



WORLD
METEOROLOGICAL
ORGANIZATION

**Supply and delivery of Hydrological Stations in the
Volta Basin Countries under the framework of the
WMO Volta Flood and Drought Management (VFDM)
Project.**

Technical Specifications

ITB 2313-23

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Table of Contents

List of Acronyms.....	3
2. General Information	4
1.1. Definition of roles and responsibilities	Error! Bookmark not defined.
1.2. General conditions and standards.....	4
2. Delivery Conditions and Functional Requirements.....	6
3. Technical Specifications.....	7
3.1. Measurements, Sensors and Equipment	7
1. Temperature and relative humidity.....	7
2. Precipitation Measurement.....	8
3. Automatic Water Level Stations	10
5. Datalogger and Data Collection Unit.....	10
6. Cabling.....	13
7. Protection, Warning and Alarms.....	14
8. Batteries and Charging Units	16
9. Observation Enclosure and Sitting.....	17
10. Software requirements.....	17
3.2. Station Data Collection System (SDCS)	17
4.Training requirements	19
5.User Acceptance Tests	20
6. Maintenance, Warranty and Calibration	23
1. Maintenance Requirements.....	23
2. Calibration	26
7.Documentation	27
Installation Manuals	27
System-Operator Manuals.....	27
Configuration Manuals.....	27
User Manuals.....	27
Technical Reference Manuals	28
Software Manuals	28
Training Manuals	28
Validation of documentation by WMO.....	29
Reproduction.....	29
Review and approval	29

Annex-1: Assessment Results 30
Annex-2: Work Locations, Recipient Countries and Technical Sheet 30
Annex-3: MCH Technical Specifications 32
Annex-4: Documentation requirements, methods, and timing..... 33

List of Acronyms

Abbreviation	Definition
CIMO	Commission for Instrument and Methods of Observation
CLS	Contractor Logistic Support
COTS	Commercial off the shelf
DBMS	Database Management System
DCU	Data Collecting Unit
DCS	Data Collection System
DOC	Document
DVD	Digital Versatile Disc
EMI	Electromagnetic Interference
EN	English
EUMETCast	EUMETCast is a multi-service dissemination system based on multicast technology
EUR	European
COA	Certificate of Acceptance
FTP	File Transfer Protocol
GPS	Global Positioning System
GRIB	Gridded Binary
GSM	Global System for Mobile Communication
GTS	Global Telecommunication System
HQ	Head Quarter
HTML	Hypertext Mark-up Language
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
IP65	Ingress Protection Codes
ISO	International Organization for Standardization
LAN	Local Area Network
MA	Ministry of Agriculture (Palestine)
MIPS	Meteorological Information Processing System
MTBF/MTTR	Mean time between failure
NMHS	National Meteorological and Hydrological Service
PAT	Provisional Acceptance Test
PVC	Polyvinyl chloride
RFI	Radio Frequency Interference
SMS	Short Message Service
SQL	Structured Query Language
TCP	Transmission Control Protocol
UPS	Uninterrupted Power Source
UV	Ultraviolet
VPN	Virtual Private Network
WAN	Wide Area Network
WMO	World Meteorological Organization
XML	Extensible Mark-up Language

1. General Information

Under the framework of the [Volta Basin Flood and Drought management \(VFDM\)](#), which is implemented in the Six Countries (Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali, and Togo), it is sought to install a total of 12 priority new hydrological stations in the Volta Basin region (Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali, and Togo) to collect main driving hydrometeorological parameters for floods and drought events from these real observation networks (Precipitation, water levels, temperature, and humidity).

For this, consultation and assessment studies were carried out in 2021 to identify the status of the hydrological stations in the Recipient Countries of Volta Basin ([Annex-1: Assessment Results](#)). Based on the assessment results, it was agreed to install new hydrological stations to the work locations and connect the stations to the Recipient Country databases, which are operating MCH Database Management System (DBMS)¹ ([Annex-3: MCH Technical Specifications](#)).

The data from the new hydrological stations will be connected and visualized under the transboundary VOLTALARM Early Warning System (<https://volta.myDewetra.world/>) for real-time observations as well as modelling and forecasting for the provision of the early warning of the hydrological disasters.

