#IndiaEUWater

# How is the LOTUS technology improving water quality in India ?

Caroline GUILLET, 08 June 2021

PANI WATER पानी

LOTUS

PAVITRA GANGA

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EU GREEN WEEK

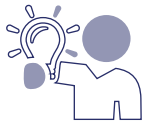
An initiative of the European Commission

# LOTUS in a nutshell

- **Full title**: LOw-cost innovative Technology for water quality monitoring and water resources management for Urban and rural water Systems in India
- **Research and Innovation Action Co-creation of innovative low-cost technology for India's water challenges**
- Co-funded by:
  - the European Commission under the Horizon 2020 programme and
  - the Indian Government, Ministry of Science and Technology

| 22 | 6 | 5 | 48 | 3,7 |
|---|---|---|---|---|
| Partners | EU Countries | States of India | months (February 2019 – January 2023) | Million euros |

# Our approach: co-creation



Co-creation workshops

Validation workshops



Project launch

End of project

**2019** **2020** **2021** **2022** **2023**

LOTUS development

Field testing

Product refining



Our activities are carried hand in hand between Indian and European partners Enabling a perfect adequacy to the Indian market needs

Co-creation occurs at all stage:

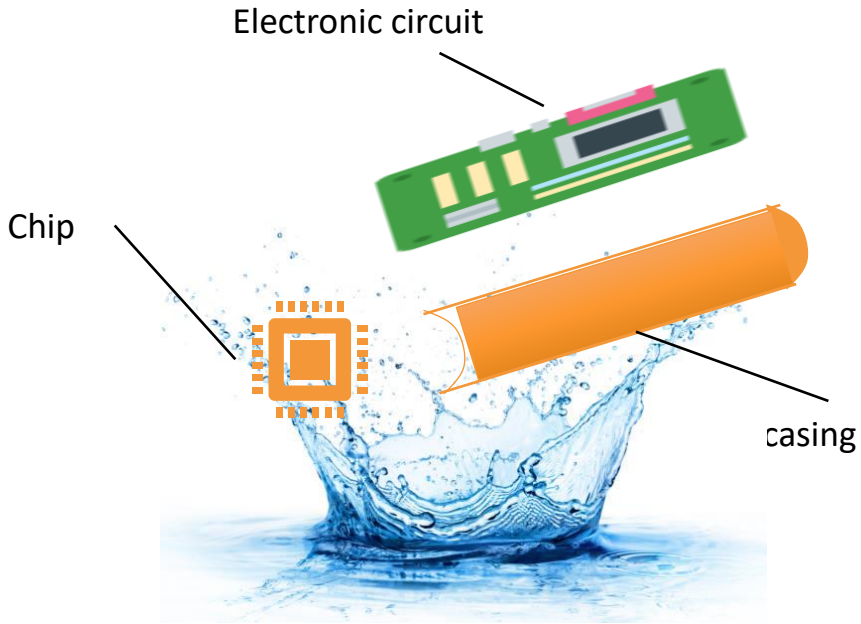
- Product development
- Deployment of the demonstrator

And beyond the project:

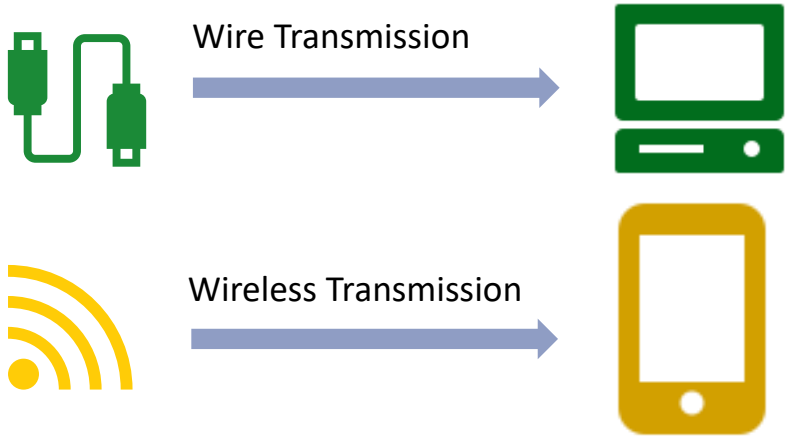
- Business development
- Industrialisation of the production

