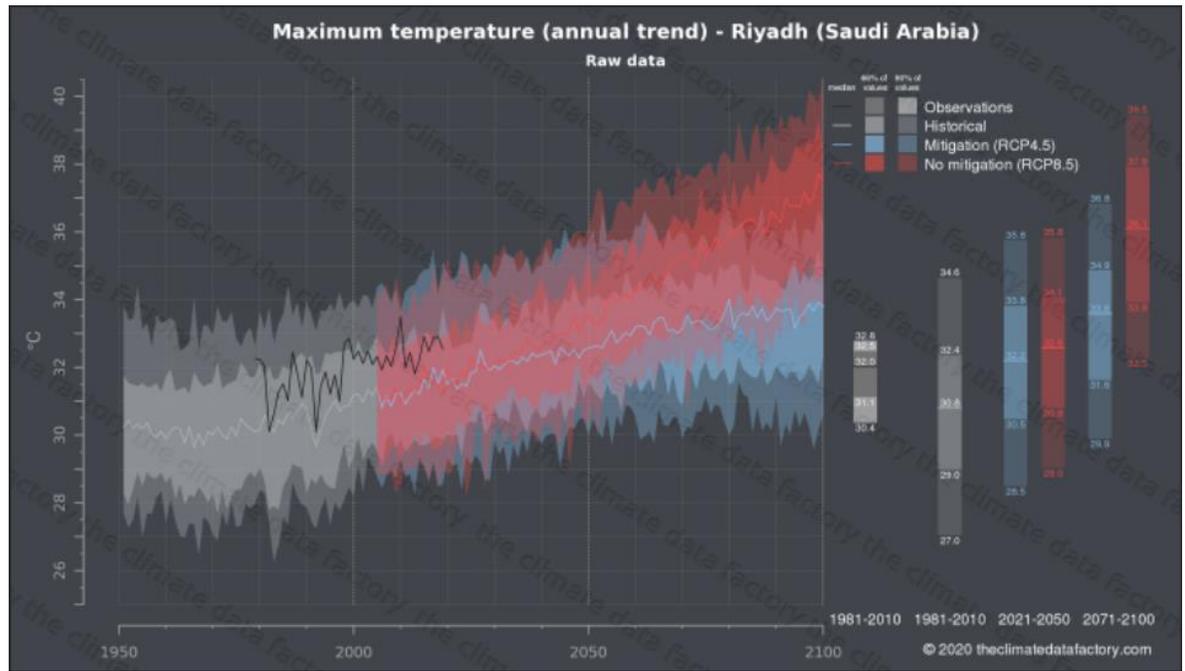
# Considered Targets



	<b>Pilot Project</b> 10,000 m <sup>2</sup>
Green roofs [m <sup>2</sup> ]	4,000
Green walls [m <sup>2</sup> ]	500
Landscaping – grass [m <sup>2</sup> ]	5,000
Landscaping – trees [nos]	100 nos*
Landscaping – shrubs [nos]	200 nos

\* 100 trees are considered equivalent to 500 m<sup>2</sup>

# Challenge #Urban heat island effect



Asphalt temperatures have been measured to run 40-60 degrees hotter than the surrounding air

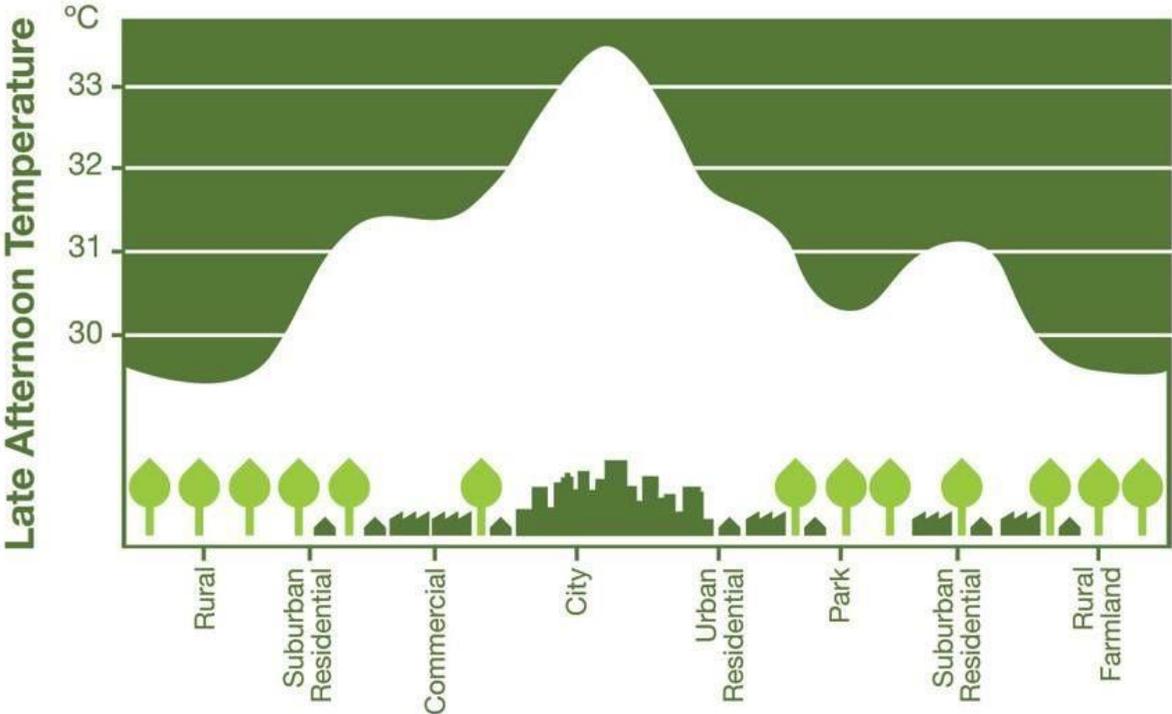
The climate of the Middle East is warming and extreme hot temperature events are becoming common, as observed by the significant upwards trends in mean and extreme temperatures during the last few decades.  
<https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.5489>

