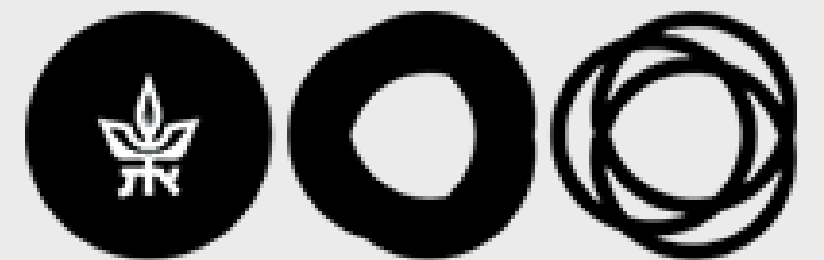


Treatment of sewage ponds in rural India

Prof Hadas Mamane
Tel-Aviv University



TEL AVIV אוניברסיטת
UNIVERSITY תל אביב

**If water is life than
sewage is what?**





Stopping Diarrhea

- Death by depleting body fluids resulting in dehydration.
- Diarrhea impact on childhood growth and cognitive development
- 88% of diarrhea-associated deaths are attributable to unsafe water, inadequate sanitation, and insufficient hygiene
- Rotavirus is the leading cause of acute diarrhea in children under 5
- Most diarrheal germs are spread from the stool of one person to the mouth of another.
- These germs are usually spread through contaminated water, food, or objects.

The problem



- The EU has set the goal of achieving zero pollution for a non-toxic environment by 2050.
- Conventional wastewater treatment plants (WWTPs) are highly efficient at removing organic matter and nutrients; however, they are complex, expensive, and energy-demanding.
- 360 km³ of wastewater is produced per year, of which only ~10% is treated in WWTPs and re-used; while the majority is not treated or treated and discharged to the environment
- Moreover water is not disinfected to avoid spread of pathogens

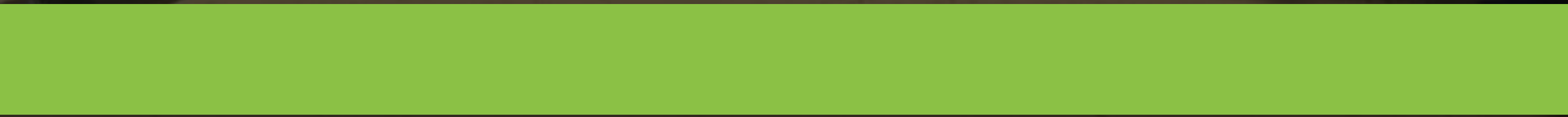
Climate Crises is Forcing Farmers to Grow Food in Sewage Water

- Many farms in countries including China are highly reliant on wastewater for irrigation
- Wastewater use in agriculture is at its highest where freshwater sources are limited.
- 65% of downstream-irrigated croplands (90 million acres, mostly in China, India, Pakistan, Mexico, and Iran) are highly dependent on urban wastewater flows.





Joint work:
Prof. Amit Dhir Thapar University
Prof. Ram Fishman, TAU
Prof. Hadas Mamane, TAU
Punjab Agriculture University



Rural villages channel the sewage into wastewater ponds





- No treatment
- Environmental hazard
- Overflow
- Infiltration into groundwater
- Used for irrigation: health problems, soil damage