# Understanding LOTUS Technology

## 1/LOTUS Sensor monitors the water quality




## 2/ Data is sent to a device

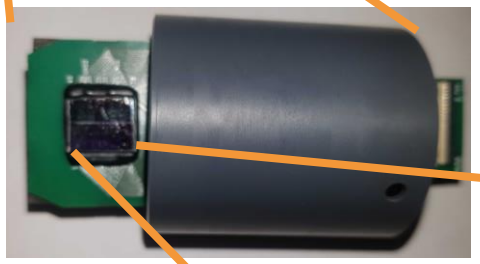



## 3/ Data is analyzed

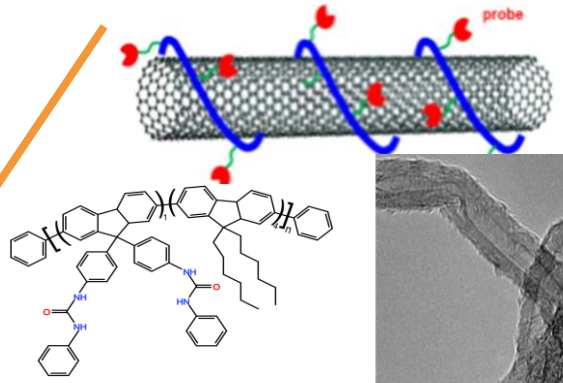
Sensor technology: initial plans

- 4 (+2 upcoming) parameters within a single water quality probe
- Wireless & energy-autonomous in field conditions
- Real-time continuous sensing
- x10 smaller than state of the art

# What is beneath?

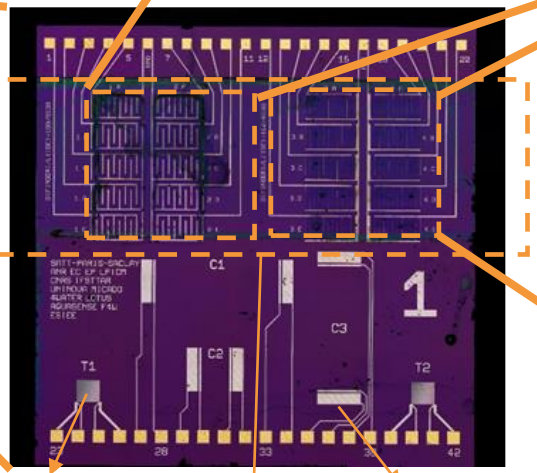


Sensor head




Functionalized Carbon nanotube network

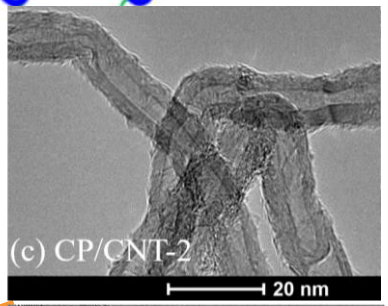
1 cm² sensor chip

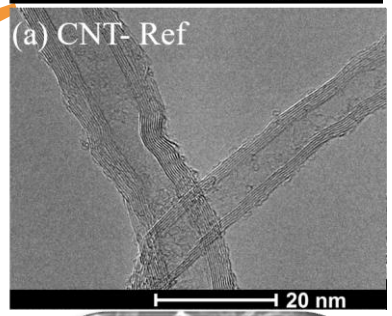


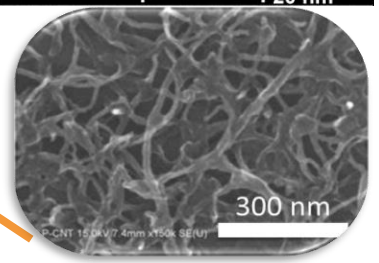

Temperature

Conductivity

pH and chlorine sensors




Sensor technology:

- 2019: worked in lab (TRL4)
- 2023/2024+: planned demonstrator in a real environment (TRL7)

Associated technologies under development, for separate use:

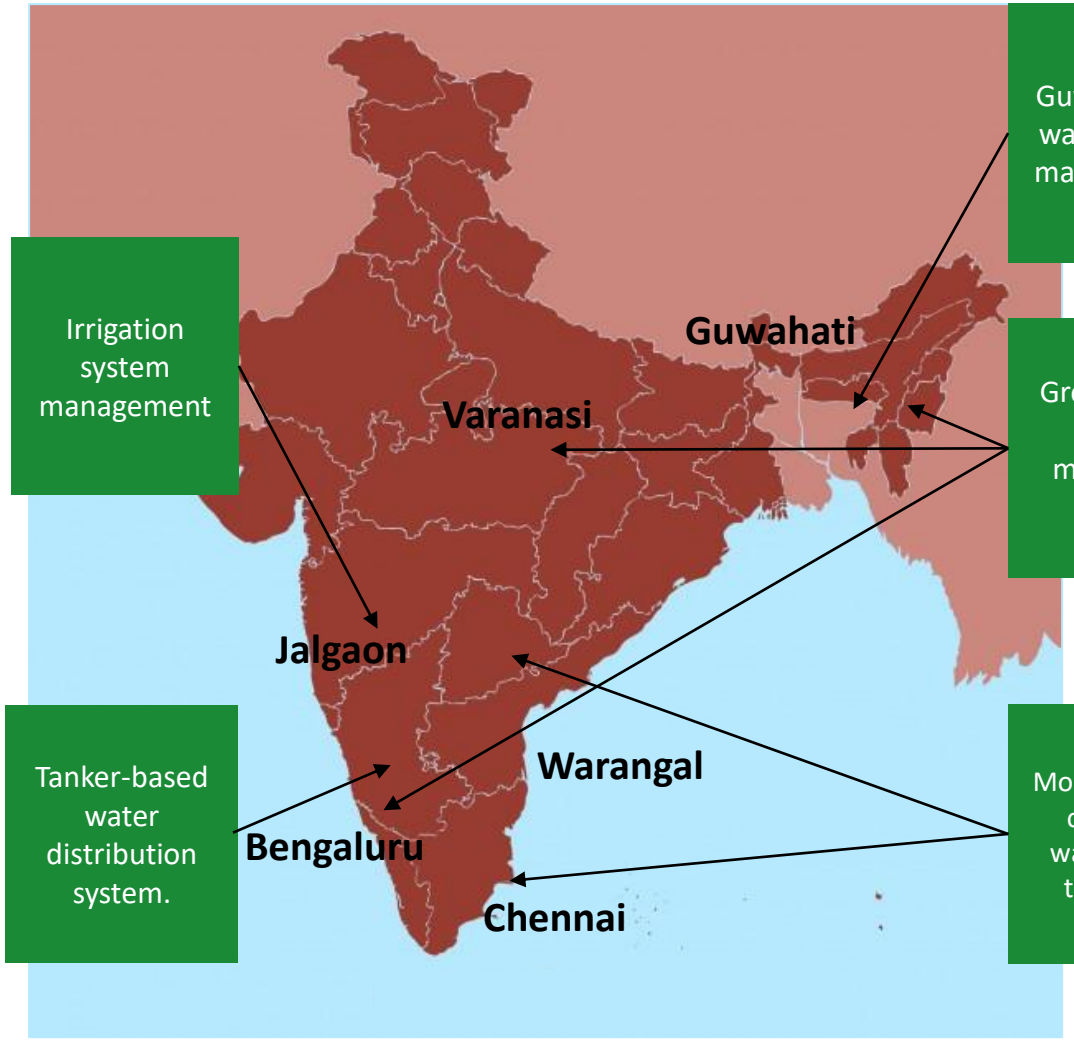
- Online and offline tools
- Tailored for each case

# LOTUS strength: versatility

LOTUS technology to be deployed in a variety of environments where there is an issue of water pollution.

LOTUS is not a water treatment technology but a high-tech water monitoring technology to enable tackling water pollution in many cases.

Irrigation system management




Guwahati city water system management.

Ground/river water monitoring system

Tanker-based water distribution system.