Built infrastructure may alter heat hazard. Constructing a significant piece of infrastructure can significantly alter the thermal properties of the area, generally inducing higher temperatures. Any newly built infrastructure covering large enough areas (e.g., new city quarter or harbor zone) should be undertaken with consideration as to how this will influence the local microclimate.  
<https://thinkhazard.org/en/report/215-saudi-arabia/EH>

# Challenge #Urban heat island effect - solutions



Urban Heat Island Effect	Pilot Project
Reduced temperature [°C]	3



# Challenge #Urban heat island effect - solutions

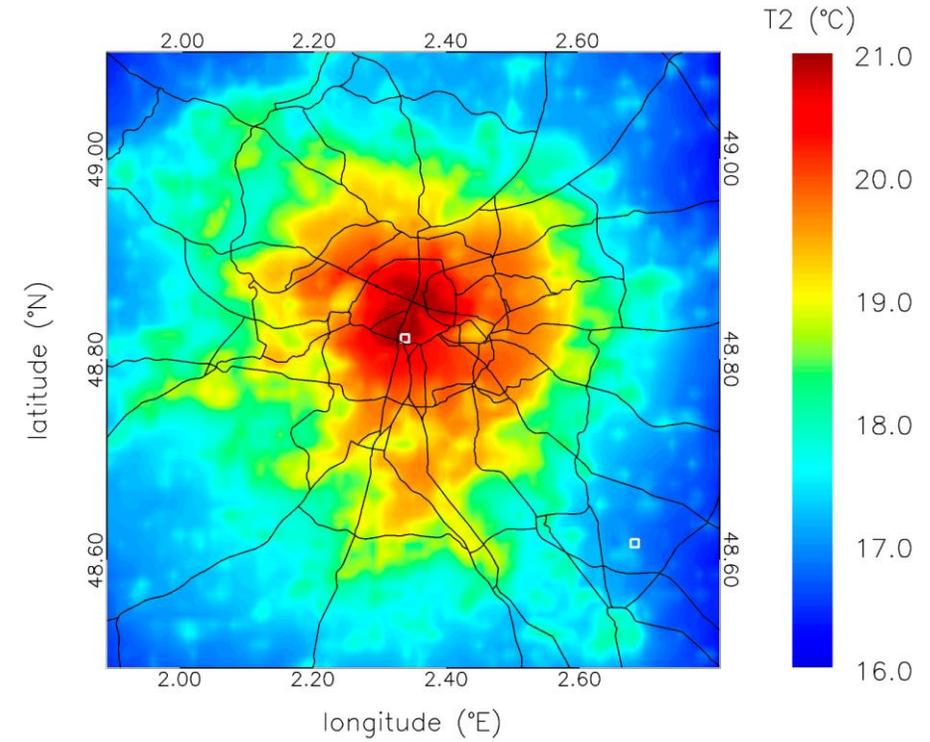
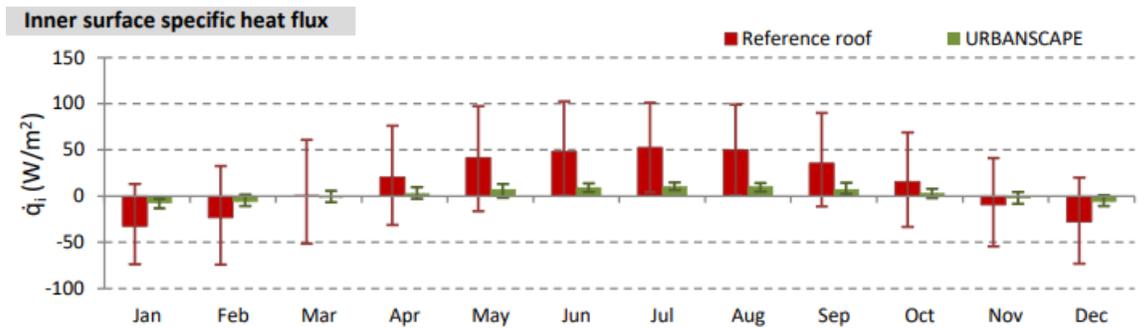


Green roofs, green walls, landscaping

Green walls: urban air - 1,37 °C  
[Manso et al. 2021]

Trees: outside 9,2 °C & indoors 4 °C  
[Rashid et al. 2014 & Misni et al. 2018]

Considered area – Dubai	10.000 m <sup>2</sup>
Green area	10.000 m <sup>2</sup>
Ratio	100 %
Lowered temperature	to 3 °C



# Pollution



## Green roofs, green walls, landscaping

1 m<sup>2</sup> green roof = 1,3 kg CO<sub>2</sub>/year

[Koronuma et al. 2018]