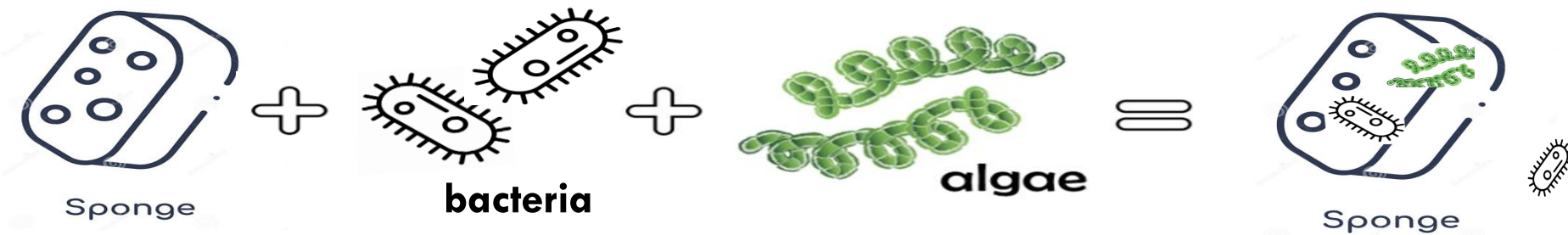




Our goal

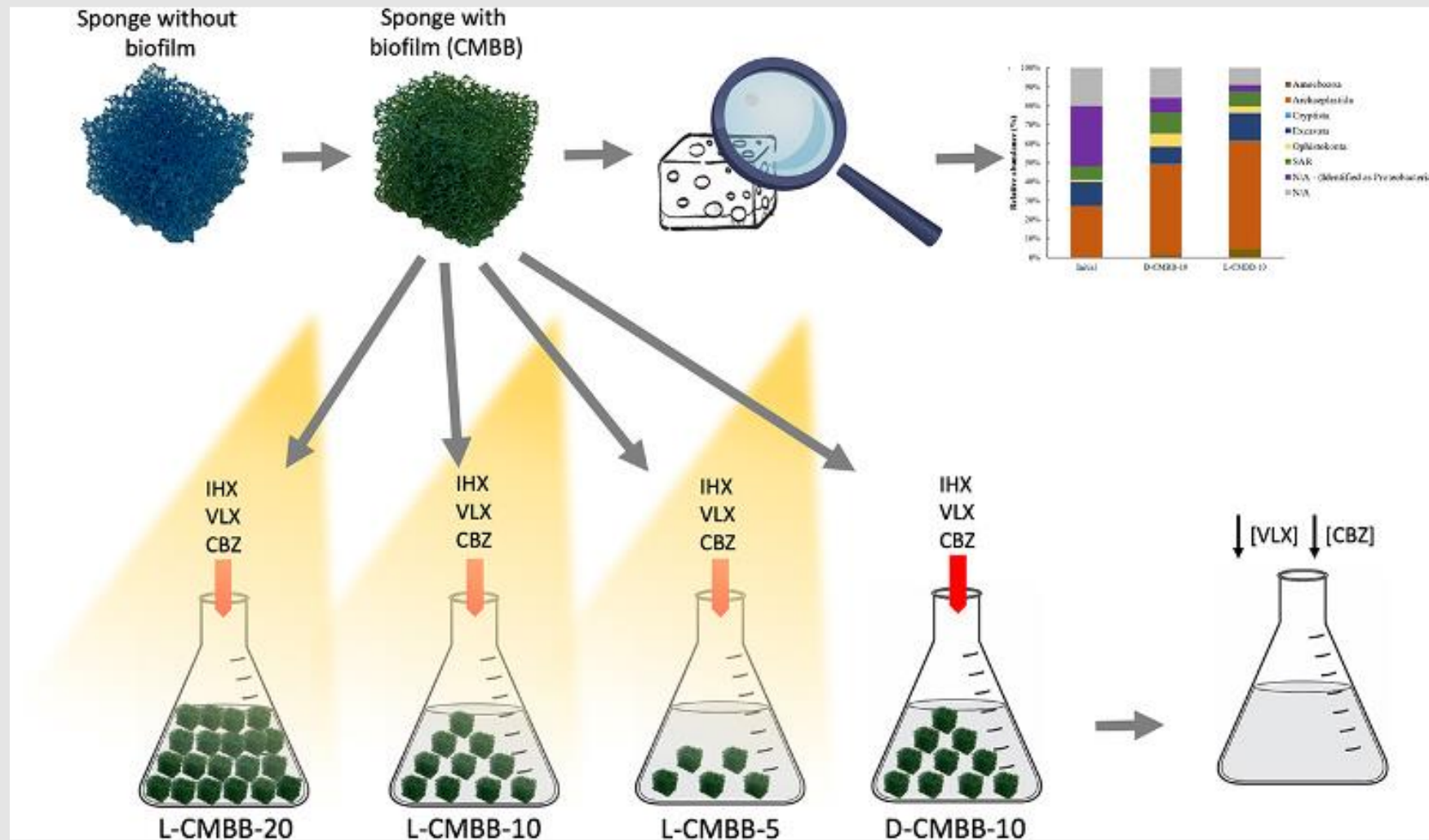
- Our goal is to scale down and localize sewage systems in rural/urban areas with economic benefits mimicking natural microalgae-bacteria consortiums in sewage ponds.
- These advantages inspired us to develop a process that we termed the attached coupled microalgal–bacterial biofilm (CMBB) as an alternative for sustainable food production and algal-based biofuel generation.
- Disinfect water using UV-LED as a barrier to pathogens

The concept



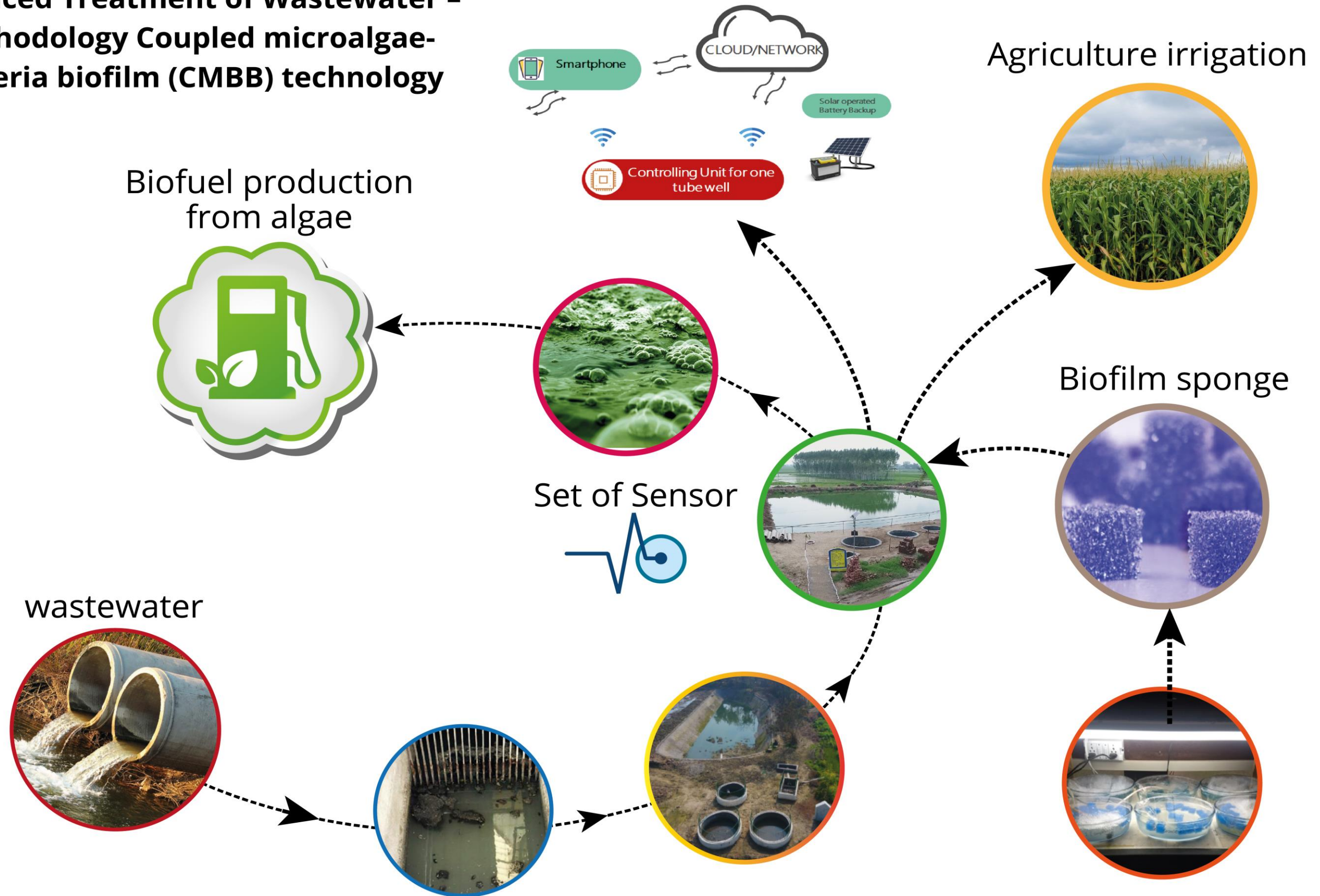
Indigenous microalgal–bacterial biofilm attached to biodegradable floating supports provides a self-sustaining in-situ natural oxygen supply