1.1. General conditions and standards

Bids for offered goods and services shall ensure the following:

1. Compliance with "Guide to Hydrological Practices, Volume I: Hydrology – From Measurement to Hydrological Information"² for water level measurement sensor, data and information system, enclosure design, and sitting.
2. Compliance with "Guide to Instruments and Methods of Observation (WMO-No. 8: 2018 and 2021)"³ for temperature, humidity, wind measurement sensors,
3. Compliance with "Guide to Instruments and Methods of Observation (WMO-No. 8)" for lifecycle management, data and information processing, enclosure design (except water level), maintenance conditions, spare-parts, training and documentation, and statement of work.

¹ MCH DBMS details are available at : <https://public.wmo.int/en/resources/bulletin/mch-database-management-system>

² Guide to Hydrological Practices, Volume I: Hydrology – From Measurement to Hydrological Information is available at: https://library.wmo.int/index.php?lvl=notice_display&id=21815#.ZDOranZByUk

³ Guide to Instruments and Methods of Observation WMO-No. 8:2018, 2021 are available at: https://community.wmo.int/en/activity-areas/imop/wmo-no_8

4. There shall be enough information provided to enable a calculation of the calibration/maintenance intervals.
5. The Bidder shall provide documentation outlining the field/operational performance of the sensor uncertainty over time [at least a year], which shall include sensor/calibration drift and any factors
6. Each instrument shall be supplied with a calibration valid for at least 90% of the calibration period, as the manufacturer recommends. The initial calibration shall be done by an accredited calibration laboratory or at least be fully traceable to such an ISO17025 accredited laboratory.
7. All offered stations shall have the same instruments, sensors, and Dataloggers. Any sensor and parts of the stations shall be able to be removed from one to be plugged into the other one easily without any mismatch, physical and port problem (for instance: for any of the stations', plugging and utilization of any desired sensor shall be operational by the user)
8. End-of-life and end-of-support goods shall not be offered
9. Unless specifically defined within related sections of this document, all sensors and system parts shall comply with the following environmental conditions:

Outdoor:

- Temperature: 0°C and +55°C
- Relative Humidity: 0 to 100%
- Wind Speed: 50 m/s
- IP65 for electronic and signalization units
- Resistance to (vibration) shocks and lightning protection

Indoor (ICT):

- Temperature: 5°C and +30°C (for ICT equipment)
10. The initial station locations are 14, as provided in the worksheet and country list (Annex-2). WMO reserves the right to consider having the same stations for the "contingency" locations based on the availability of the funding.

2. Delivery Conditions and Functional Requirements

Due to local conditions, bidders are asked to provide their bids with the following options. Bidders are strongly encouraged to provide offers for both options.

1. Obligatory to be delivered to the Recipient Country and station locations:
 - 1.1. 12 full set of stations with installation units (mast, sitting, protection boxes, electronic units, cabling, cabling, batteries, and charging units, solar panels, protection and alarm units, observation sitting and enclosure, installation, hardware & software, and materials and documents)
 - 1.2. 6 Data Collection Systems to be delivered to the 6 Recipient Country hydrometeorological service and to be connected to LAN and MCH DBMS
 - 1.3. Database connection to the existing ICT systems in the Recipient Country, including the 12-month (maximum) cost of the temporary sim cards
2. **Option-1:** Besides the obligatory goods and services, turnkey delivery (with GSM connection) and installation to the 12 station locations.
3. **Option-2:** Besides the obligatory goods and services, turnkey delivery (with METEOSAT GCS telemetry) and installation to the 12 station locations.

Bidders are invited to provide solutions for options "1" and/or "2".

Stations shall be assembled and completed at the contractor's facilities, and the Contractor shall provide a Provisional Acceptance Report (PAT) to demonstrate the successful operations of the stations. After the WMO's approval, the stations and other hardware and software shall be shipped to countries.

All quotes shall be DPU-Incoterms and Turnkey basis for the installation.

The Contractor can offer different modalities for PAT and shall only proceed with it based on the approval of WMO.

The total period of the delivery of the whole contract requirements is **nine months** from the signature of the Contract.

The Contractor shall submit detailed work and project executing plan no later than **one month** after the contract signature.

The Contractor shall deliver PAT successfully no later than **four months** after the signature of the Contract.

The Contractor shall complete the Final Acceptance Test and submit the CoA no later than **four months** after the PAT.