1 m<sup>2</sup> of green roof catches up to 0.22 kg of dust particles each year

[Huang et al. 1994]

Average urban voice insulation with green roofs & walls is 5,5 dB

[Manso et al. 2021]

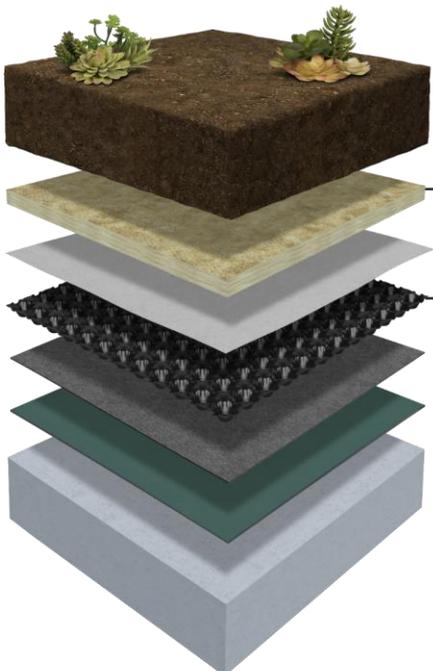
Reduced Pollution Pilot Project #2	Area [m2]	CO2 [kg/year]	PM10 [kg/year]	O3 [kg/year]	NO2 [kg/year]	SO2 [kg/year]
Green roofs	4,000	5,200	4.5	18	9.3	2.6
Green walls	500	1,150	1.3	1.0	0.5	0.3
Landscaping – grass	5,000	6,500	5.6	22.5	11.7	3.3
Landscaping – trees	100 nos	2,500	557	2,835	702	53
Landscaping – shrubs	200 nos	146	0.1	0.5	0.2	0.1
<b>Total</b>		<b>15,496</b>	<b>568.5</b>	<b>2,877</b>	<b>723.7</b>	<b>59.3</b>
<b>Total [t/year]</b>		<b>15.5</b>	<b>0.6</b>	<b>2.9</b>	<b>0.7</b>	<b>0.05</b>

# Challenge #Energy loss due to heating and colling of buildings



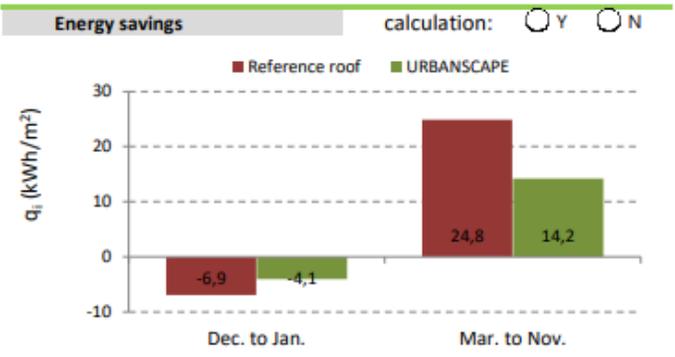
Due to a rapidly escalating population and a high level of economic growth, UAE is experiencing a vigorous infrastructure expansion, especially with respect to residential buildings. As a result, energy demand for residential buildings is of a very high level.

# Challenge #Energy loss due to heating and colling of buildings - solutions

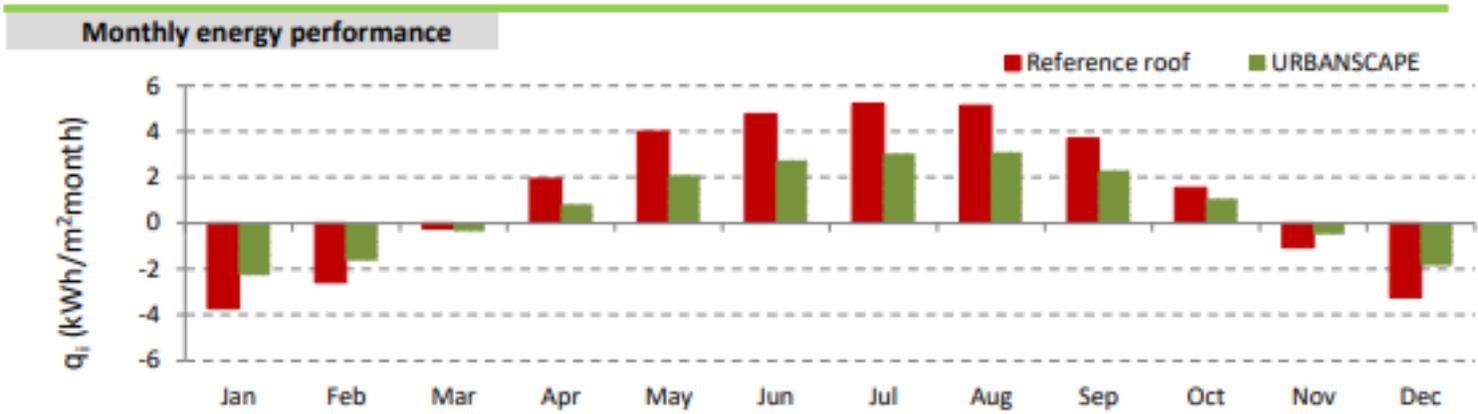


→ Urbanscape Green Roll 40

→ Urbanscape Drainage with Buffer 25



**4000 m<sup>2</sup>:**  
 Reference roof: -126,800 kWh  
 Urbanscape roof: -73,200 kWh  
Savings 53,600 kWh



# Challenge #Photovoltaics on green roofs



+



**Yearly sun energy in Dubai: 2200 kWh/m<sup>2</sup>**

<https://meteo.arso.gov.si/>

**$\eta$ : 22 %; S of solar cells: 5.000 m<sup>2</sup>;**

**Produced energy: 2.420 MWh**

**Enhanced en. production due to green roofs: 8 %**

[Shafique et al. 2020]

