

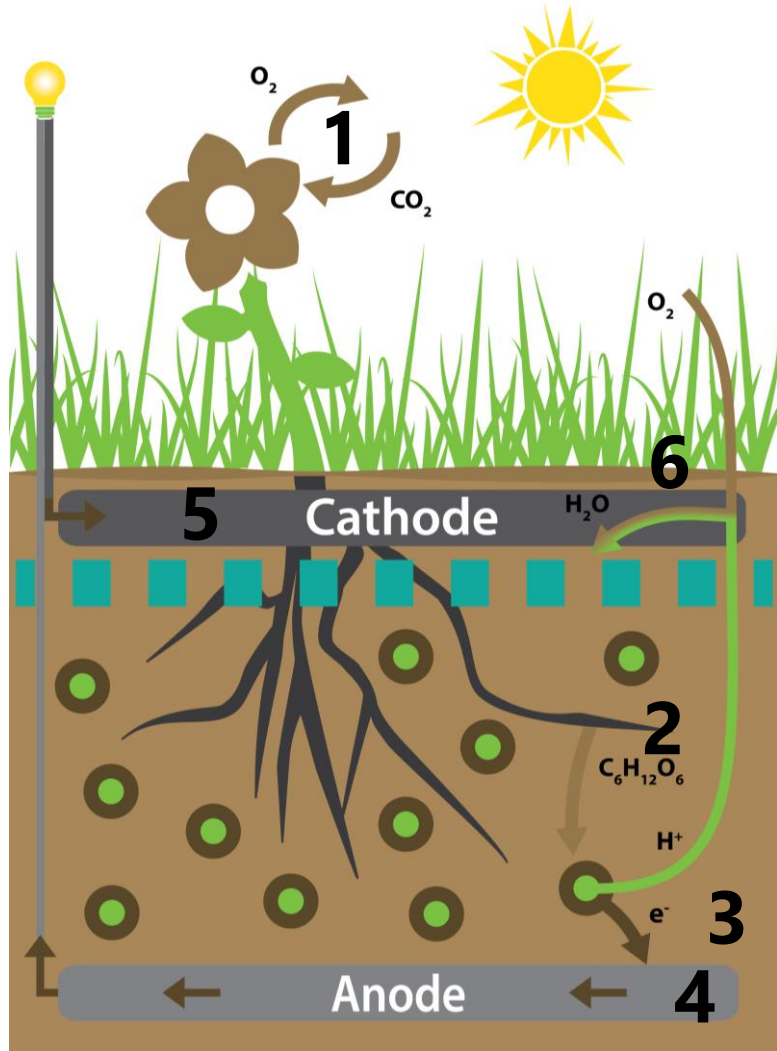


Electricity generation with living plants

Responsive Cities Symposium – Design with
nature

Marjolein Helder, Nov. 12, 2021

Plant-e concept

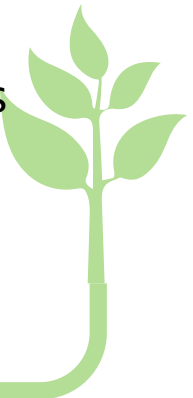


- 1 Plants produce organic matter through photosynthesis
- 2 Part of the organic matter is excreted into the soil
- 3 Bacteria break down the organic matter and release electrons
- 4 Electrons are captured in a carbon electrode (anode)
- 5 Electrons are transported to the counter electrode (cathode)
- 6 At the cathode oxygen is reduced to water.

Technology USPs



- 1 Applicable anywhere plants can grow and water is available
- 2 24/7 electricity generation
- 3 Carbon capture and methane reduction lead to CO₂-negative power
- 4 Electrode materials are inert so no harm to nature
- 5 Regenerative process of biology and inert materials lead to 30+ years of stable power output



Impact of tech: CO₂-negative power

Carbon capture 1

While the plant grows, carbon is captured by the plant. Thus, carbon is captured while electricity is produced.

Methane reduction 4

By producing electricity, 50% of methane formation in the soil is avoided. Because methane is a 25x stronger greenhouse gas than CO₂, this has a large positive impact on climate.



2 Inert, sustainable materials

All materials in the Plant-e system are inert – they don't degrade or dissolve in the soil – making the system very durable (lifetime of 50 to 100 years). We continuously search for the most sustainable option for our materials.

3 Continuous production

The Plant-e system produces electricity 24/7, which reduces the need for storage and leads to a high efficiency on output.

Lighting use-case example: Randers, Denmark



Use-Case: Social safety and decoration

Clients:



Randers Kommune

Country:

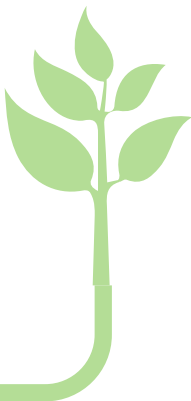


Project Description:

Rainwater basin combined with lighting to create a place for social gathering (2021)

Major Achievements - Impact

- **Current Impact:** Inspiring lighting around the waterbasin creates an attractive environment for recreation and well-being
- **Future Impact:** Stand-alone power production for lights and sensors in rainwater basins for climate mitigation in cities
- **KPIs Measurement:**
 - 128 LEDs installed, 256 light-points
 - 70% working after 2 months
 - Aim for 100% active in spring 2022



IoT use-case example: Urban tree maintenance



Use-Case: Soil moisture sensing

Clients:



Country:

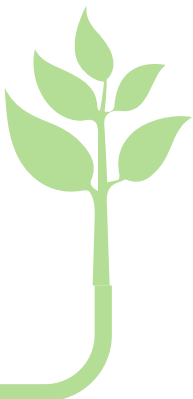


Project Description:

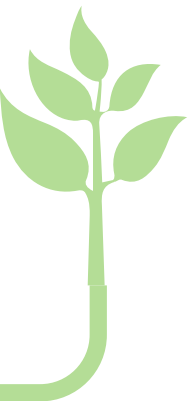
Pilot project soil moisture sensing with stand-alone trees for urban application (2020-2021)

Major Achievements: Impact

- **Current Impact:** Two types of trees are producing power for measuring soil moisture and sending data remotely to the cloud
- **Future Impact:** With monitoring of urban green for soil moisture, watering can be focused on actual need for water, reducing transport, maintenance and plant-loss. By using plantpower monitoring can be done on the spot, battery-less and vandalism-proof.
- **KPIs Measurement:** Daily measurements, year-round availability



Lighting use-case example: Rotterdam, NL



The BUILDS project – the learnings

1 **Multidisciplinarity is key**

- Breakthrough innovations require multidisciplinary knowledge
- BUILD project is multidisciplinary in knowledge and activities

2 **Perspective from practice is added value**

- Theory needs to be tested in real-life
- Start-ups/scale-ups are useful for that

3 **Speaking the same language is helpful**

- International consortium leads to different languages spoken
- Terminology used is different between fields of work
- But talk is not everything: act!