3. Technical Specifications

The full station set comprises a full set of section 3.1. goods and services, with their technical specifications as below:

3.1. Measurements, Sensors and Equipment

1. Temperature and relative humidity

Bidders can offer any technology or system as long as the following compliances are provided.

1. The air temperature measurement shall use either a resistance thermometer or thermocouple technology.
2. The sensor uncertainty shall be 0.1 °C or better.
3. If the Bidder provides any items that affect the sensor's exposure [examples include a screen, an enclosure containing multiple sensors, and a mounting post to which the sensor is affixed], then the Bidder shall provide documentation outlining the impact of the enclosure on the sensor performance and uncertainty.
4. The Bidder shall provide documentation outlining the field/operational performance of the sensor uncertainty over time [at least one (1) year]. This shall include sensor/calibration drift and any factors [for example, maintenance/cleaning/inspection requirements]
5. The sensor/instrument for Ta measurements shall be mounted inside the radiation screen at a height between 1.25 and 2.0 m above ground level.
6. The sensor/instrument for Air Temperature measurements shall be provided with a mounting unit and radiation/thermometer screen. The screen (and other contained/attached sensors) shall not affect the measurements more than 0.5 °C under any condition.
7. The Bidder shall demonstrate that the RH measurements are not influenced by wet deposition and then evaporation during Precipitation, drizzle, or fog.
8. The Bidder shall also demonstrate that screen provides enough protection from pollution that the sensor is not affected.
9. Whatever physical quantity measured, Air Temperature shall be presented in/by the instrument/system in degrees Celsius (°C).
10. The resolution of the reported temperature shall be 0.1 °C (or better).
11. Averages of all valid samples of Air Temperature shall be produced over 1-minute intervals. The 1-minute average shall be used as the instantaneous value for air temperature.
12. The maximum and minimum temperature one-minute (average) temperature values measured over a 24-hour period shall be determined [=daily maximum/minimum]. The time of occurrence shall also be stored
13. The instrument time constant under controlled conditions shall be 40 s or better over the entire operational range.
14. The sensor measurement uncertainty shall be better than +/- 3 %RH.

15. The Bidder shall provide documentation outlining the field/operational performance of the sensor uncertainty over time [at least one (1) year]. This shall include sensor/calibration drift and any factors that depend on the Customers' actions [for example, maintenance/cleaning/inspection requirements]
16. There shall be enough information provided to enable a calculation of the uncertainty budget, as well as calibration/maintenance intervals.
17. The sensor/instrument for RH measurements shall be mounted in a radiation/thermometer screen. The presence of the screen shall not affect the measurements in any way.
18. If ice rime accretion is expected to significantly reduce the air circulation in the instrument screen in which the RH Measurement is made, then artificial/forced ventilation may be used.
19. Whatever physical quantity measured, U shall be presented in/by the instrument/system in %RH.
20. The measurement range shall be 0-100%RH.
21. The Reporting Resolution for Relative Humidity shall be 1%RH (or better).
22. Averages of all valid samples of Relative humidity shall be produced over 1-minute intervals. The 1-minute average shall be used as the instantaneous value for relative humidity
23. Each instrument shall be supplied with a unique serial number.

2. Precipitation Measurement

1. There shall be enough information provided to enable a calculation of the uncertainty budget, as well as calibration/maintenance intervals.
2. The physical output of the instrument shall be of a standard type and format that can be readily interfaced to equipment from other manufacturers than the Bidder
3. Each instrument shall be supplied with a unique serial number.
4. *The stations should have a threshold and alarm functionality. The Bidder should demonstrate how the function is working*

Precipitation amount

5. If the sensor/instrument for measuring Precipitation is based on the collection of Precipitation, the area of the collector orifice shall be at least 200 cm² and no larger than 500 cm². The area of the orifice shall be known to the nearest 0.5 %, and the construction shall be such that this area remains constant while the sensor is in normal use.
6. The construction shall be such as to minimize wetting areas. The container shall also have a narrow extract and be sufficiently protected from radiation to minimize the loss of water by evaporation.
7. The sensor/instrument for measuring Precipitation shall be based on an electronic recording instrument.