**Produced energy altogether: 2.614 MWh**

**Difference: 39 kWh/m<sup>2</sup>**

**Savings: 38.500 AED/year  
7.7 AED/m<sup>2</sup>**

# Challenge #Low level biodiversity - solutions



[raziskava Bevk et al. 2019]

Green roofs, green walls, landscaping

Roofs are an important source of biodiversity

1,02 pollinator/m<sup>2</sup>

[raziskava Bevk et al. 2019]

4,000 m<sup>2</sup> green roofs = 4,080 pollinators

# Health and well-being in green environment



↓ **Employees missed work 23% less often**

[Arup et al. 2014]

↓ **Lower asthma rate for ¼ on each ~350 trees/km<sup>2</sup>**

[Lovasi et al. 2008]

**3,3-times increased likelihood of exercise frequency in a green environment**

[Forestry Commission et al. 2010]



**Table 3.** Physiologically equivalent temperature (PET) range for different grades of human thermal perception and associated physiological stress [31].

PET (°C)	Thermal perception	Physiological stress
18–23	Comfortable	No thermal stress
23–29	Slightly warm	Slightly heat stress
29–35	Warm	Moderate heat stress
35–41	Hot	Strong heat stress
>41	Very hot	Extreme heat stress

[Matzarakis et al. 1999]

# Urbanscape® solutions

## Trees & Raised gardens



## Green roof



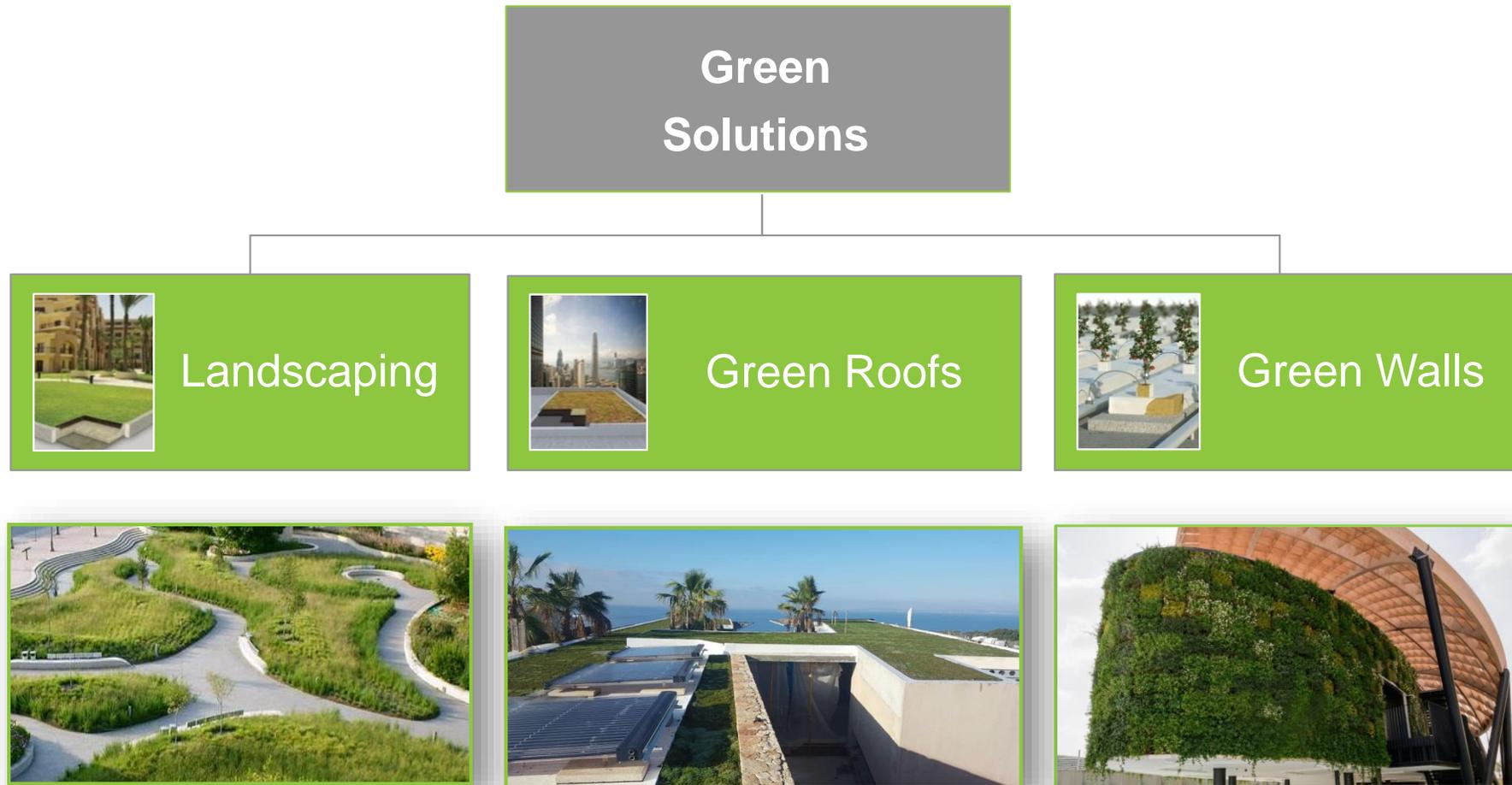
## Green wall



How do we achieve  
this?