Monitoring and control of waste-water treatment

# Use case 1: Guwahati Water Distribution System

**The challenge:**

- Important demographic growth
- Irregular water supply from the Brahmaputra river, with sharp seasonal variation
- Issues with water quality:
  - Increased levels of turbidity during monsoon
  - Irregular water supply carrying dust in the pipes
  - Leakages enabling pipe contaminations

**The opportunity:**

- Part of the Guwahati water distribution system is being renovated to work 24/7
- Possibility to use LOTUS sensors to monitor water quality in the taps

**Expected results:** part of the inhabitants will benefit from clean water directly from the tap , limiting the need for local retreatment

# Use case 2: Guwahati groundwater management

**The challenge:**

- 80% of the population in Guwahati pumps water from wells
- The overuse of water creates up and downs in the water table, liberating arsenic and fluoride in the drinking water
- This phenomenon is increased during the rainy season
- People drink contaminated water which may harm their health

**The need:**

- Creating a community information system on the quality of water

**Expected results:** inhabitants will be informed about the water quality from the well in real-time.
Combined with community education, this will prevent water-contamination related diseases

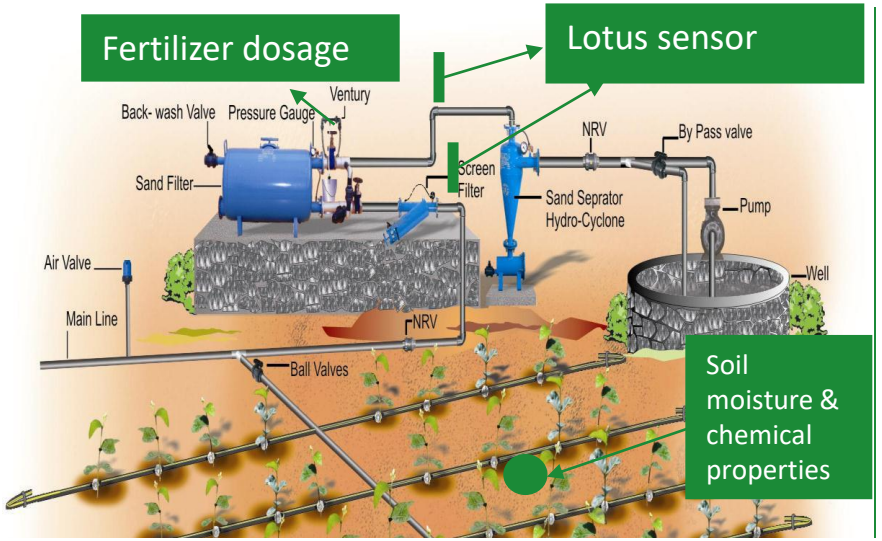
# Use case 3: Irrigation system in Jalgaon

**The challenge:**

- Ground water overuse
- Water pollution from overuse of fertilizers

**The opportunity:**

- Farmers use fertigation machines which inject fertilizers in the irrigation water
- JAIN Irrigation is codeveloping a more intelligent fertigation machine using the LOTUS technology




**Expected results: sensors are planned to be integrated directly to the fertigation machines**

- inject the perfect amount of fertilizers in real-time
- Monitor the quality of the water
- Prevent clogging
- Optimise the use of water from different sources where surface water is used for irrigation