8. The sensor uncertainty shall be larger of 5% or 0.1 m for the precipitation amount
9. Whatever physical quantity is measured; the Precipitation Amount shall be presented in/by the instrument/system in millimeters.
10. The maximum measurement range shall be 0-500mm/day. This may be increased to meet local conditions
11. The Reporting Resolution for Precipitation Amount shall be 0.1mm: amounts over 1 minute, 10 minutes, hourly, 24 hours."

Precipitation intensity:

12. Precipitation intensity shall be presented in mm/hour (based on a 1-minute average), and it shall be in a separate column with a unique header inside the data output table
13. The sensor uncertainty shall be

Under constant flow conditions in the laboratory:

5% for > 2 mm/h,

2% for > 10 mm/h.

In the field:

5 mm/h,

5% above 100 mm/h."

14. The instrument time constant under controlled conditions shall be better than 30 s.
15. The measurement range shall be 0.02 – 2,000 mm/hour.
16. The individual measurements provide instantaneous readings. Therefore, the System shall calculate/make available: intensities over 1 minute, 10 minutes, hours, 24 hours.
17. If the instrument can report the accumulated Precipitation over a certain period, this amount shall be reported in a separate column with a unique header inside the data output table.

Installation

18. The instrument mounting shall be optimized for taking precipitation measurements and in compliance with Paragraph. 1.1 above
19. A windscreen shall be included around the precipitation sensor to minimize errors due to wind. The top of the windscreen shall be at the same height as the orifice of the precipitation sensor. (For some other types of instruments, this requirement may not apply.)
20. The precipitation sensor shall be sited such that obstacles are at a distance of at least twice the height of the object above the sensor. That is, if the sensor is 2m taller than the precipitation sensor's top, it shall be at least 4m away.
21. The precipitation sensor shall be sited such that any obstacle does not occupy more than 10 degrees of arc around the sensor

3. Automatic Water Level Stations

The following technical specifications shall be used for water level measurements and installation.

4. Contactless measurement methods, sensors, and their required sittings shall be offered.
5. Data shall be recorded over 1 minute, 10 minutes, hourly, and 24 hours.
6. The preferred location to install is over the existing structures, e.g. bridges, nearby structures. In case a suitable sitting is missing for the camera shall be mounted on a protected structure (e.g., concrete or steel). The bidders shall provide unit pricing for such mounting accessories. The Contractor shall provide detailed plans for sitting arrangement within them
7. Water level and distance to water shall be measured
8. Preferred installation locations are flood safe locations (e.g. bridges or through establishing a new mounting). The Contractor shall define the exact installation locations within the pre-installation report or the location shall be decided on-set,s in consultation with the WMO Project Manager for the procurement.
9. Measurement span shall be 0.2m to 30m
10. Measurement resolution shall be 2mm
11. Measurement uncertainty shall be 2 mm
12. Temperature coefficient shall be max 0,01%
13. The System shall be IP68 shall provide related safety and operational regulations: EN 301 489-3, EN 60950-1
14. If smart sensor offered, the bidders shall provide details regarding the connection interfaces

For data collection and reporting:

5. Datalogger and Data Collection Unit

Either smart sensor or logger systems offered, the following functionalities shall be provided.

1. Data Collecting Unit (DCU) is datalogger and communication unit (e.g. integrated or external modem or telemetry system), that shall be able to support data from the sensors within the same span and precision. The Contractor shall provide the detailed test and calibration for the Datalogger and hand over the related documents to management with the manufacturer test and calibration documents.
2. Datalogger shall have enough input and output ports. No multipliers shall be used.
3. The bidders shall provide a detailed explanation for demonstrating the following in their bidding file.
 - *The Datalogger preferably should have a display.* This display should be able to show all direct measurement values and any intermediate results used in the measurement. For instance, for temperature measurement

display shall show the sensor values in resistance, voltage etc., within the temperature itself. Bidders can offer a separate screen solution for data logger.