# Green Solutions



# Application of Rock Mineral Wool in different Green Solutions

The main benefits of the Rock Mineral Wool:

- 1. Significant water savings**
- 2. Reduction in mortality rate**
3. Perfect water absorption and distribution
4. Providing GREEN spaces in demanding environment
5. Pure volcanic rock, sustainable, no additives, no chemicals



# How RMW is made?



Made of pure rock mineral fibers.

## Volcanic rock

are converted into super absorbent mineral fibers.

## No additives

100% pure mineral growing media made of rock mixture (diabase, dolomite, basalt).



## Reusable

Can be further used as soil enhancer.

## How it works?

Innovative and easy to install system designed for various landscaping applications.

## Unique solution

for growing plants in the most demanding of environments.

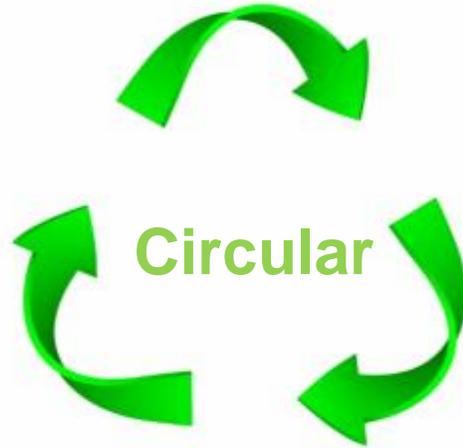
## Better root distribution

which in turn encourages good plant growth and development.

## Superior water absorption

and water retention properties, releasing water when required and reducing evaporation at higher temperatures.

# From nature to nature



# 1. Landscaping

Applications for Landscaping



# Benefits:

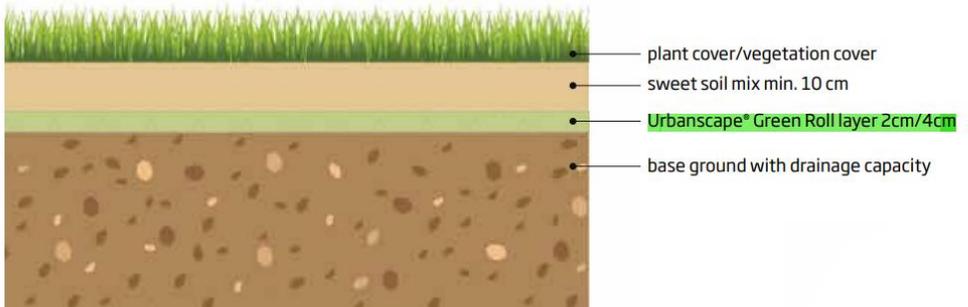
Green areas in cities, such as parks, gardens, and urban forests, can provide numerous benefits to the environment, the community, and the individuals living in urban areas. Some of the benefits of green areas in cities include:

- 1.Improved air quality:** Plants absorb carbon dioxide and other pollutants from the air and release oxygen, improving the air quality in urban areas.
- 2.Climate regulation:** Green areas help to regulate the temperature of urban areas by reducing the heat island effect caused by the concentration of buildings and pavement.
- 3.Increased biodiversity:** Green areas provide habitats for various species of plants and animals, increasing the biodiversity of urban areas.
- 4.Noise reduction:** Plants can absorb and reflect sound, reducing noise pollution in urban areas.
- 5.Improved mental and physical health:** Access to green areas has been linked to improved mental health, reduced stress levels, and increased physical activity.
- 6.Community building:** Green areas provide a space for community members to gather, socialize, and engage in outdoor activities together.
- 7.Economic benefits:** Green areas can increase property values and attract businesses, tourism, and investment to urban areas.

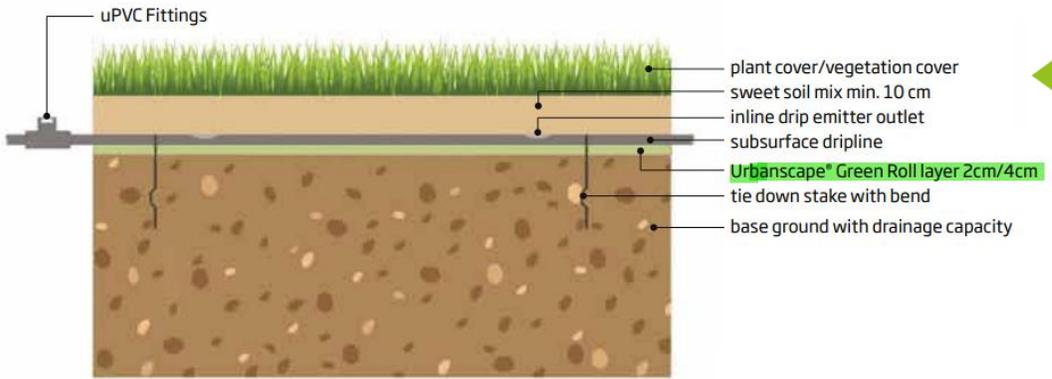
Overall, green areas are essential components of healthy and sustainable cities, providing a range of benefits to both the environment and the people living in urban areas.



