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SWAMED

Sustainable WATER management for smart agriculture in the MEDiterranean regions  
(SWAMED) - A\_T\_2.3\_0561\_SWAMED

### **Lot 3: METERING TELEMETRIC NETWORK IoT**

#### **General:**

The network will consist of the following telemetry stations:

1. One (1) weather station
2. Eight (8) soil moisture measuring stations
3. Two (2) soil moisture, temperature, and conductivity sensors
4. Sixteen (16) soil moisture sensors
5. Eight (8) water supply metering stations
6. One (1) water quality measuring station

All stations will send the data automatically to the cloud via mobile NB-IoT every 30 minutes, but this time can be modified by the user.

The cost should include the **cloud and mobile telephony** for **at least 3 years**.

The stations should be energy autonomous and operate with PV generators. The cost should include installation at points that will be indicated to the contractor.



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### **Item 1: Weather station (One Unit)**

The station should consist of the following sections:

**Unit for temporary recording and teletransmission of measurements** Have a programmable microprocessor.

Ability to access the unit via USB port.

Programming should be done wirelessly via built-in WiFi.

It should have a built-in WEB UI.

Be able to power via USB 4.5 - 5.5 V.

Have a built-in rechargeable battery, independent of the external power supply system with the PV generator.

The battery can be charged, either from the external power supply system with the PV generator, or from the USB port.

Have a built-in mobile modem, for connection via at least NB-IoT & 2G.

Have a built-in temperature and humidity sensor.

Have built-in GPS.

It must have built-in memory for the temporary recording of measurements.

Provide accurate measurement of battery voltage even in a state of charge. Have independent and adjustable fuses for battery, solar panel and USB ports protection, 3.3 V regulator

Have a door for SDI12 sensors.

Have a door for modbus sensors.

Have at least 4 analog inputs for sensors with voltage output.

Have at least 2 inputs for digital sensors such as rain gauges.

It must have a supply voltage of 12V sensors.

Have an external on/off switch.

All antennas (WiFi, GSM, GPS) must be included.

It must have an LED indicator for the state of charge of the battery.

It must have an indicator LED for the communication status of the modem.

It must have an LED indicator for the operating status of the unit.

It will be encased in its own plastic shell at least IP 65 independent of the outer shell. All antennas should be included (WiFi, GSM, GPS)

**Compact weather station, one (1) unit** \_Compact station.

No mobile place.

SDI 12 digital output and modbus for data.

Typical measurement duration < 500 ms.

Ability to measure the electrical conductivity (EC) of water.

Have two methods of measuring rainfall,

a) droplet counting with electrodes, b) tipping trough.

Diameter < 15cm



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Height < 50cm

Operating voltage at least in the range of 5 – 15 V DC

Typical consumption during measurement < 10mA

Operating temperature at least -40 to +60°C

Compliance with EM ISO/IEC 17050:2010 (CE Mark) standards.

### Sunlight

Measurement range of at least 0 to 1500 W/m<sup>2</sup>

Resolution of at least 1 W/m<sup>2</sup>

Accuracy of at least ± 5% on the measurement

### Rainfall

Measuring range at least in the range of 0 to 1000 mm/h

Resolution better than 0.02 mm

Accuracy: at least ± 5% of the measurement in the range 0 to 1000 mm/h

### Vapor pressure

Measuring range of at least 0 to 45 kPa

Resolution of at least 0.01 kPa

Accuracy at 20°C and humidity range 20-60% equal to or better than ±0.1 kPa

### Relative Air Humidity

Range 0 to 100%

Resolution of at least 0.1%

Accuracy at 20°C and in the range 0 – 100% equal to or better than 2%.

