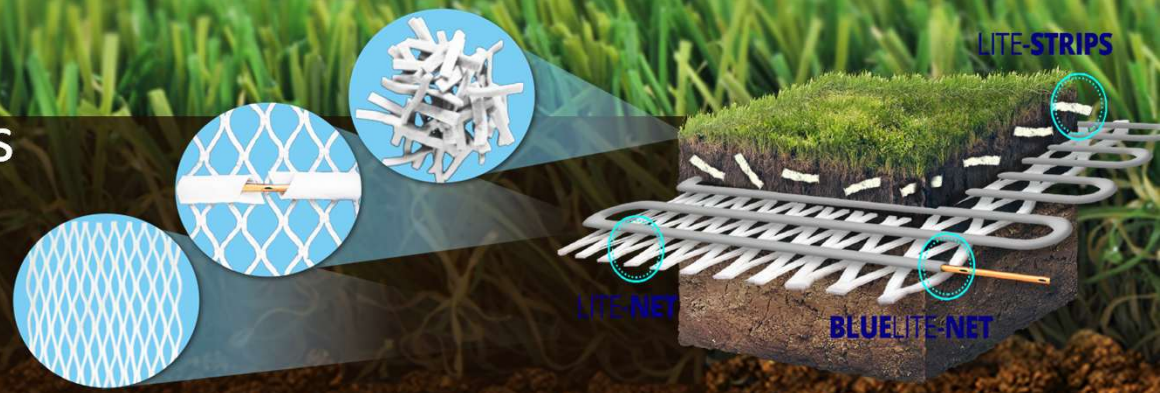
FUTURESCAPE GLOBAL
In association with IFLA

LITE-SOIL®
All in ONE: Air-Soil-Water

Subsurface irrigation systems as a response to climate change particularly in hot, dry climates like in Saudi - Arabia



OVERVIEW

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2. **CLIMATE CHANGE & CONSEQUENCES FOR PLANTS**

3. **SOLUTION? SUBSURFACE IRRIGATION**

4. **SUBSURFACE TEXTILE IRRIGATION SYSTEMS**

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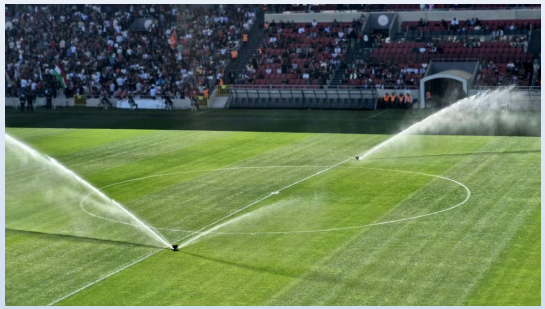
a) (coated) tubes for subsurface irrigation
b) Full surface textile systems + (coated) tube
c) Net shaped textiles + coated trip irrigation tube

7. SUBSURFACE TEXTILE WATER STORAGE STRIPS & DISTRIBUTION NET

1. CONVENTIONAL SURFACE IRRIGATION with sprinklers or drippers



ADVANTAGES:

- Cost effective
- Visual check
- Easy to automatize
- Flexible
- Easy to renew

DISADVANTAGES:

- Evaporation of valuable drinking water
- Wind drift
- Drip tubes and pop-up sprinklers get damaged by UV, heavy loads and vandalism
- High water consumption
- Mowing or walking not possible during irrigation
- High sensitivity to climate change
- Risk of surface felting with soil compaction
- Plants only grow where the drip pipe runs

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1. EXAMPEL CONVENTIONAL DRIP SURFACE IRRIGATION & CONSEQUENCES

Dubai, 30.1.2026

2. CLIMATE CHANGE AND CONSEQUENCES FOR THE PLANTS

Copernicus Climate Change Service (C3S) 9th October 2024:
„The global mean temperature anomaly for January-September was 0.71°C above the 1991-2020 average and 0.19°C warmer than the same period in 2023. This makes it very likely that **2024** will end up as the **warmest year** on record"*1

*1 Data source: ERA5 • Reference period: pre-industrial (1850–1900) Credit: C3S/ECMWF

3. SOLUTION? SUBSURFACE IRRIGATION

a) Subsurface drip irrigation (SDI), sometimes in combination with hydrogels. Mostly used in agriculture.

b) Subsurface textile irrigation systems (STI). Mostly used in gardening and landscaping.