# Use case 4: Bengaluru Water tankers

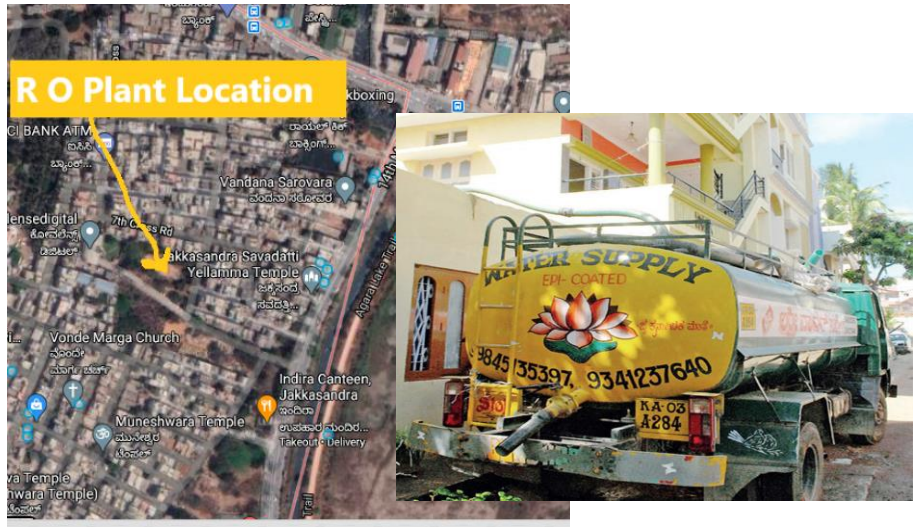
**The challenge:**

- Bengaluru suffers important drought has the urban expansion has progressively covered the lakes that used to provide water to the city
- Water scarcity has led to an increase in the use of water tankers
- There are more than 120 water tanker companies in the city, with more than 3000 vehicles in the city reaches
- However, there is little regulation and to date it is impossible to assess water quality from the tankers

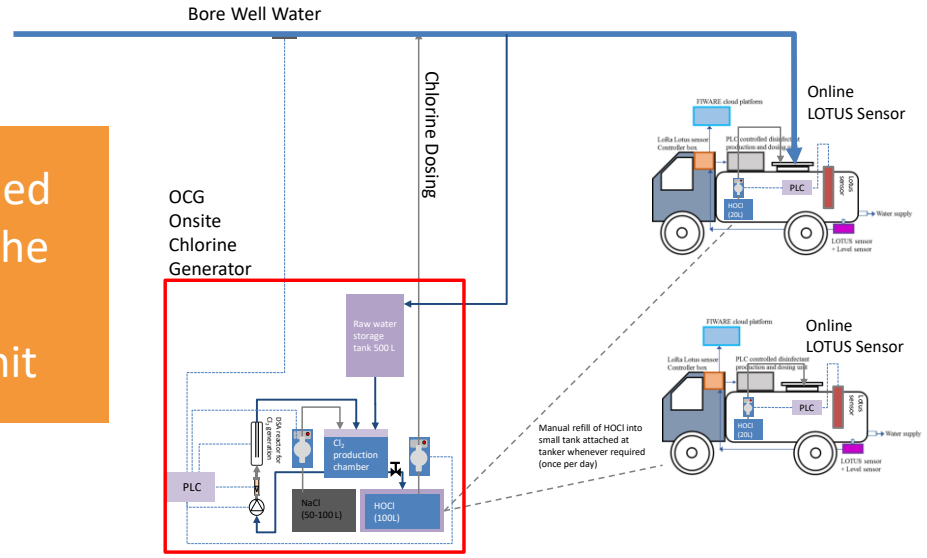
**The opportunity:**

- The company JustPaani will lend 2 water tankers to LOTUS
- Water transported will be guaranteed contaminant free
- A chlorination station installed on-board will ensure there is no bacterial contamination

Tanker refill at a RO water plant (no need for further treatment)