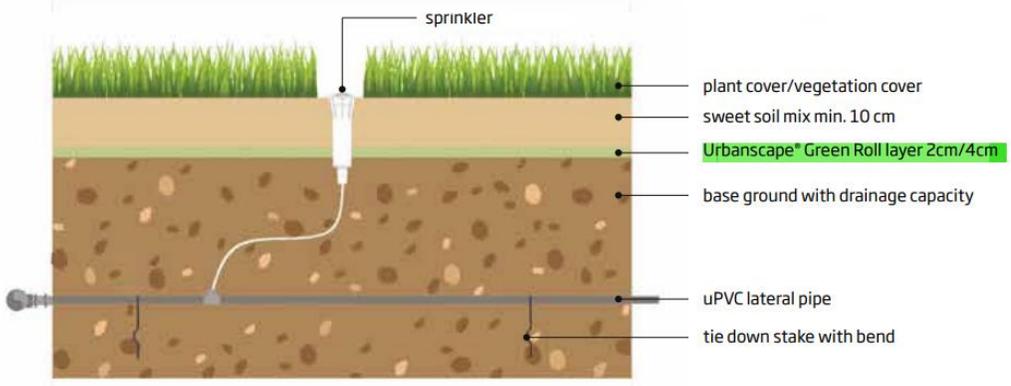
# Applying Rock Mineral Wool in Landscaping