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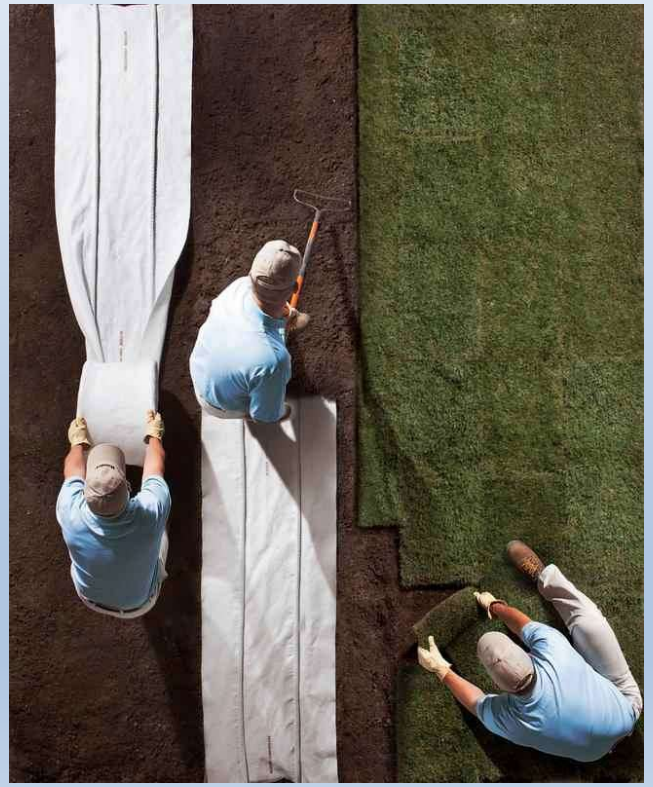
SDI



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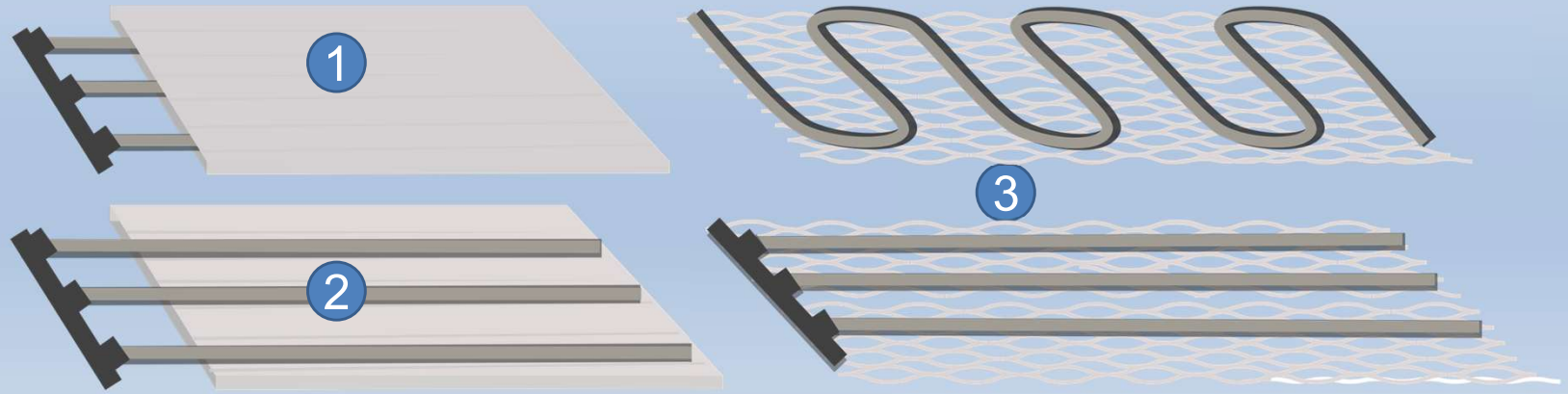
STI