Water maintained safe thanks to the embarked chlorination unit



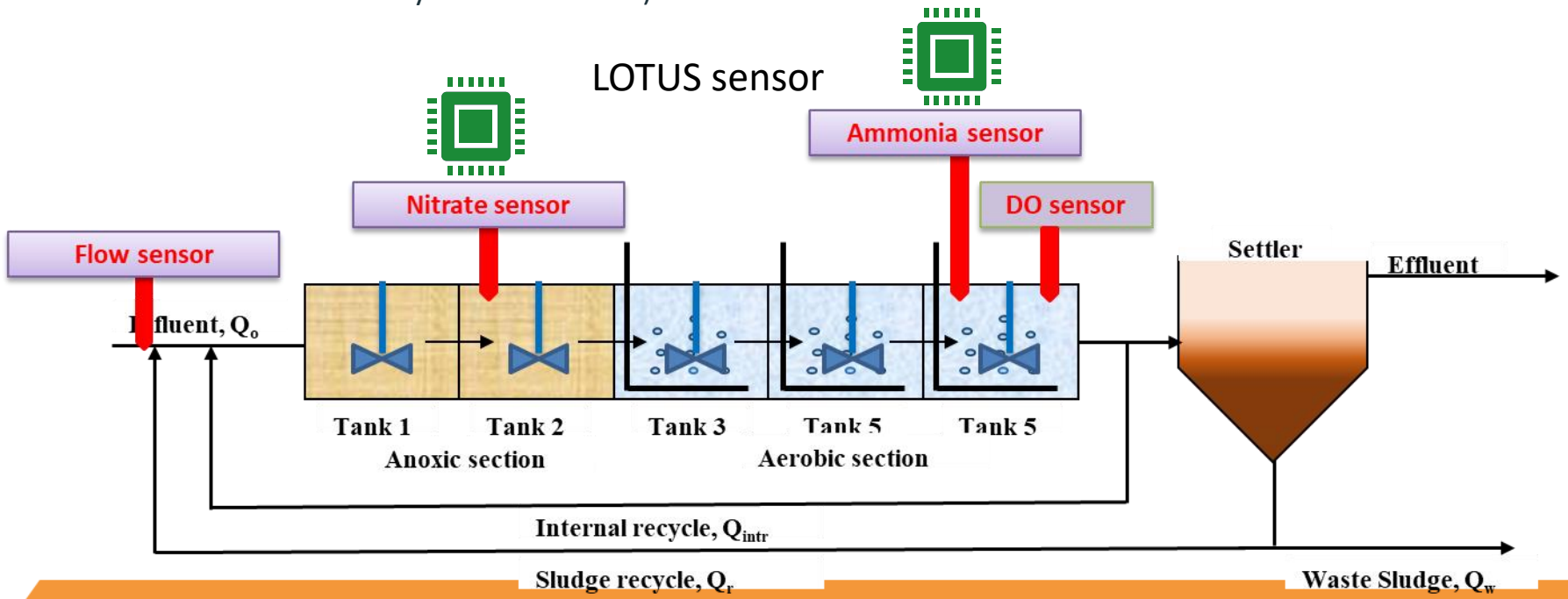
# Use case 5: Waste water treatment plant management

- LOTUS sensors used for MPC based feedback control
  - Minimizing energy consumption
  - Improving the effluent water quality
- Two types of system
  - Conventional (lab system NITW)
  - Micro-algae (reactor volume 1000 & 500litre over three days NEERI Chennai)

**Next Steps**

- Installation Micro-algae WWT plant (Dec 2020)
- Development of controller algorithm
  - Currently based on existing sensor and models ongoing
  - until LOTUS sensor ready for use in actual site
- Installation of LOTUS sensors (5) in WWT plant (Jan 2022)