- The Contractor shall provide the user manual and data monitoring guide of the Datalogger at least 15 days before the tests. WMO reserves the right to change the order of the information and/or adding/removing information.
- 2. The Datalogger shall have integrated control panel for controlling, managing and settings.
- 3. The Datalogger shall be able to support different programming sampling-intervals simultaneously. The Contractor can provide a higher number of sampling-interval within the Datalogger they offered.
- 4. The Datalogger preferably should be able to be programmed via the remote access and local access from the computers. This access rights shall be encrypted to block unauthorized access.
- 5. The situational values of sensors shall be monitored whenever Datalogger is connected locally and remotely.
- 6. The Contractor shall submit the software of the operating system on Datalogger. Also, the Contractor shall deliver the software updates without billing additional charges in the warranty period.
- 7. The Contractor shall provide the necessary software and connection apparatus for remote access and local computer connections. The Contractor shall be responsible for providing the updated/new versions during the warranty period.
- 8. The Contractor shall provide and setup remote and local access software (interface) to any desired computer(s) which is (are) decided by the management.
- 9. The Datalogger shall be able to provide access to remote users with TCP/IP protocol and to local users, for the operations such as deleting the software, downloading, copying/cutting the stored data, and changing the Datalogger settings
- 10. The Datalogger shall be able to provide wide user possibilities such as changing the sensors, adding new sensors, moving the Datalogger to another station, changing the any of the Datalogger parameters and equations, for any needed time. For this occasion, any information, material or catalogue regarding the Datalogger shall be delivered to the management during the training.
- 11. Communication Ports: Datalogger shall have different ports to perform connection and access with different devices. The bidders shall provide detailed information about their Datalogger ports in their offer.

System Date and Time

- 12. Datalogger shall sync with the Local Agency Server time as the system time. This server time shall be able to modifiable. During the first start of the Datalogger and for the lack of access to the server time, Datalogger shall use GPS module time. And then when the access to the server provided the datalogger shall synchronize its time according to the server time automatically.
- 13. Datalogger shall be capable of performing without any timing problem after the resetting. When the Datalogger rebooted, it shall perform time synchronization first; then it shall transfer and store the data without any complexity or problem.

14. Datalogger shall use the "Coordinated Universal Time (UTC)" as time. Datalogger shall be able to perform synchronization, system check and time adjustment via the local agency server time.
15. Also, Datalogger shall never produce fault in data timing series, during all these time synchronizations between Datalogger, GPS, and Server.

Quality Control System

16. Datalogger shall provide pre-quality control for its data and indicate sensor values.

Station Status Information

17. Station status information (shield and coverage locker open/close, battery voltage, the inside temperature of the shield, the situation of the external power lines) shall be logged to the Datalogger and shall be sent to "Local Agency Database."

Data Archiving

18. Data shall be stored in Datalogger, at least 365 days.

Access to the Archive Data in the Datalogger

19. Datalogger shall be able to be accessed (view/cut/copy) by the user, during the operational status of Datalogger, without any loss in Datalogger data archiving; from the user accesses the portal, from a Laptop via connecting Datalogger, from the local station office with a desktop pc and with remote access from any desired point in the server, with encrypted access, by any desired time. The Contractor shall provide this software to WMO before the acceptance test without any expense. This software shall not have any time limitation or licensing problem after its delivery.
20. In case of any data transfer problem in Datalogger, archive data shall be accessible by a portal for transferring the data to the server via computer. The Contractor shall provide the necessary software to WMO free of charge and without any licensing and limitation problem.
21. Datalogger shall be able to transfer the data to "local agency database" even in the case of Datalogger is using the memory card for data archiving, and the card is removed.

Local and Remote Software Update and Maintenance

22. Datalogger shall be able to provide access for maintenance for performing software re-installation and update. For this purpose, Datalogger shall be able to provide access to operation terminal, local and remote personal computers/laptops (users) which are connected to local agency database, with an encrypted data protocol. Accessing interface shall be provided by an encrypted access protocol for blocking unauthorized accesses. The Contractor shall provide any necessary cable, connector, software etc. items to management before the training. This software will not have any licensing or

limitation problem after the system acceptance. Also, the Contractor shall be responsible for updating and changing the software with new versions during the warranty period.

Operational for maintenance functions

23. Controlling the raw data, transferring data via data communication lines.
24. Control, Inspection, Adjustment of the Set-up Configuration
25. Change and control of the Datalogger parameters
26. Resetting Datalogger, Re-installing the Datalogger software, formatting Datalogger software.

Maintenance mode

27. Datalogger shall include a maintenance mode. Datalogger shall provide user maintenance mode (with local and remote access and integrated control pad on Datalogger), Datalogger shall be able to perform maintenance mode for any of the sensor(s). During the Maintenance, sensor data shall be stored and archived via a sign code indicating "maintenance-mode". If the user forgets to exit from the maintenance mode, the system shall provide automatic "normal mode" in 2 hours.