4. SUBSURFACE TEXTILE IRRIGATION SYSTEMS

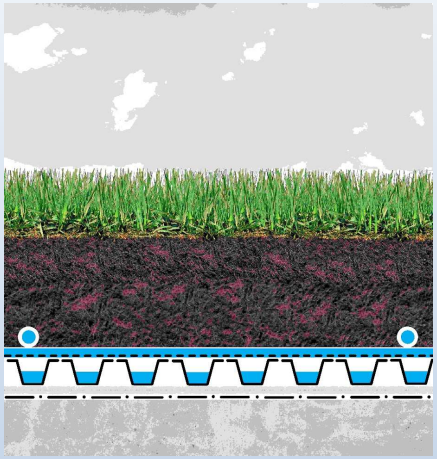
- Usually nonwovens with an air void content of 80-90% are used – a lot of water can be stored internally in these pores and distributed by capillary action. Some of these nonwovens store more than 10 liters water/kg
- The systems are installed usually at root depth in order to utilize water as effectively as possible
- Drip irrigation tubes are mostly protected by a nonwoven so that roots cannot grow in
- In the case of individually coated tubes, the leaking water is distributed vertically in the non-woven coating, transferred to the underlying nonwoven via contact and distributed over the surface

<u>Various options for installing the tubes:</u>

a) embedded between 2 full-surface textiles 1
b) individually wrapped and placed on either a full-surface textile 2
c) or a textile net 3



4. SUBSURFACE TEXTILE IRRIGATION SYSTEMS with (coated) tubes



full-surface textile with non-coated drip irrigation tubes (roof greening example) – tubes placed on drainage layer

net-shaped textile with coated drip irrigation tubes (roof greening example) – system placed individually at root level

4. SUBSURFACE TEXTILE IRRIGATION SYSTEMS ENLARGEMENT of the nonwoven material

- Air void content of normally 80-90%
- In the pores, an extremely large amount of air and water can be stored internally and distributed capillary

5. SUBSURFACE TEXTILE IRRIGATION SYSTEMS compared to SURFACE IRRIGATION

ADVANTAGES:

- Water savings of up to 70% *), compared to spray irrigation in very hot countries, where the water already partially evaporates in the air and wind drift occurs
- The area can also be used, played on or mowed during irrigation
- Less matting, weeds and waterlogging on the surface, thus reducing maintenance costs, evaporation and surface runoff on slopes
- Even and effective water distribution directly at root level
- Less seepage loss
- Protected components, no vandalism
- Less fertilizer required, as it can be applied precisely to the roots in the right dosage
- The distance between the tubes can be significantly increased with a nonwoven

DISADVANTAGES:

- Higher initial costs
- Not flexible in case of change of plants
- No visual function control, therefore use of moisture sensors is advantageous
- You have to be careful with aerification measures
- Initial surface watering may be necessary until roots are deep enough

*) Dodds, Graeme (February 2011), Achieving Sporting Field Management in Western Sydney: A Study of Sustainable Demand Report Phase 1

6. COMPARISON OF THE DIFFERENT SUBSURFACE SYSTEMS

6a. (COATED) TUBES FOR SUBSURFACE IRRIGATION

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subsurface drip irrigation tube (STI) - non coated

© Photo courtesy of Hunter Industries Incorporated.

subsurface drip irrigation tube - coated (STIC)

- STI + STIC more sustainable alternative to conventional surface drip irrigation
- STI + STIC uses water more effectively and reduces evaporation - water delivered directly to the plant's roots

ADVANTAGES STIC COMPARED TO STI:

- Tube protection from root ingrowth mechanically + protective nonwoven covering distributes the water immediately - the roots therefore do not know where to attack
- Protective nonwovens prevent blockages caused by fine particles
- Reduced water loss due to even vertical distribution within the cover
- Additional mechanical protection
- The water/soil contact area is increased a thousandfold by the water distribution in the protective nonwoven, significantly better water distribution in systems with nonwovens, especially in mixed soil conditions or sandy soils

