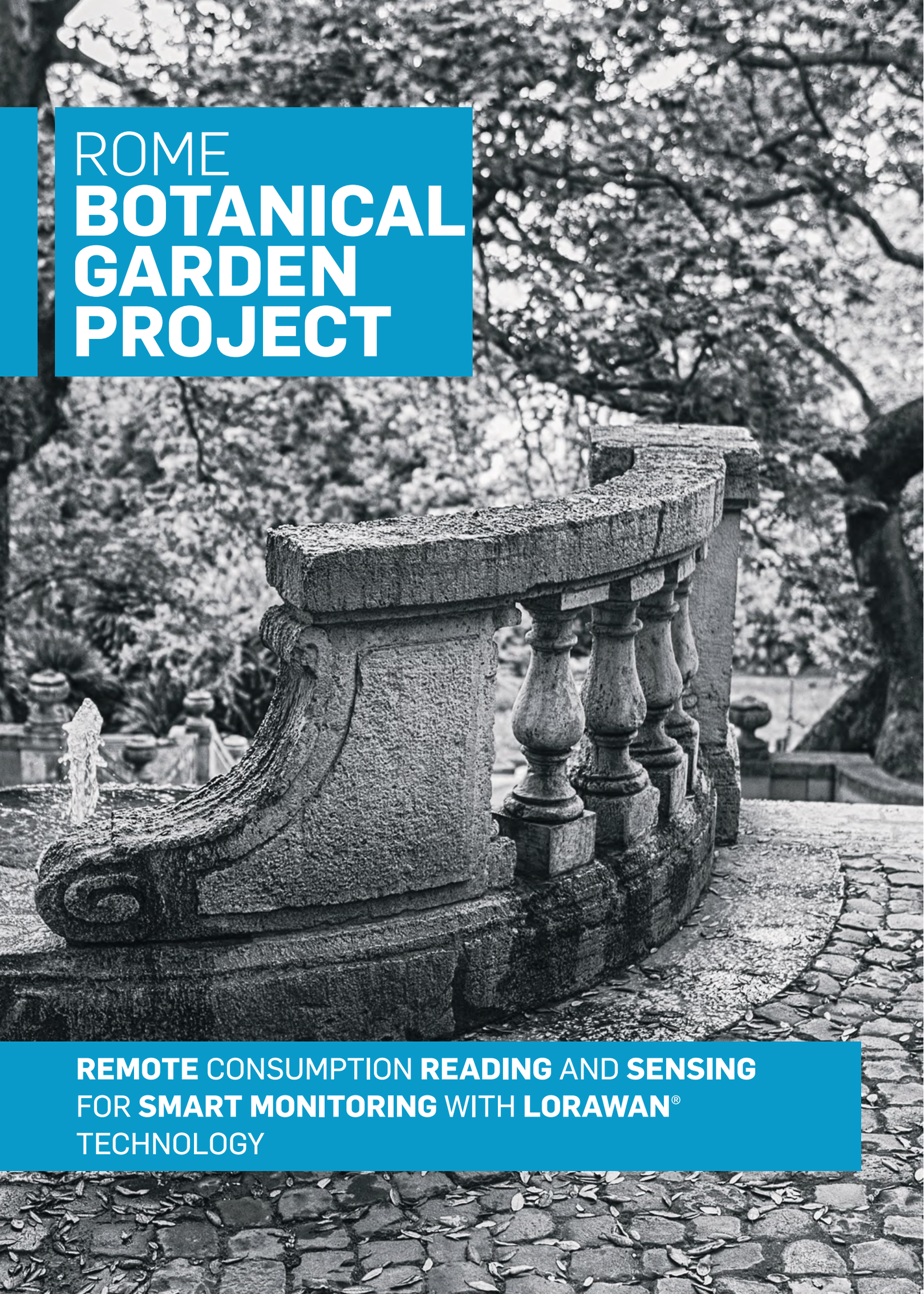

ROME **BOTANICAL GARDEN PROJECT**

REMOTE CONSUMPTION **READING** AND **SENSING** FOR **SMART MONITORING** WITH **LORAWAN®** TECHNOLOGY

THE BOTANICAL GARDEN

The Botanical Garden of Rome covers an area of about 12 hectares in the heart of the city, between Via della Lungara and the Janiculum Hill.

In addition to being an open-air museum, it is a research and educational facility that houses numerous collections of plants from around the world: palm trees, conifers and bamboo forests.

IL PROGETTO

The project for the Botanical Garden was born from the collaboration between **Unidata**, **Sapienza University of Rome.** It is aligned within the objectives for sustainable development of the "Sapienza Sostenibile" program, and **DAMA Studio Associati**.

The goal was to use **LoRaWAN®** technology for the indoor and outdoor monitoring of the area, the optimization of the use of water resources and the control of the main environmental parameters in the vicinity of the tropical greenhouse.

After **preliminary surveys** aimed at:

- Verification of LoRaWAN® coverage
- Sensor placement
- Identification and field adaptability of monitoring devices
- Study and understanding of the water infrastructure

The executive project was prepared with the specifications of the type, number and location of sensors for each monitoring area, that can be summarized as follows:

1. Water monitoring

- Hourly meters with pressure detection.
- Daily water consumption meters.
- Water storage tank filling sensors.

2. Indoor environmental monitoring with Tektelic sensors for detection:

- Co2
- Humidity and PH of the soil
- Temperature, air humidity and solar radiation

3. Outdoor environmental monitoring

- Weather station (temperature, humidity, wind speed and direction, rain intensity)
- Soil moisture and PH sensors
- Temperature, air humidity and solar radiation sensors

In addition, two dendrometers were placed to read the bark growth of **Ficus** and **Ceiba Speciosa**.

MONITORING DASHBOARD

The entire monitoring system is collected in a single interface, in which various users can access to view and analyze historical data through the **ThingsBoard** platform.

In relation to the area of interest, a dashboard has been developed that allows to navigate the monitoring system giving access to the sections of greatest interest: the tropical greenhouse, the water consumption and the weather station.

By accessing the platform, we can then:

- Check water consumption
- View the installed sensors on the map
- Consult the weather station
- View on the detail map the tropical greenhouse
- Check the soil parameters
- View graphs with temporal trends
- Isolate single data curves on the graphs where different quantities are represented

POTENTIALITIES OF THE PLATFORM

- Possibility to have access to the collected data
- HTTP API for integration with external analysis applications
- Possibility to connect external machine learning systems to the platform

MAP-BASED SUMMARY OF INSTALLED SENSORS AND QUICK LINKS TO SPECIFIC SECTIONS

TEKTELIC SENSORS

CONTROL WATER CONSUMPTION AND PRESSURE ON TWO CRITICAL POINTS ON AN HOURLY BASIS

DETAIL PAGE OF THE DENDROMETER FOR MEASURING THE GROWTH OF CEIBA SPECIOSA AND FICUS

MICROCLIMATE TREND OF ENVIRONMENTAL SENSORS IN GREENHOUSE

UNIDATA

SAPIENZA
UNIVERSITÀ DI ROMA

TEKTELIC
COMMUNICATIONS

LoRaWAN

ROME
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