Removal of carbamazepine, venlafaxine and iohexol secondary effluent (SSE) from the Shafdan WWTP in Israel



- Light, microorganism composition and DO impact pharmaceutical and ammonia removal.
- CMBB removed 82–94% VLX and 18–51% CBZ in a 5-day treatment.
- No removal of IHX was observed.
- Microorganisms produced chlorophyll, even in the dark.
- Pharmaceutical removal rate was correlated with biofilm concentration.

Enhanced Treatment of Wastewater – Methodology Coupled microalgae-bacteria biofilm (CMBB) technology



3D-printed mushroom-shaped PLA biodegradable carriers



Bio-remediation of domestic wastewater at pilot-scale

Dimensions of each Pond (Waterproof)

Length = 3 meters

Breadth = 2.5 meters

Depth = 1.5 meters

Total Volume = 11,250 liters

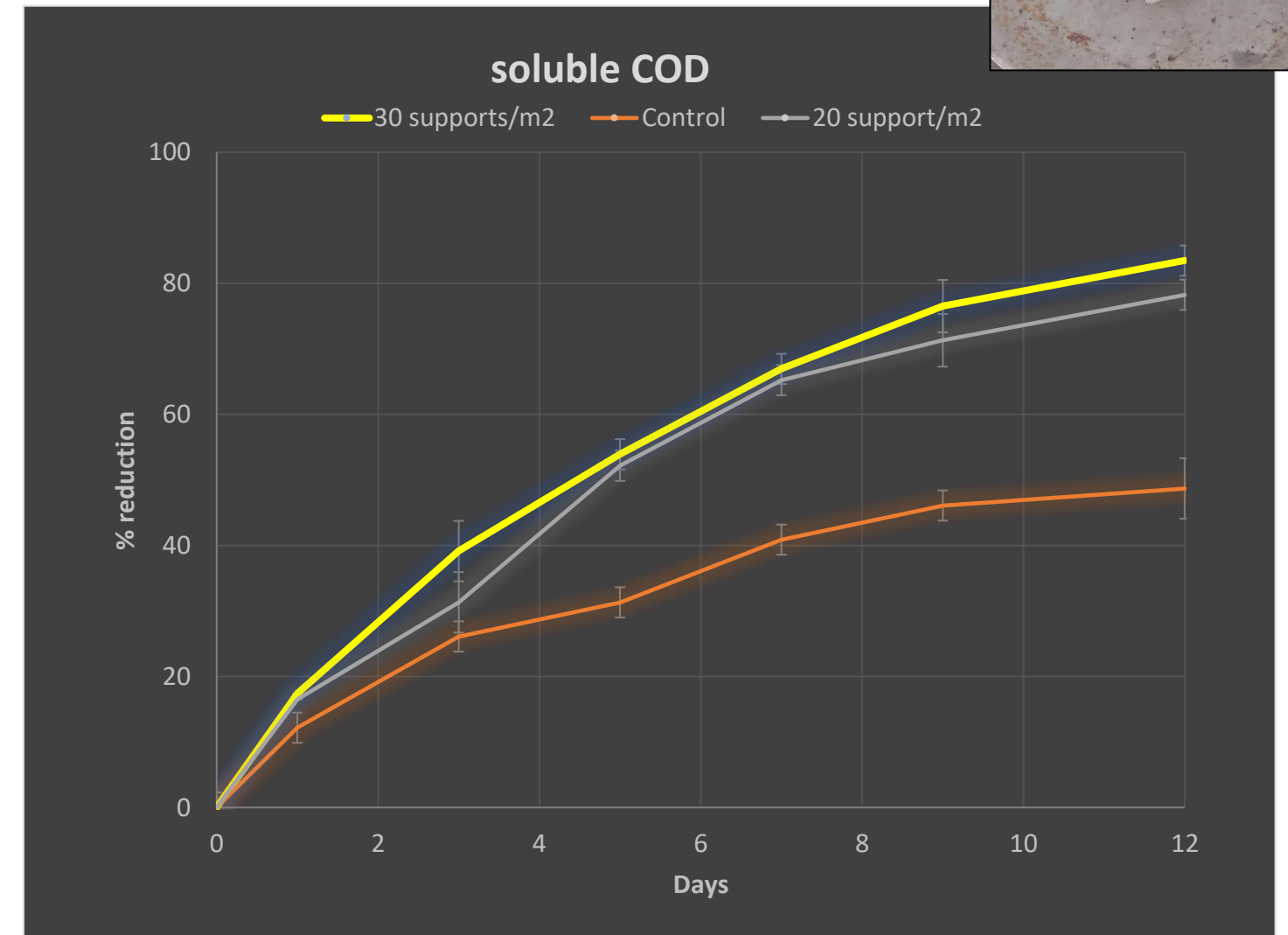
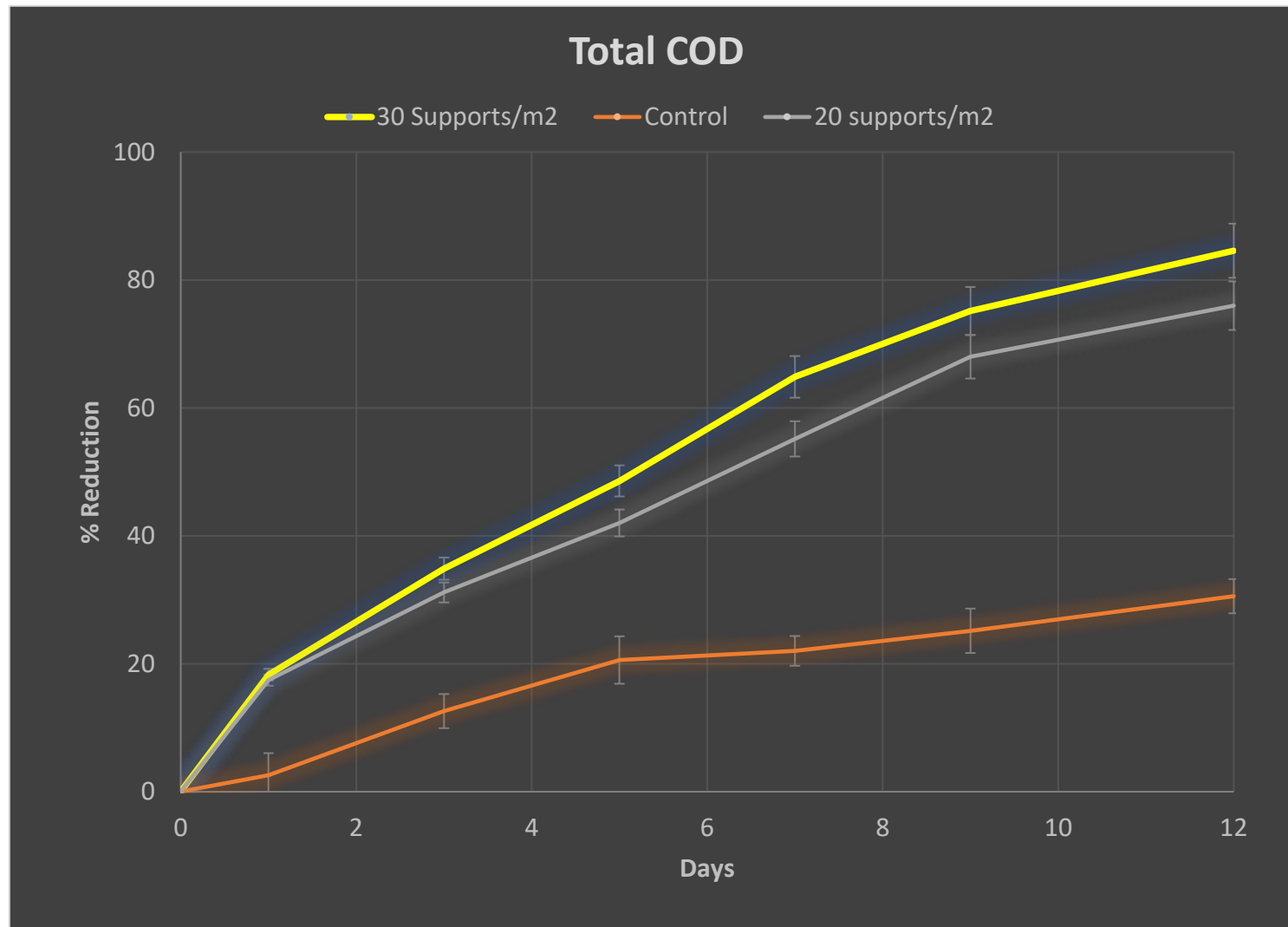
Working volume = 7,500 liters

Retention time = 7-12 days

Ponds are designed to operate in parallel as well as series combination



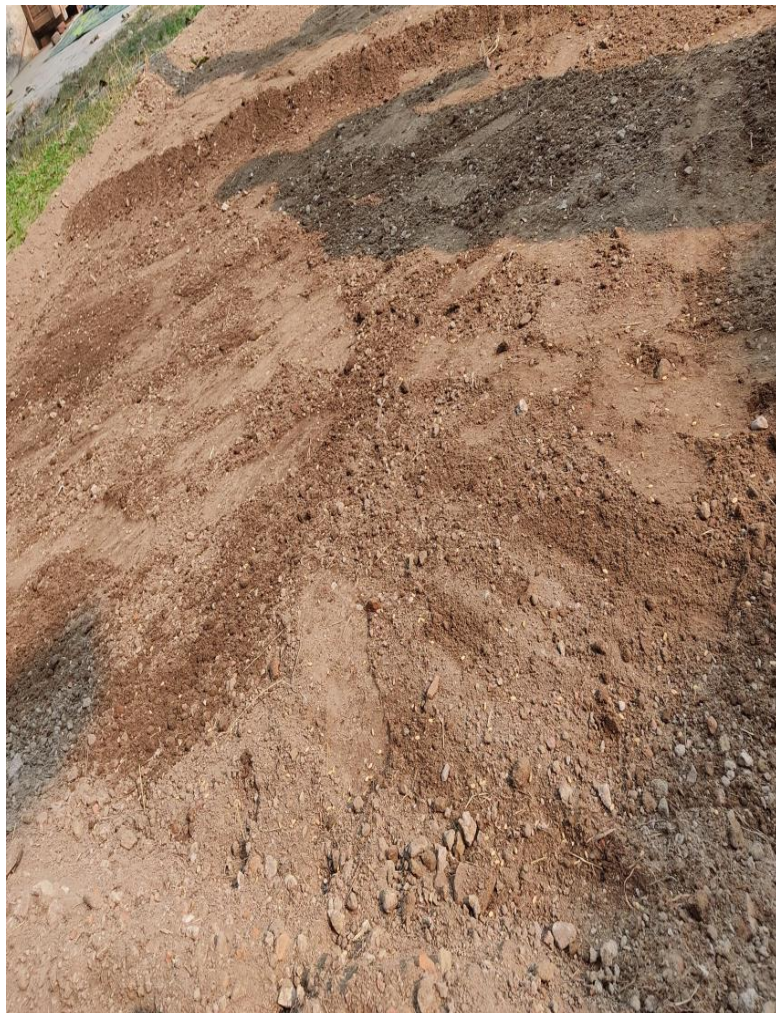
Bio-remediation at Pilot-scale (P cube)