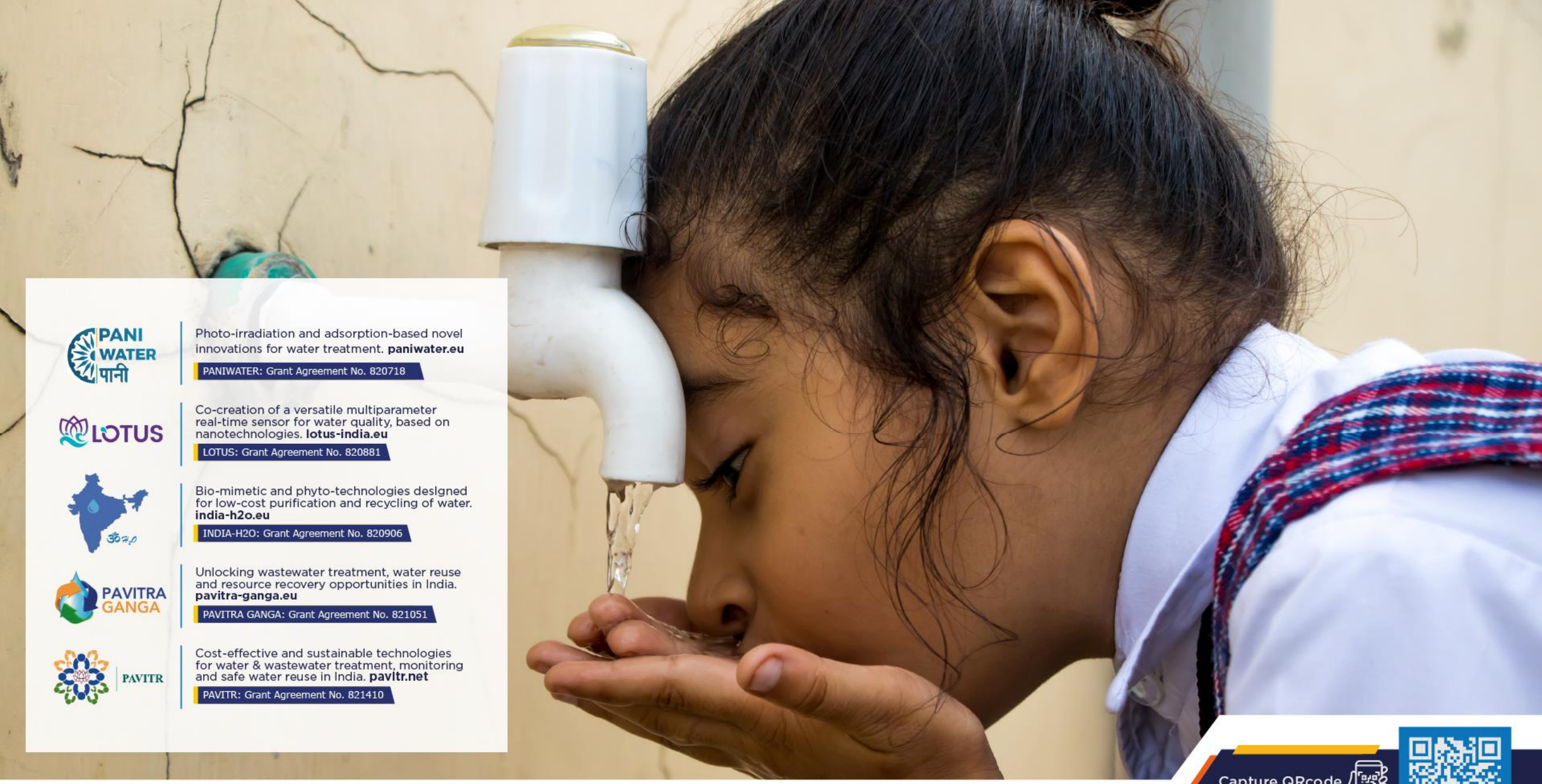
LOTUS contributes to increasing water quality all along the water cycle by reducing pollutions from effluents of WWTP



# How to reach zero pollution in India?

LOTUS solution is a major asset to reach zero water pollution in India:

- **Co-creation:** the solution is tailored for the Indian market thanks to incredible work of Indian partners.
- **Versatility:** the sensors (still under development) is expected to be used in other potential application cases.
- **Up-scalability:** The ultimate goal is to produce LOTUS sensor in India. Economies of scale will enable it to become a low-cost sensor, with sensing capacities well above market standards.



PANI WATER पानी

Photo-irradiation and adsorption-based novel innovations for water treatment. **paniwater.eu**

PANIWATER: Grant Agreement No. 820718

LOTUS

Co-creation of a versatile multiparameter real-time sensor for water quality, based on nanotechnologies. **lotus-india.eu**

LOTUS: Grant Agreement No. 820881

Bio-mimetic and phyto-technologies deslgned for low-cost purification and recycling of water. **india-h2o.eu**

INDIA-H2O: Grant Agreement No. 820906

PAVITRA GANGA

Unlocking wastewater treatment, water reuse and resource recovery opportunities in India. **pavitra-ganga.eu**

PAVITRA GANGA: Grant Agreement No. 821051

PAVITR

Cost-effective and sustainable technologies for water & wastewater treatment, monitoring and safe water reuse in India. **pavitr.net**

PAVITR: Grant Agreement No. 821410

The **HRB - Horizon Result Booster** is an initiative funded European Commission, Directorate General for Research and Innovation, Unit J5, Common Service for Horizon 2020 Information and Data.

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