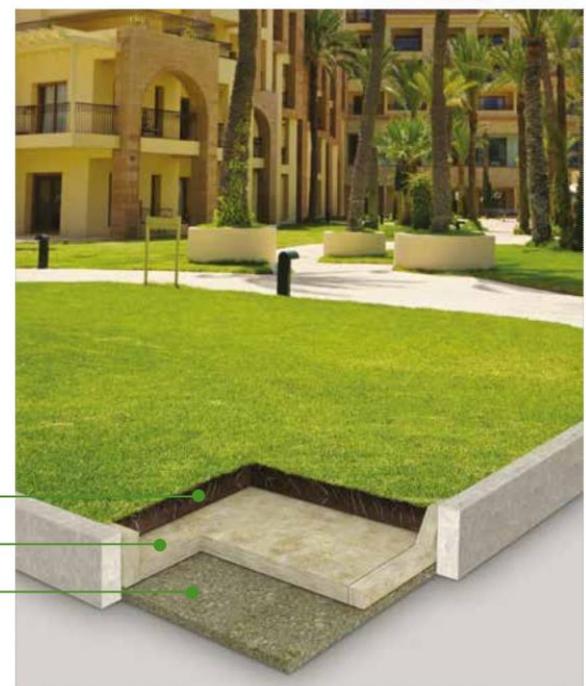
Without an irrigation system



With subsurface irrigation



With sprinkler irrigation

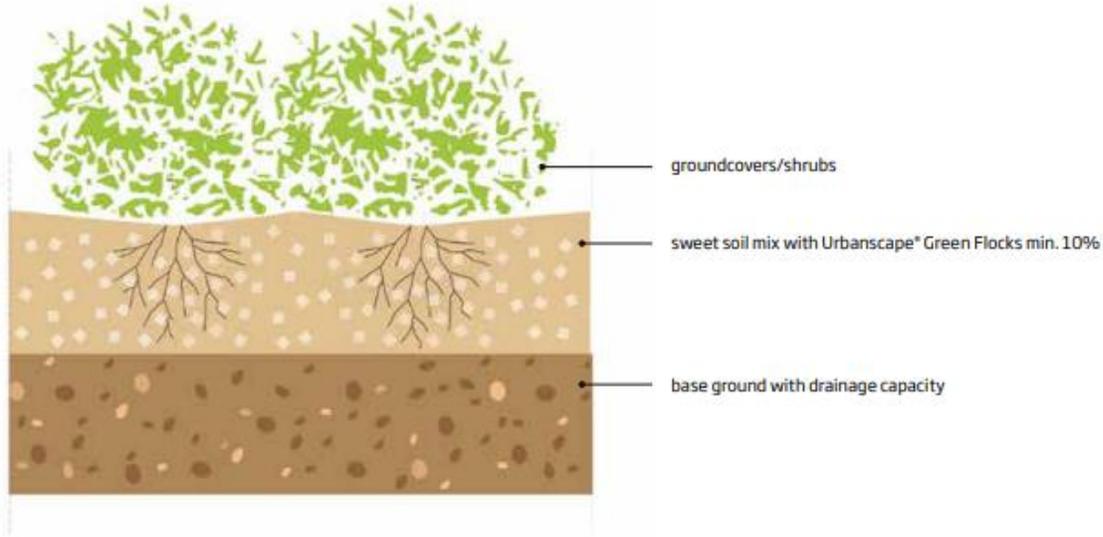


Vegetation layer  
Urbanscape® Green Roll  
Base ground

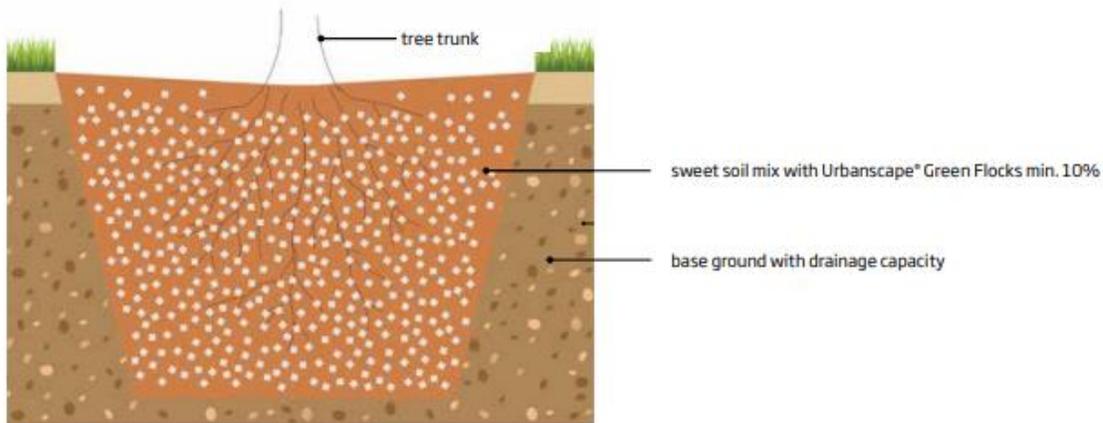
Urbanscape® Landscaping solutions

# Applying Rock Mineral Wool in Landscaping

Groundcovers/shrub



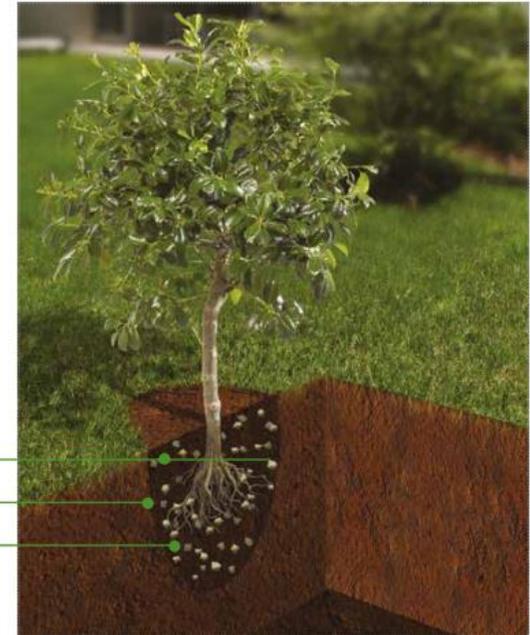
Tree pit



Urbanscape® Green Flocks

planting pit

soil/commercial substrate/sweet soil mix



Urbanscape® Landscaping solutions



# Grass

# TEST RESULTS: Week 18 – Grass **without** RMW

**Roots: 5 – 7 cm**

**Grass: Brown spots, Fungus**



# TEST RESULTS: Week 18 – Grass **with** RMW

**Roots: 15 – 20 cm**  
**Grass healthy**  
**50% less water for irrigation**



# Performance Case Studies

## Case Study Kuwait

Kuwait is a small, desert country, situated at the northeast corner of the Arabian Peninsula and is famous for its very dry and hot climate. The flat, sandy Arabian Desert covers most of Kuwait. The summer months (April to October) are extremely hot and dry (it never rains during the summer months) and while the usual day temperatures are 33°C, during the months of June, July and August they rise up to 51°C i.e. 124°F. Winters (November to March) are cool with limited rain. Due to these weather conditions in which only drought tolerant plants can survive without additional irrigation, you will find very little vegetation in Kuwait.

**Urbanscape® Landscaping Solutions:** Urbanscape® Green Roll

**Vegetation used:** *Paspalum* grass

**Type/area:** 3 test plots



**Plot 1**  
10 cm regular soil on top of 2 cm  
Urbanscape® Green Roll



**Plot 2**  
10 cm regular soil on top of 4 cm  
Urbanscape® Green Roll



**Control plot**  
50 cm regular soil

## Results

- less water usage and lower irrigation frequency was established after installation
- **average water savings of up to 50 % have been achieved**
- lower cost of irrigation and maintenance
- prolonged average life cycle of grass in extreme conditions was observed



# Landscaping Applications



Public parks



Hotels/resorts



Highway greening



Desertification



Tramway greening



Challenging urban applications



Private villas



Agriculture in dry areas



Home & gardening



Urban farming



Roundabouts

## 2. Green Roofs

What are the main benefits?

- |   |  |   |
|---|--|---|
|  Complete solution                    |  Low construction height      |  Improved root growth  |
|  High water absorption and retention |  Lightweight solution        |  Sustainable solution |
|  Rainwater purification             |  Fast and easy installation |  Instant green       |
|  Cleaner air                        |  Stronger vegetation        |   |