Degradation of inorganic and organic pollutants results in reducing the **total COD** values from **232 to 46mg/l** and **soluble COD** from **156 to 32mg/l (84% and 82% respectively)**

Punjab Agriculture University

Application of treated water as an alternative irrigation source



1st day of wheat kernel sowing



After 10 weeks of sowing



After 20 weeks of sowing



Wheat grain after maturation of crop

Governments must take farmers on board before taking decisions for them

Dr Ranjit Singh Ghuman & SS Dhaliwal
19 May 2022 5:56 AM



OF INDIA

How: Farmers protest across Punjab



BATHINDA: Farmer group BKU Ekta Ugrahan held state on Saturday against the tweaking of rules reg the members of Bhakra Beas Management Board
Various other farmer organisations, under the banner of Kisan Mazdoor Sangharsh Committee (KMSC) Morcha (SKM), had held protests on Friday, while the front Sanyukt Samaj Morcha (SSM) have announced on Monday. As per the new rules, the member (position) (irrigation) can come any state. So farmer member (position) from Punjab in Haryana. the per of the Punjab

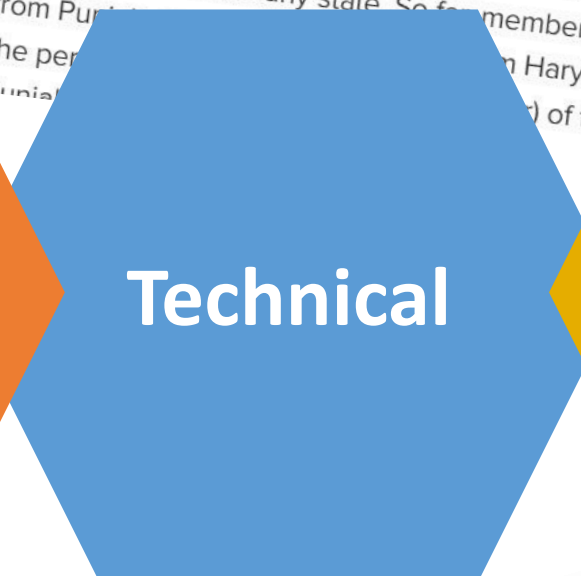
THE TIMES OF INDIA

Punjab: Unions divided over water pollution

TNN | Jul 14, 2022, 03:37 AM IST



AMRITSAR: Indicating a division in the farmer union the Kisan Mazdoor Sangharsh Committee (KMSC) gear up for their proposed 'Punjab morcha' from July other groups have a separate programme for highlighting and contamination of groundwater.
KMSC state general secretary Sarwan Singh Pandher said had designed its programme at Chabba village on Wednesday with BKU (Ekta Ugrahan). Hinting that the biggest demonstration Vallaha near Amritsar in the Majha region of Punjab, he said state's groundwater depletion had become faster, while its c underground water were being polluted.



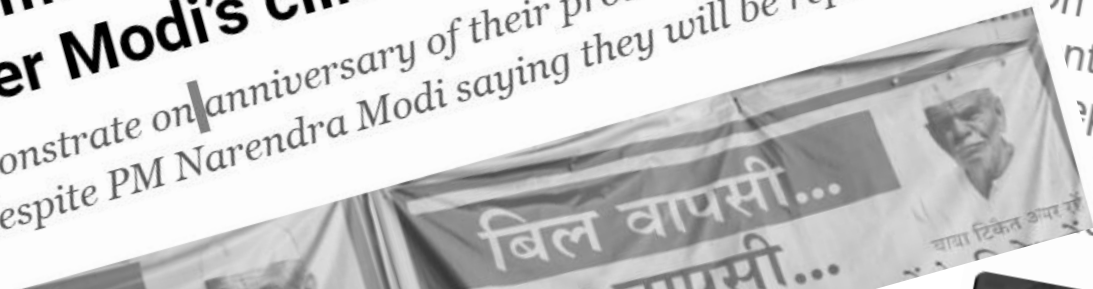
Punjab Assembly Elections 2022: Ignoring the groundwater depletion problem

aming farmers alone won't work; prices for crops other than paddy must be remunerative