### Air temperature

Measuring range, at least -40 to 60°C

Resolution at least 0.1 °C

Sensor Accuracy : ± 0.2°C

### Barometric pressure

Measuring range of at least 1 to 120 kPa

Resolution of at least 0.01 kPa

Accuracy of at least ± 0.05 kPa at 25°C

### Wind speed

Measuring range of at least 0 to 60 m/s

Resolution of at least 0.01 m/s

Accuracy: greater than 0.3 m/s or 3% of the measurement

### Gust of wind

Measuring range of at least 0 to 60 m/s

Resolution : 0.01 m/s

Accuracy: greater than 0.3 m/s or 3% of the measurement

### Wind Direction

Range : 0 to 359°

Resolution : 1°

Accuracy : ± 5°



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#### Web call – installation

Range : 0° to +180°

Resolution : 0.1°

Accuracy : ± 1°

#### Lightning Count

Range at least 0 - 50000 lightning strikes

Resolution : 1 lightning bolt

#### Lightning Detection Distance

Area : 0 to 40 km

Resolution of at least 5 km

#### **Support:**

Mast 2-3 meters high.

Support without wire ropes.

Stainless steel or galvanized steel construction.

To have all the necessary arms and cabinets.

### **Item 2: Soil moisture measuring station, eight (8) units**

The station will measure soil moisture, temperature and conductivity at 2 depths with 2 independent sensors.

Each station will consist of the following sections:

**Unit for temporary recording and teletransmission of measurements** Have a programmable microprocessor.

Ability to access the unit via USB port.

Programming should be done wirelessly via built-in WiFi.

It should have a built-in WEB UI.

Be able to power via USB 4.5 - 5.5 V.

Have a built-in rechargeable battery, independent of the external power supply system with the PV generator.

The battery can be charged, either from the external power supply system with the PV generator, or from the USB port.

Have a built-in mobile modem, for connection via at least NB-IoT & 2G.

Have a built-in temperature and humidity sensor.

Have built-in GPS.

It must have built-in memory for the temporary recording of measurements.



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Provide accurate measurement of battery voltage even in a state of charge. Have independent and adjustable fuses for battery, solar panel and USB ports protection, 3.3 V regulator  
Have a door for SDI12 sensors.  
Have a door for modbus sensors.  
Have at least 4 analog inputs for sensors with voltage output.  
Have at least 2 inputs for digital sensors such as rain gauges.  
It must have a supply voltage of 12V sensors.  
Have an external on/off switch.  
All antennas (WiFi, GSM, GPS) must be included.  
It must have an LED indicator for the state of charge of the battery.  
It must have an indicator LED for the communication status of the modem.  
It must have an LED indicator for the operating status of the unit.  
It will be encased in its own plastic shell at least IP 65 independent of the outer shell. All antennas should be included (WiFi, GSM, GPS)

### **Item 3: Soil moisture, temperature, and conductivity sensors,**

#### **Two (2) Units**

It must have 3 metal pins through which the measurement is made.

Measurement frequency > 50 MHz.

SDI12 output.

Length < 10 cm, Width < 5cm, Height < 10cm.

Sensor length < 10cm.

Operating voltage at least in the range of 5 – 12 V DC.

Typical measurement duration < 1s.

#### **Measurement of humidity**

Area of measurement in mineral soils, at least 0.00–0.60 m<sup>3</sup>/m<sup>3</sup>.

Range of measurement in non-territorial media, 0.0–1.0 m<sup>3</sup> /m<sup>3</sup>.

Measurement resolution of at least 0.001 m<sup>3</sup> /m<sup>3</sup>.

Accuracy with general calibration  $\leq \pm 0.03$  m<sup>3</sup>/m<sup>3</sup> in soil samples with electrical conductivity < 5 dS/m.

Precision with special calibration at any porous medium  $\pm 0.01$ – $0.02$  m<sup>3</sup>/m<sup>3</sup>. **Temperature measurement**

Measuring range: at least in the range –20 to 60 °C.

Resolution :  $\leq 0.1$  °C.

Accuracy  $\leq \pm 0.5$ °C.

#### **Bulk electrical conductivity (EC) measurement**

Measurement range at least in the range 0–20 dS/m (bulk).

Measurement resolution  $\leq 0.001$  dS/m.