## Benefits:

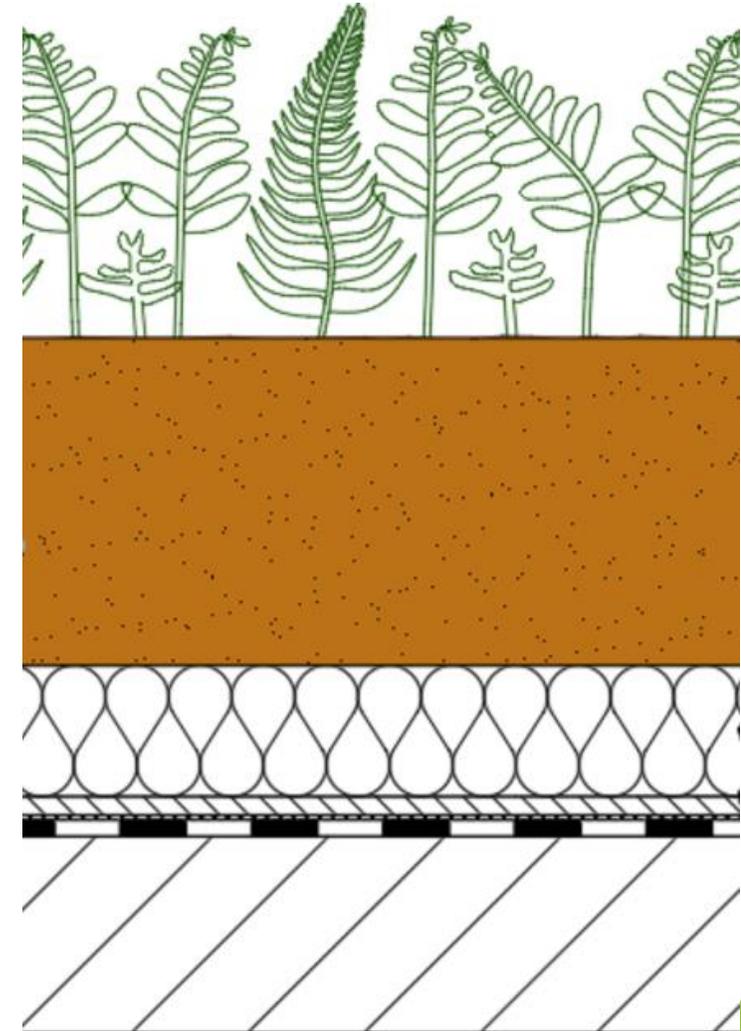
- **Reducing urban heat island effect:** Green roofs absorb and deflect sunlight, reducing heat absorption and urban heat island effect, which can help to cool cities. Surrounding air temperature can be potentially reduced for up to 3°C
- **Reducing noise pollution**
- **Improving air quality:** Vegetation on green roofs filters the air by absorbing pollutants and reducing the amount of dust particles in the air:
  - Every square meter of green roof absorbs approx. 1.4 kg of CO<sub>2</sub> per year:  
1,000,000 m<sup>2</sup> of green roofs = 1,400 tons of CO<sub>2</sub> absorbed per year
  - Every square meter of green roof can clean up to 0,0015 kg of PM<sub>10</sub> particles, 0,002 kg of NO<sub>3</sub>, 0,001 kg of NO<sub>2</sub>.
- **Visual benefit (aesthetics, increasing green space)**
- **Enhancing energy efficiency:** The insulation provided by the soil and vegetation on green roofs can help to reduce energy consumption by regulating building temperatures. Urbanscape Green Roof comparing to „normal“ green roof is more efficient (less water needed)
- **Providing habitats for wildlife:** Green roofs provide habitats for insects, birds, and other small animals, which can help to increase biodiversity in urban areas



**Overall, green roofs offer environmental, economic, and social benefits, making them a valuable addition to urban landscapes**

# Applying Rock Mineral Wool on Green Roofs

- **Improved Water Conservation:** RMW can store excess water (rain), which can then be released gradually to plants as needed, reducing water waste and ensuring that plants receive a steady supply of moisture.
- **Reduced Irrigation Needs:** By reducing the need for frequent irrigation, water retention materials can help save time and money on landscaping maintenance.
- **Enhanced Plant Growth:** Adequate water supply is essential for plant growth, and RMW can help keep the soil moist and promote healthy root development, leading to stronger and more vibrant plants.
- **Water to Air Ratio:** provides optimal environment for the roots.
- **Better Resistance to Drought:** During periods of drought or water scarcity, RMW can help plants survive by retaining moisture in the soil, reducing stress on the plants and helping them recover more quickly after drought conditions have ended.



## 3. Green Walls

Green walls, also known as living walls or vertical gardens, are structures that incorporate plants and vegetation on the walls of buildings or other structures.



## Benefits:

- 1. Improved air quality:** Green walls can help to remove harmful pollutants from the air, improving the overall air quality in the surrounding area.
- 2. Enhanced aesthetics:** Green walls can improve the visual appeal of buildings and structures, creating a more attractive and pleasant environment.
- 3. Reduced energy costs:** Green walls can help to insulate buildings and reduce the amount of energy needed to heat or cool them, reducing energy costs.
- 3. Noise reduction:** Plants can absorb and reflect sound, reducing noise pollution in surrounding areas.
- 4. Improved mental health:** Access to green spaces has been linked to improved mental health, reduced stress levels, and increased relaxation. Green walls can provide these benefits to people who may not have access to traditional green spaces.
- 5. Biodiversity:** Green walls can provide habitats for various species of plants and animals, increasing the biodiversity of urban areas.
- 6. Educational opportunities:** Green walls can serve as educational tools to teach people about the benefits of plants and sustainable living.



# Applying Rock Mineral Wool on Green Walls

- Light weight
- Smart system
- Instant Green
- Optimal internal water distribution





**Sustainability is the key  
to a better future**

# Thank you

## for your attention

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