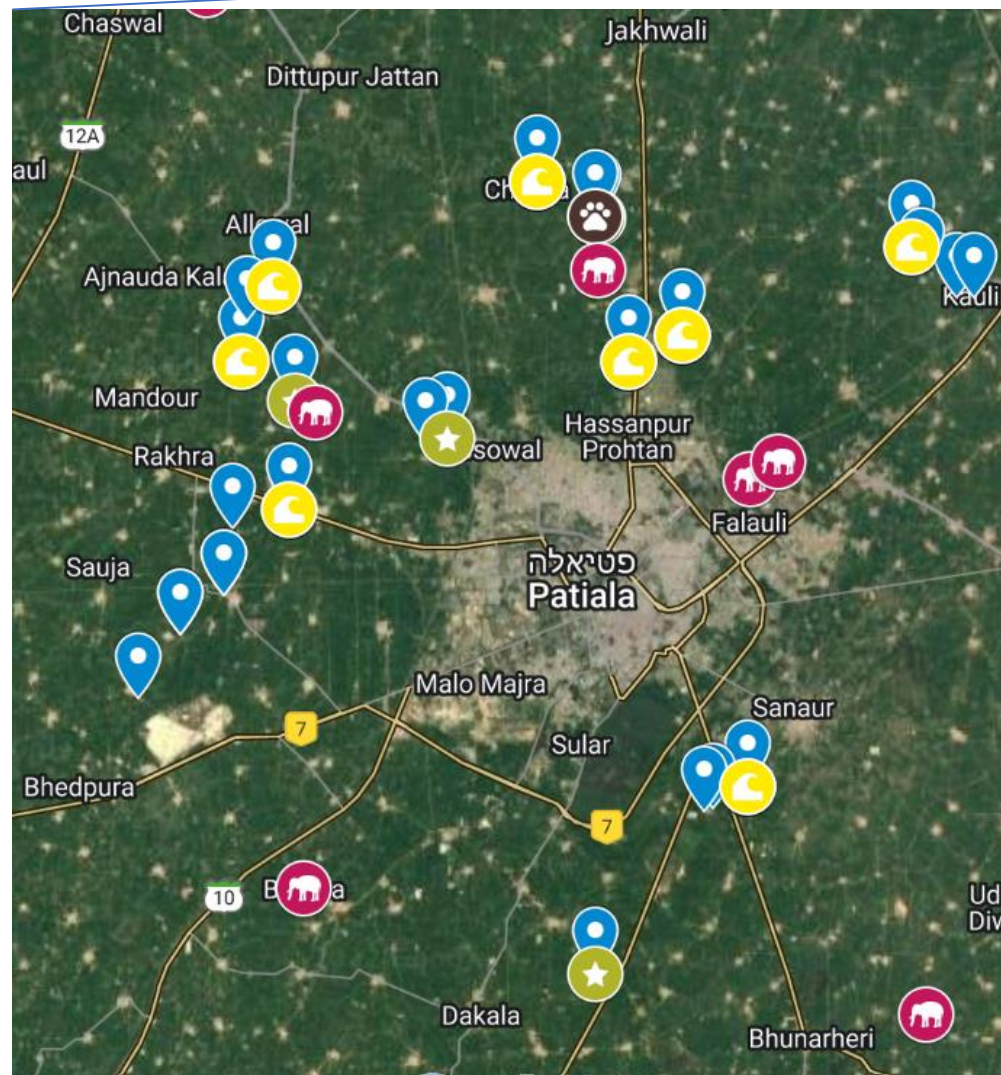
Indian farmers mark a year of protest week after Modi's climbdown

Farmers demonstrate on anniversary of their protest against three farm laws, despite PM Narendra Modi saying they will be repealed.



'Save water, save farming' campaign: BKU U demands groundwater testing by independent laboratory

In the second day of the stir, union leaders accused the Tride... ntaminating groundwater in nearby areas and sought testing independent laboratory. Punjab government had recently o's chairperson, Rajinder Gupta as the... mic Policy and Planni



- **Assessment of water quality in different sources for irrigation**

- **Effect of groundwater, treated and untreated wastewater on Soil Properties**





Irrigated with
groundwater

ਜ਼ਮੀਨੀ ਪਾਣੀ ਨਾਲ
ਸਿੰਚੀ .ਫਸਲ

DIVIDED COUNTER

Irrigated with
treated sewage

ਸਾਫ਼ ਕੀਤੇ ਸੀਵਰੇਜ
ਦੇ ਪਾਣੀ ਨਾਲ
ਸਿੰਚੀ .ਫਸਲ

Adhered to standards set by the
Punjab Pollution Control Board

ਪੰਜਾਬ ਪ੍ਰਦੂਸ਼ਣ ਕੰਟਰੋਲ ਬੋਰਡ ਵੱਲੋਂ
ਨਿਰਧਾਰਤ ਮਾਪਦੰਡਾਂ ਦੀ ਪਾਲਣਾ



Purifying water for everyone, everywhere

UV-LED disinfection network for rural areas



SoLED Leadership

Founded out of the Water-Energy lab @ TAU



Prof. Hadas Mamane

Water treatment expert. Head of the Environmental Eng. program and Water-Energy Lab, TAU



Igor Donskoy

Former tech intelligence IDF unit. Experienced Mechanical engineer and R&D team leader.



Dana Pousty

Water LED Disinfection Expert
Ph.D. candidate in Environmental Eng.