Measurement accuracy  $\leq \pm(5\% + 0.01$  dS/m) in the range 0–10 dS/m.



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#### **Item 4: Soil moisture sensors, sixteen (16) units**

It must have 3 metal pins through which the measurement is made.

Measurement frequency > 50 MHz.

SDI12 output.

Length < 10 cm, Width < 5cm, Height < 10cm.

Sensor length < 10cm.

Operating voltage at least in the range of 5 – 12 V DC.

Typical measurement duration < 1s.

##### Measurement of humidity

Area of measurement in mineral soils, at least 0.00–0.60 m<sup>3</sup>/m<sup>3</sup>.

Range of measurement in non-territorial media, 0.0–1.0 m<sup>3</sup> /m<sup>3</sup>.

Measurement resolution of at least 0.001 m<sup>3</sup> /m<sup>3</sup>.

Accuracy with general calibration  $\leq \pm 0.03$  m<sup>3</sup>/m<sup>3</sup> in soil samples with electrical conductivity < 5 dS/m.

Precision with special calibration at any porous medium  $\pm 0.01$ – $0.02$  m<sup>3</sup>/m<sup>3</sup>. Temperature measurement

Measuring range: at least in the range –20 to 60 °C.

Resolution :  $\leq 0.1$  °C.

Accuracy  $\leq \pm 0.5$ °C.

##### Bulk electrical conductivity (EC) measurement

Measurement range at least in the range 0–20 dS/m (bulk).

Measurement resolution  $\leq 0.001$  dS/m.

Measurement accuracy  $\leq \pm(5\% + 0.01$  dS/m) in the range 0–10 dS/m.

#### **Item 5: Water supply metering station, eight (8) units**

The meter will be adjusted to the output of the channel.

Each station will consist of the following sections:

**Unit for temporary recording and teletransmission of measurements** Have a programmable microprocessor.

Ability to access the unit via USB port.

Programming should be done wirelessly via built-in WiFi.

It should have a built-in WEB UI.

Be able to power via USB 4.5 - 5.5 V.

Have a built-in rechargeable battery, independent of the external power supply system with the PV generator.

The battery can be charged, either from the external power supply system with the PV generator, or from the USB port.



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Have a built-in mobile modem, for connection via at least NB-IoT & 2G.

Have a built-in temperature and humidity sensor.

Have built-in GPS.

It must have built-in memory for the temporary recording of measurements.

Provide accurate measurement of battery voltage even in a state of charge. Have independent and adjustable fuses for battery, solar panel and USB ports protection, 3.3 V regulator

Have a door for SDI12 sensors.

Have a door for modbus sensors.

Have at least 4 analog inputs for sensors with voltage output.

Have at least 2 inputs for digital sensors such as rain gauges.

It must have a supply voltage of 12V sensors.

Have an external on/off switch.

All antennas (WiFi, GSM, GPS) must be included.

It must have an LED indicator for the state of charge of the battery.

It must have an indicator LED for the communication status of the modem.

It must have an LED indicator for the operating status of the unit.

It will be encased in its own plastic shell at least IP 65 independent of the outer shell. All antennas should be included (WiFi, GSM, GPS)

#### **Flow meter**

It must be of a plastic body.

It must be a tangential propeller.

It must have an analogue flow measurement mechanism with rolling digits. Have a pulse output to connect to the telemetry unit.

### **Item 6: Water quality measuring station, one (1) unit**

The station will consist of the following sections:

**Unit for temporary recording and teletransmission of measurements** Have a programmable microprocessor.

Ability to access the unit via USB port.

Programming should be done wirelessly via built-in WiFi.

It should have a built-in WEB UI.

Be able to power via USB 4.5 - 5.5 V.

Have a built-in rechargeable battery, independent of the external power supply system with the PV generator.

The battery can be charged, either from the external power supply system with the PV generator, or from the USB port.



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Have a built-in mobile modem, for connection via at least NB-IoT & 2G.

Have a built-in temperature and humidity sensor.