Calibration of Datalogger

28. Dataloggers shall be calibrated with an ISO/IEC 17025 and ISO EN 9001 accredited lab, with traceability provided reference device. The Contractor shall provide both Datalogger's calibration and reference device documents to the management before the acceptance test, which are clearly showing that the calibration carried out by the applying same sensor specs to the Datalogger, in terms of "voltage, current, resistance and frequency".

Installation of the correction values to Datalogger

29. Any provided Datalogger shall be able to be programmed according to the gathered correction values from the lab. With the terms of these new correction values, the Contractor shall make it sure that calibration values well implied and new values are correct. Datalogger shall be able to provide these corrections separately for each sensor with a provided menu in the system. The system shall be accessible by Datalogger integrated terminal pad, local computer, laptop connection and with Pc, with an encrypted access

6. Cabling

1. All cables shall be coded, colored and indexed with labels
2. Labelling shall not be made by paper or erasable materials.
3. Labels shall be durable against the outdoor conditions.
4. All cabling shall be protected against friction or harm might occur during the operations and maintenance (cleaning. controlling, bending the mounting arm down etc.)

5. All cabling networks shall be detailed and mapped with schemes, and these schemes shall be provided to WMO after the installation, and then schemes shall be mounted inside the connection box. These mapping and scheming process shall be made for all system cabling and networking, and shall be delivered to WMO after the installation, both in electronic and hardcopies (a PVC pressed copy shall be hanged to the connection boxes as well).
6. All cabling shall be made by the UV durability material cables, and these cables shall be covered by the UV resistant black cable clothing spirals. The Bidder shall also include the details of these materials
7. Cable ducts and protection covers shall not contain more than 75% of their maximum capacity
8. Only a single voltage or power supply shall be supported by a cable. It is not allowed to have two different voltages or power supply from two different circuit breakers in one cable.
9. Cables shall be of one uninterrupted length; patchwork connections are not acceptable.
10. Wires that are planned to be placed underground shall be placed in protection against environmental (rain, snow, animals etc.) conditions and threats
11. All outside cables other than lightning cable shall have end-to-end protection (from devices to the connection box) and shall be insulated
12. The lightning protection cable is located outside of the mounting units
13. Cable ends shall be clenched by connectors; the connection shall be made through connectors
14. Cable supports or clamps shall be spaced at adequate intervals to eliminate excessive sag or mechanical tension of the cables;
15. Cable entrance to the connection boxes shall be through records and records shall be sealed for protecting the cables.
16. All cabling and wiring shall be identified at both ends by fixed markers giving wire number as shown on Contractor's drawings.
17. All cables shall be identified at both ends with non-corrodible cable markers.

7. Protection, Warning and Alarms

1. All installed equipment shall comply with applicable local electrical safety regulations. In the absence of local requirements, IEC 60950-1 shall be used.
2. All electronic equipment shall have the grounding
3. The Contractor shall use the international standards for cabling and coloring
4. The offered solutions shall provide protection for any operational and maintenance related conditions, e.g. voltage fluctuation, lightning, and any static electricity effect.
5. The bidders shall define in their bids what kind of protective equipment is offered, and for what purpose together with its functionalities and connections. This equipment shall be provided with the same for each station. Protector shall be suitable with the System, where the application shall not result in any obstruct, blockage, malfunction or problem
6. All station equipment shall have protection and mounting sets, fences against malicious attacks. Please provide detail of your fencing and mounting in your bids.

The lightning protection

7. Station shall be installed for mounting arms to ensure protection against direct lightning strikes to parts of the protective case and mounting arms. The lightning protector shall be made of copper or another material with similar conductivity and include a grounding plate. The lightning protection system shall be isolated from mounting arms and protective cases and shall be insulated, with copper braiding or equivalent with cross-section not less than ten mm²;
 - cable color: yellow/green;
 - cable length (depending on the design)
 - fittings shall be made of dielectric material and separated from other equipment
 - complete set shall include lightning rod, cable, earthing rod, and fittings;

Grounding

8. All grounding network shall be provided via copper plate.
9. No mechanical add-ons shall be used.

Protective Cases

Protective Cases for electronic equipment and connection boxes shall minimum be:

10. Made of polycarbonate or corrosion and rust-free metal.
11. Reinforced heat insulation made of non-combustible material.
12. Heat insulation thickness calculated based on environmental conditions shall
 - Not be less than R5;
 - inputs: at least two air-tight inputs for installation of moisture-proof jacks to connect sensors and peripherals.
 - ensure free placement of and access to the equipment installed
13. *In case the box accessed (e.g. door opened) datalogger preferably should log the attempts and shall report to the database and should provide alarms to the operator (sound and visual) for notifying the attempts.*
14. A cabling diagram made of PVC shall be placed on the inside of the door.
15. All cables shall be marked in English and French, and diagram shall clearly indicate the connections
16. All cabling shall be properly guided and bundled, and attached every 30 cm (no loose cables, no free hanging cables). Unnecessary extra cable loops shall be avoided.
17. All cable connections in cabinets shall be terminated on connector plugs with metal enclosures. The cabling inside cabinets shall be routed in an orderly manner in fixed traces and tied up. The presence of loose cabling over lengths of more than 30 cm is not permitted.
18. All parts shall be properly attached by screws, adhesive or brazing (no loose parts).

19. Any connection change or loss shall be logged and reported to the datalogger and center.

8. Batteries and Charging Units

20. Stations shall be fed from the solar cells and battery systems, and the bidders shall provide solutions for uninterrupted system run in line with data collection and reporting requirements. Offered battery systems shall allow system operations at least 30 days. Technical documents regarding power calculation, batteries and solar cells shall be included within the offers.
21. In case datalogger used, router and dataloggers shall be fed by an additional internal battery.
22. The battery level shall be monitored by a led, or digital screen and System shall charge the battery in case of low voltage till it is full. Once it is full System shall cut the charging operation.
23. The System shall use two battery units.
 - An internal one to feed datalogger and router and external one to feed sensors. Batteries shall not apply deep de-charge and shall be fed by solar cells. The internal battery shall not be deep de-charge, and it shall primarily feed by solar cells
 - External Battery shall be installed into a different protective case and shall feed sensors and internal battery.

Batteries shall have the following specifications:

24. Max 10% for ten years and %20 for 20 years for power lost
25. Different colored and UV protected cables connected via insulated and protected against environmental conditions.
26. In compliance with IEC 61215 and IEC 61730 CE, ISO 9001, ISO 14001 standards.
27. A bypass diode shall be applied (shall be placed in the connection box)
28. type: quick charge, low self-discharge
29. service life not less than ten years.
30. A battery charging controller to ensure overcharge protection.
31. Battery charge level to be displayed on Datalogger
32. The ambient temperature is not affecting the battery charge.

Solar Cell (Photovoltaic Panels) shall have the following requirements:

33. The structure shall be able mounted with "the most effective angle and position" (according to the seasons) shall be calculated by the Contractor and provided to WMO with instructions.
34. The minimum mounting height of solar cells is 1 meter, provided it is mounted on a separate structure without affecting the measurement of the sensors and getting blocked by any object.
35. The support of the solar cell unit shall be strong and resistant to any major impacts.

36. In compliance with IEC 61215 and IEC 61730 .
37. Solar cell voltage shall be logged to datalogger or else reported to the database at the center (minutely, hourly and daily)
38. The solar cell shall be of the minimum size with maximum efficiency so that it can provide enough voltage for the whole stations and its components during night and times of low sunlight intensity and shall provide continuous power for the system even for minutely data transfer.

9. Observation Enclosure and Sitting

- 1- The Contractor shall provide "Observation Enclosure" in compliance with WMO No-8 CIMO Guide, for new AWS, Water level and precipitation stations.
- 2- Observation Enclosure shall be covered by 1,5 meters height wire netting. Wire netting shall start max 5 cm high from the ground level, as for not affecting the sensors.

10. Software requirements

- 1- Any operational software used within the offered design shall belong to WMO/administrator at the end of the implementation and System shall not require additional software or recurring costs for operating the System
- 2- Any software or data processing system offered shall ensure that data and products being created or generated shall belong to Recipient Countries.
- 3- The Contractor shall have the right to use the software developed as part of the implementation of the contract only for its own needs. The use of the specified software by the Contractor in contracts or agreements commissioned by third parties, as well as the transfer to third parties is allowed only with the written permission of the WMO and Recipient Countries.
- 4- The Contractor shall transfer all intellectual property rights and source codes to WMO and Recipient Countries

3.2. Station Data Collection System (SDCS)

Following is the functional requirements for stations to report the data to the respective databases of the Recipient Countries.