Partnerships and funds for scalable impact




Current solutions don't fit

 Unscalable manual process

Boiling

 Require chemical supply availability

Chlorine

 Require backwash and water pressure

Filters

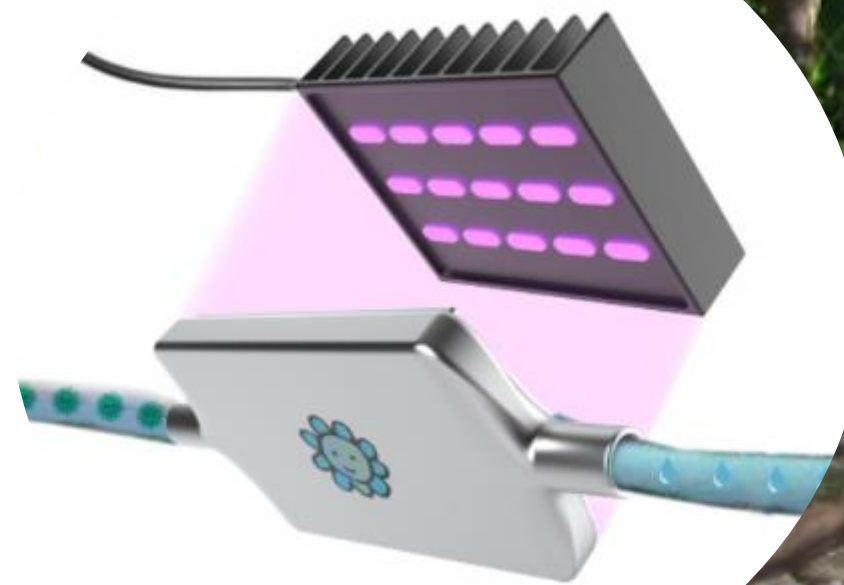


Limited effect
against viruses and others...



Following years of research at Tel-Aviv university,
SoLED developed a **solution**

Off-grid bio-LED disinfection device for rural areas



Plug & Play | Low maintenance | 99.99% effective



New UV source: Light-Emitting Diodes (LEDs)

Advantages

- Quick start-up time without warm-up
- Long lifetime
- Compact and robust design

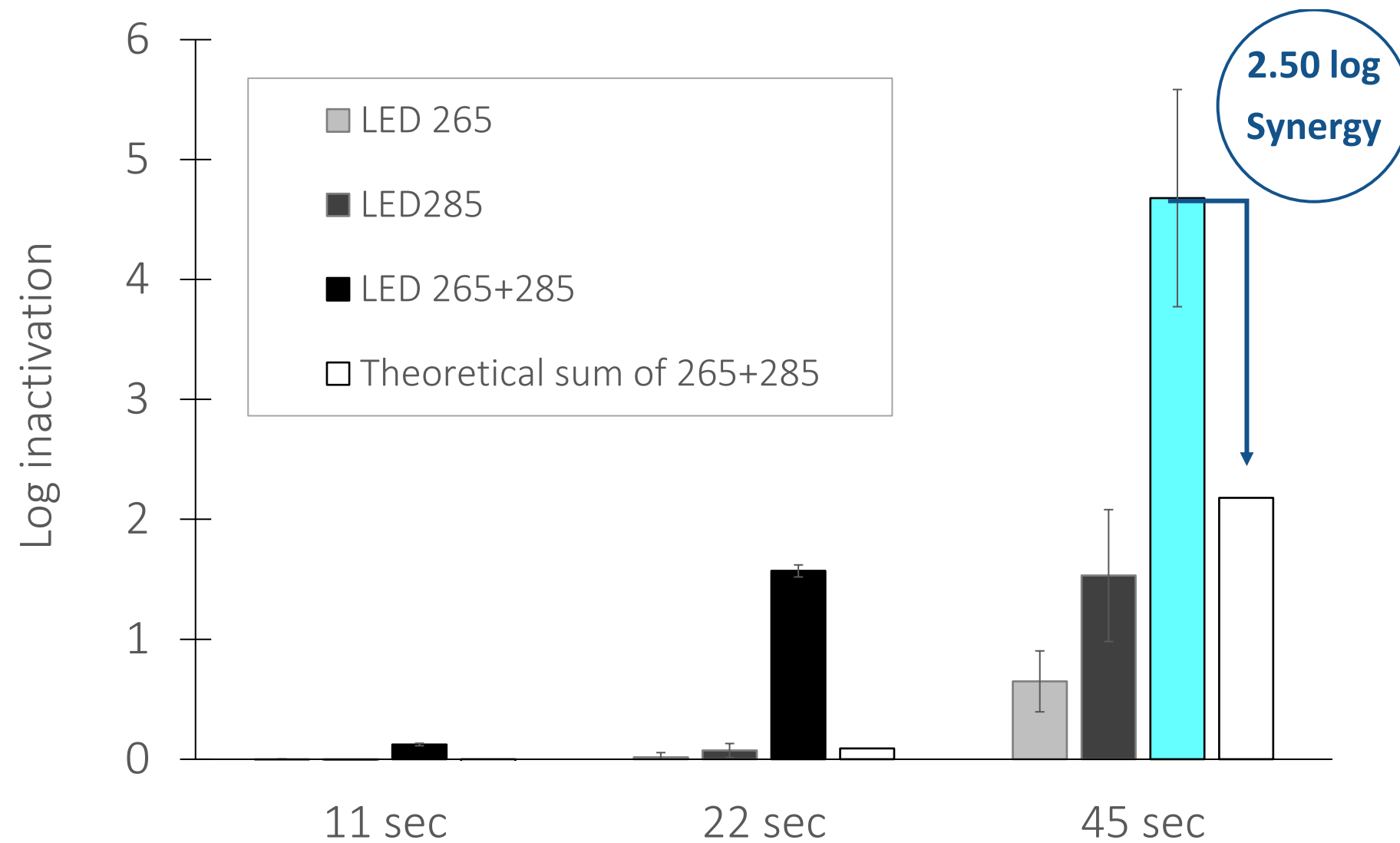
Water Contamination Management

- Low electrical output power
- Environmentally friendly (Mercury free)
- Wavelength targeted

