

## Precipitation sensor network and automatic weather station

### Precipitation measurement stations (10x)

#### Precipitation sensor

- Weighing Rain Gauge
- Parameters measured: Cumulative precipitation, precipitation intensity, bucket content in real time and non real time
- Measurement technology: Weighing principle
- All-weather precipitation gauge without moving parts according to WMO guide line No. 8
- Recordable precipitation: Liquid, solid, and mixed
- Collecting area: 200 cm<sup>2</sup> / 400 cm<sup>2</sup>
- Recordable precipitation amount: 1500 mm / 750 mm
- Accuracy (at -25 ... +45 °C )
  - Amount  $\pm 0.1$  mm or  $\pm 1$  % of measured value
  - Intensity  $\pm 0.1$  mm/min,  $\pm 6$  mm/h or  $\pm 1$  % of measured value
  - Resolution 0.01 mm, 0.01 mm/min or mm/h
- Measurement interval: 1 min
- Data transfer: 10 min
- Data logger
  - Data collection and transfer
  - Updatable software
  - Possibility to connect to the internet via WIFI and mobile internet (1 station have to connect to internet using mobile internet, the rest have to connect via WIFI)
  - all the measured values have to be stored in the station, in case of data transfer errors it have to be collected from the stations
- Water resistant instrument box
- Uninterruptible power supply
  - The instrument have to operate from battery minimum 4 hours
- Instrument mast
  - 1 m height
  - 8 station it have to tie down into the soil, 2 cases it have to be a tripod fixed to concrete slabs
- Fence around instrument
  - 1,5 m height
  - 3 (4 site) or 4 (4 site) sided
- Long range WIFI router
  - 9 sites
  - Distance to are cover up to 55 m
- GSM modem
  - 1 site

### Complete automatic weather station (1x)

#### Sensors

- temperature
- Accuracy  $\pm 0.2$  °C
- humidity
- Accuracy  $\pm 5$  %
- wind
- Accuracy  $\pm 0,5$  m/s in case of wind speed and  $\pm 5^\circ$  in case of direction
- precipitation
- Same as the precipitation stations
- air pressure
- Accuracy  $\pm 0,5$  hPa
- radiation
- Accuracy  $\pm 20$  W/m<sup>2</sup>
- Measurement 1 min
- Data transfer 10 min
- Measured parameters (in each 10 min):
  - minimum, maximum, mean value and the actual value at the end of the 10 min interval of temperature, humidity, wind speed, air pressure
  - sum and actual value at the end of the 10 min interval: radiation
  - sum: precipitation
  - actual value at the end of the 10 min interval: wind direction
- Data logger
  - Data collection and transfer
  - Updatable software
  - Possibility to connect to the internet via mobile internet
  - all the measured values have to be stored in the station, in case of data transfer errors it have to be collected from the stations
- Water resistant instrument box
- Uninterruptible power supply
  - The instrument have to operate from battery minimum 4 hours
- Instrument mast
  - 10-2 m height
- Fence around instrument
  - 1,5 m height
  - 4 sided
  - fixed with wires (2 end points have to fixed into ground, 1 endpoint into a building wall near to station)
  - wires have to protected with plastic or rubber cover in the lowest 2 m

GSM modem

**Instrument installation**

Sites are presented in the attached supplement

Stations and fence have to be deployed

Electricity cable have to be connected to the nearest possible connections. The cable have to placed in to cable channel in case of building walls or have to be placed 0.5 m depth into the soil.

Long range WIFI router have to be installed into suitable position.

**Data collection software**

It will be installed into a server located in the Department of Climatology and Landscape Ecology. The operation system is debian linux, MySQL is available.

The software stores the incoming data into MySQL database and into txt files.

The software have to move the daily txt files to archive directory

Operation of the data collection could be monitored with nohup, but the nohup.out file have to be moved to archive in each day.

**Warranty**

1 year for equipment

limited warranty for 5 year for the operation of the system (including software errors and design failures)

**Deadlines, Payment**

**Production of the equipments**

2018 October

up to 60 000 EUR

**Deployment of equipment**

2018 December

up to 32 000 EUR