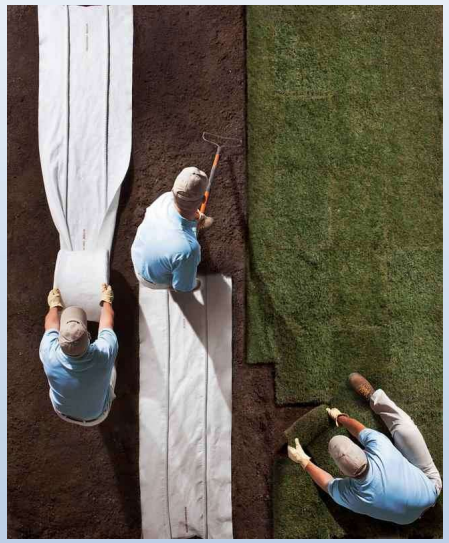
DISADVANTAGES STIC COMPARED TO STI:

- Higher cost, the weight of the coating can be even greater than that of the tube

6. COMPARISON OF THE DIFFERENT SUBSURFACE SYSTEMS

6b. FULL SURFACE TEXTILE SYSTEMS + (COATED) TUBE

- Full-surface systems in which irrigation tubes are needled between two nonwovens and thus fixed in place have been available for around 30 years
- In other full-surface variants, the tubes are sewn in between 2 layers of nonwovens or the tubes are laid or fixed on a full-surface distribution nonwoven **with** or **without** a nonwoven coating
- Full-surface systems must be installed relatively close at root depth
- The full-surface variants are easy to install for wide base areas with consistent widths e.g. between tram or train tracks *1
- In the event of overwatering, water flows downwards uselessly with the full-surface variant, as the roots cannot reach it
- On slopes, the full-surface version can quickly create a sliding layer on which the soil slips on the wet fleece



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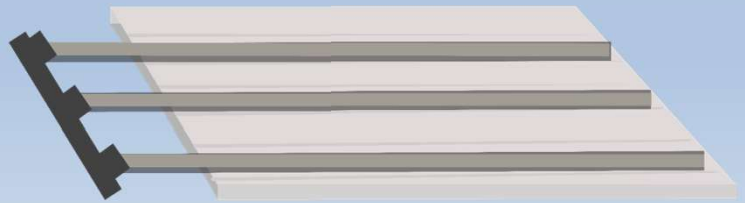
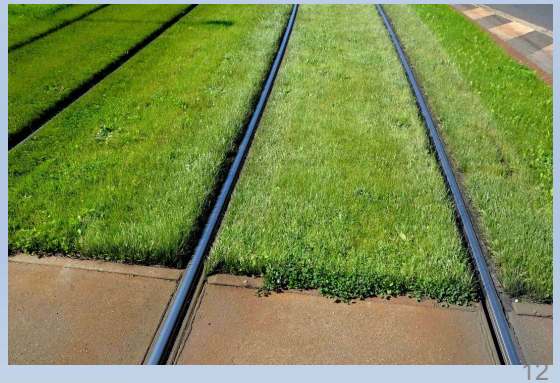
Full nonwoven mats + linear installed drippers

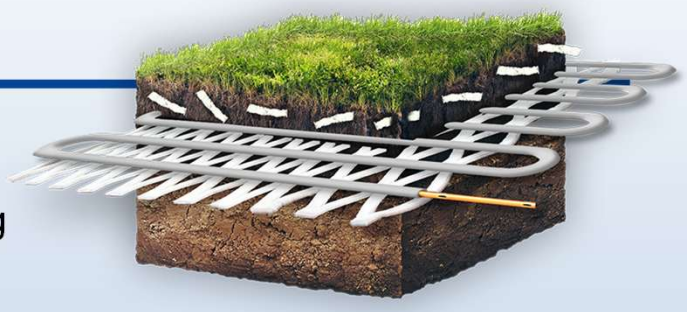




* 1 tram tracks

6. COMPARISON OF THE DIFFERENT SUBSURFACE SYSTEMS

6c. NET-SHAPED TEXTILES + COATED DRIP IRRIGATION TUBE



Newer and more cost effective system: a partial area variant in which irrigation tubes protected by nonwoven covering are laid on a nonwoven net. The water-distributing nonwoven net covers only about 25–35% of the total area, resulting in significant differences compared to full-area variants:

- No barrier effect: The roots can grow through the net without any problems and anchor themselves all around the thick nonwoven material → **100% of the water** stored in the material is available to the plants, including the water on the underside of the nonwoven material
- The full-surface variants are easy to install for consistently wide base areas with suitable widths. However, the net variant has clear advantages for small or somewhat more challenging areas *1
- The installation depth of the net is much more flexible and suitable for plant mixtures with different root lengths. The net itself is very flexible and can even be wrapped around root balls of trees *2
- The tubes can be laid parallel or meandering on the water distribution net. Tube spacing approx. 50 - 60 cm

*2 Tree net

© Lite-Soil GmbH

6. COMPARISON OF THE DIFFERENT SUBSURFACE SYSTEMS

6c. NET-SHAPED TEXTILES + COATED DRIP IRRIGATION TUBE

- Full-surface variants “bounce” slightly under load. The net version does not, as the load is transferred downwards via the spaces between the nets. This means, for example, that the water stored in the nonwoven on a soccer pitch is partially squeezed out downwards when a player runs over it in the full-surface version, but not in the net version

- Even in the event of overwatering, water drains away uselessly downwards with the full-surface variant, as the roots cannot reach it, whereas this is not the case with the net variant

- On slopes, the full-surface version quickly creates a sliding layer where the soil slides on the wet nonwoven. The net variant interlocks with both the soil and the roots and can therefore be installed on much steeper slopes. In addition, the meander effect means that on a slope the water is held much better in the net variant

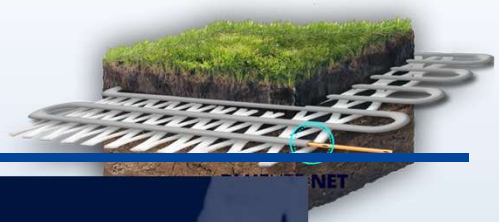
Slopes Golf course sand pit bunker

Net shaped textiles

© Lite-Soil GmbH + Kawa Solution

6. COMPARISON OF THE DIFFERENT SUBSURFACE SYSTEMS

6c. NET-SHAPED TEXTILES + COATED DRIP IRRIGATION TUBE



Video

7. SUBSURFACE TEXTILE WATER STORAGE STRIPS & DISTRIBUTION NET

- Elongated nonwoven water **storage strips** installed in the substrate at root level (0.5 – 1 l/m²) to improve the substrate, loosen compacted soil, aerate + support initial growth
- Water storage capacity is significantly increased. The plants can access all the water stored in the nonwoven very easily and effectively when required. 1 kg stores up to 10 l of water!

© Lite-Soil GmbH

Subsurface textile water storage strips

- Subsurface nonwoven water **distribution net** with a high water and air-conducting supply to the plant roots, similar to a network of veins
- The flexible and easy-to-install net can be used close to the roots and efficiently at any level, as roots can easily grow through the open net structure and dock all around
- Biodegradable or durable versions

© Kisvakond

Subsurface textile storage & distribution net

7. TEXTILE WATER STORAGE STRIPS

- **1 kg stores up to 10 liters of water**
- Extends the watering intervals - at least by half as much!
- Substrate improvement: Increased water storage capacity & permeability
- Prevents soil compaction
- 100 % of the water is available to the roots
- Simple application: mix approx. 2 - 5 % by volume into the substrate

7. TEXTILE WATER DISTRIBUTION NET

- **2 in 1: irrigation & aerification**
- Large-scale and even water distribution
- 100 % of the water is available to the roots
- Does not form a barrier for roots
- Easy to install
- Adapts to any terrain

THANK YOU FOR YOUR ATTENTION!

Exclusive representative in the Kingdom of Saudi Arabia

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Each drop counts!

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Awards

Innovation award GaLaBau Nuremberg 2022 & 2024 (DE)

1st prize in the category environment Young Entrepreneurs 2020 (AT)

Pioneering award innovation- iLab 2020

TÜV Science Award in the category Business Audience Award 2019 (AT)

Environmental Award nominated Vienna 2019 (AT)

Austrian Patent award nominated 2018 (AT)

1st prize Flormart 2018 (IT)

AGRI-WATER Challenge Cape Town 2018 Finalist (ZA)

City of Vienna - New Building Climate Protection Award 2018 (AT)

1st prize Myplant 2018 (IT)

Silver Medal demopark 2017 (DE)