- High lamp costs
- High energy consumption
- Recovery of contaminants



UV-LED Multispectral Patented technology



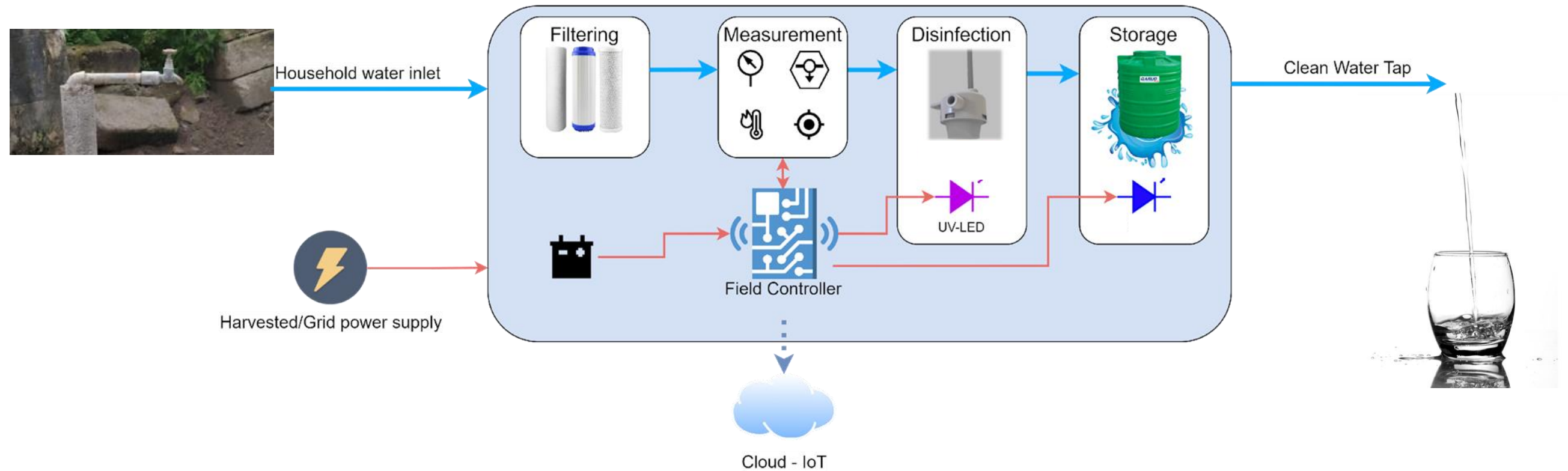
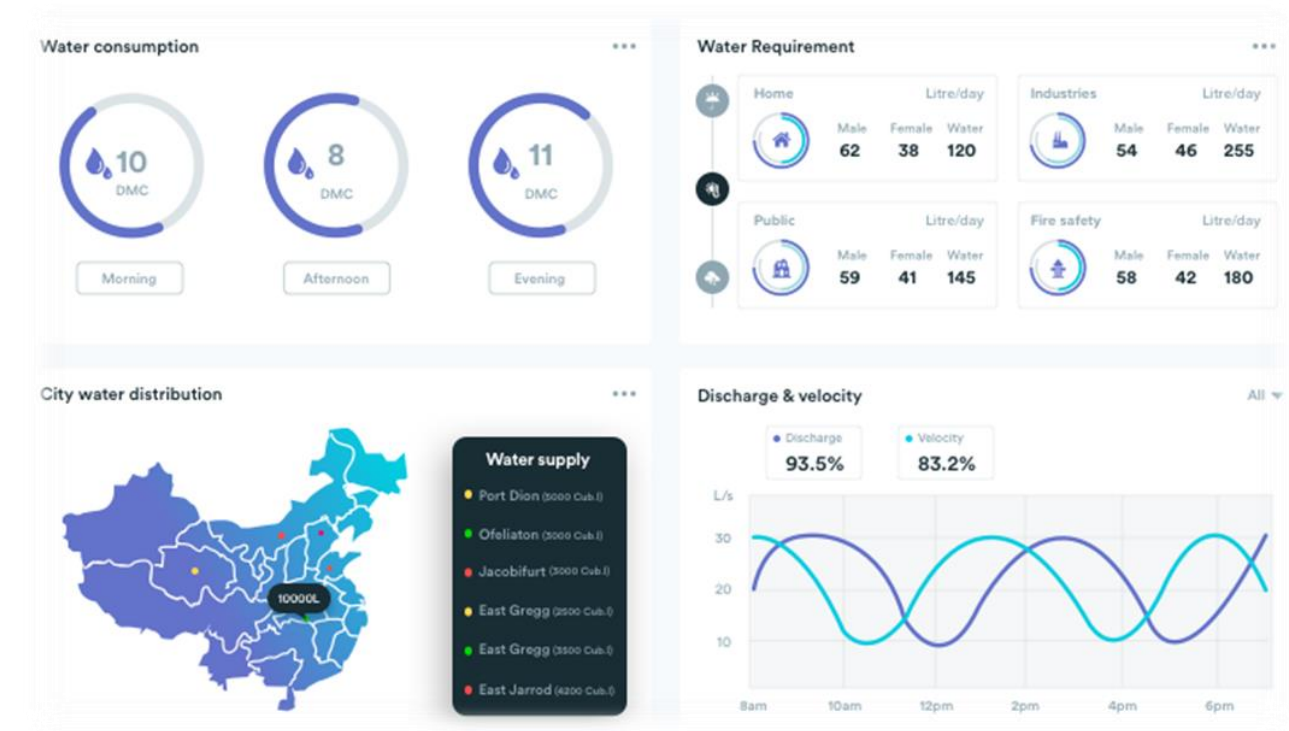
Advantages

- Low system costs
- Low energy consumption
- Effective against viruses
- Control regrowth and biofilm in storage tanks
- Decentralized, mobile,



Pilots planned

- Cost-effective disinfection reactor
- Easy to install and operate
- Remote control and monitoring of system metrics
- IoT ensures continuous operation and effective maintenance by local personnel



Award-winners for sustainability technology

- Israel representative at the Global Falling Walls
- Winners of the desert-tech competition
- Participants of a prestige 8200 accelerator
- Finalist of the Coller and Sustain-IL competition





LED it be

Join us in the journey of saving lives

dana@soledx.com
hadasmg@tauex.tau.ac.il
Soledx.com