Have built-in GPS.

It must have built-in memory for the temporary recording of measurements.

Provide accurate measurement of battery voltage even in a state of charge. Have independent and adjustable fuses for battery, solar panel and USB ports protection, 3.3 V regulator

Have a door for SDI12 sensors.

Have a door for modbus sensors.

Have at least 4 analog inputs for sensors with voltage output.

Have at least 2 inputs for digital sensors such as rain gauges.

It must have a supply voltage of 12V sensors.

Have an external on/off switch.

All antennas (WiFi, GSM, GPS) must be included.

It must have an LED indicator for the state of charge of the battery.

It must have an indicator LED for the communication status of the modem.

It must have an LED indicator for the operating status of the unit.

It will be encased in its own plastic shell at least IP 65 independent of the outer shell. All antennas should be included (WiFi, GSM, GPS)

### **Multi-parameter water quality measurement sensor**

Automatic checking for problems and errors to ensure proper installation. Smart probes type sensors, with automatic recognition of the sensors by the instrument.

All sensors should have their own memory.

In case of sensor failure, the instrument should automatically close the specific door so as not to affect the operation of others.

Operation for calibration, programming, cable-free procedures using wireless communications.

Sensors made of titanium with crystals (for opticians) made of Sapphire.

Position the sensors even when they are wet.

Have built-in procedures that will automatically detect incorrect configurations, memory status and confirm the operation of the sensors.

Have an SDI12 output to connect to the telemetry unit.

Have a USB adapter to connect to a computer.

Have built-in Bluetooth for wireless communication with the computer.

Have > 5 doors for connecting sensors.

It must have a central cleaning system with a wiper.

All sensors can accept antifouling.

Operating depth > 200 meters.

Sampling frequency > 2 Hz



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#### Conductance

Measurement range of at least 0 to 100 mS/cm.

The accuracy in the range of 0 - 100mS/cm should be  $\pm 1\%$  on the reading.

Response time  $T_{95} < 30$  sec.

Resolution of at least 0.001 mS/cm.

The sensor should be shaped in such a way that the cleaning brush passes through it and cleans it.

#### Optical Oxygen Sensor

Measuring range 0 - 50 mg/L

Accuracy in the range 0 - 20 mg/L:  $\pm 0.1$  mg/l Resolution 0.01 mg/l

#### ORP

Measurement range -999 to 999mV

Accuracy at  $\pm 20$ mV

Resolution 0.1 mg/l

#### pH

Measuring range 0-14

Accuracy to  $\pm 0.1$ pH Andle: 0.01 mg/l

#### Salinity

This parameter is calculated based on the conductivity sensor

#### Temperature

Measuring range -5 to 50°C

Accuracy  $\pm 0.2$ °C Resolution 0.001 °C

#### Total Dissolved Solids (TDS)

This parameter is calculated based on the conductivity sensor

#### Total Suspended Solids (TSS)

This parameter is calculated based on the Turbidity sensor

#### Opacity

Measuring Range 0 - 4000 FNU

Accuracy in the range of 0 - 999 FNU: 0.3 FNU assay in the range 0 - 4000 FNU:

0.1 FNU



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- Quotation must be addressed to (The British University in Egypt), clearly stating the project name (SWAMED Project) within the offer.
- Proposals must be submitted via email in two separate PDF files (Technical Offer & Financial Offer separately) to Mr. Mahmoud Konswa [Mahmoud.Khalil@bue.edu.eg](mailto:Mahmoud.Khalil@bue.edu.eg) no later than **15 February 2026**.
- The financial offer must be inclusive of all taxes.
- Prices must be quoted in Euro, but the payment will be in Egyptian Pounds according to the Central Bank of Egypt's exchange rate on the day of payment.
- A precise timeline for delivery and installation must be specified per item/project.
- The provided price must include Supply, Install, and Transportation at the project site in ElBeheira - Alexandria.
- Technical alternatives may be proposed, given that their efficiency is not less than the attached specifications.