- 1- Bidders shall offer any open source SDCS hardware and software.
- 2- All offered system will be connected to the MCH DBMS of the Recipient Country.
- 3- MCH DBMS uses open-source SQL database, allowing modification of the data tables for any industrial based application server.
- 4- Based on the Option and Solution that Bidder submitted (router and/or application computer/server) the Bidder shall provide costing of their delivery and installation services within under related section of the Financial Offer.

- 5- Recipient Country ICT facilities and MCH DBMS has empty slot within the wall mounted racks. The bidders are requested to use the dedicated place for installation of their SDCS hardware. Please note that installation location of the SDCS hardware can be changed based on the Contractor's recommendation and WMO's approval.
- 6- Recipient Country will give access to their ICT facilities for MCH DBMS connection over LAN.
- 7- Bidders shall provide details on Station Data Collection System (SDCS) based one of the following solutions:
 - 7.1. Connecting SDCS to the Recipient Country local data collection systems of the respective hydrometeorological services
 - 7.2. Connecting SDCS to the MCH DBMS
 - 7.3. Connection and data retrieval through internet or Casting System (if bidders offer a solution that is reporting only to METEOSAT DCS)
 - 7.4. Any other data collection and reporting method offered by the Bidder
8. Please note that the data transmission costs (GSM, SMS etc.) shall be covered by the Bidder until the Recipient Country takes over the transmission costs. This period shall not exceed one (1) year. Bidder shall provide the cost of transmission within their offers.

4. Training requirements

- 1- The Contractor shall provide training, installation, and maintenance guidance materials to Recipient Country representatives.
- 2- The Contractor will be accompanied by the representatives of the Recipient Country for installation works. The attendance cost of the representatives will be covered by WMO.
- 3- The Contractor shall provide hands-on training to the representatives during the installation.
- 4- WMO shall provide all material and software, scripts, applications, interfaces required for installation to the Recipient Country representative.
- 5- All training materials shall be in English and French.

5. User Acceptance Tests

1. Contractor shall prove by tests the correct operation and well-functioning of the System according to the technical specifications of this document,

Provisional/Factory Acceptance Test (PAT)

2. The PAT shall be performed to the stations before the stations delivered to the Recipient Country.
3. The Contractor shall provide a provisional acceptance test report for stations before shipping to the warehouses

Certificate of Acceptance (CoA)

4. CoA shall be signed by the Contractor, Recipient Country representative and the WMO Project Manager for this procurement, confirming the finals tests are satisfactory, and that the equipment is operationalized and stable.

The Contractor shall prepare Test Plans for the following sections within the proposed test plans:

5. Purpose:

This section shall state the purpose of the Test Plan and shall identify the phase to which it applies. The purpose shall be stated in terms of establishing detailed requirements, criteria, general methods, responsibilities, and overall planning to confirm, in accordance with the specifications, that the System or designated portions of it, fulfil the requirements of the specification. Reasons for excluding any portions of the System from this Test Plan shall be stated.

6. General Requirements:

Discuss pertinent background information and functions performed, and include a brief overall description of the System, overall responsibility for the execution of the Test Program and overall schedules.

7. Description of the Test Item:

Indicate the number of test items involved and the features which positively identify the items.

8. Participating Organizations:

List each of the participating organisations and their basic responsibilities and tasks. Include a breakdown of the test force functional organisation and a time-phased listing of test force personnel requirements by organisations and job title.

9. Milestones and Schedules:

The plan shall include an overall flow diagram of the entire Test and deployment program as outlined. This flow shall be sequentially arranged to include all significant Test milestones and any additional information which clarifies the

description of the Test program. The schedule includes identification of the milestone, start and finish dates and the associated location.

10. Test Support Requirements:

Include the technical and logistic support required to perform the Test and identify special facilities, support equipment and personnel required to support the Test. Considerations shall be given to such items as electronics, computer programs, facilities, ranges, simulation, and material. Provide a schedule of critical support requirements showing time, duration, for furnishing the support items. Provide calibration information, which will define and describe all systems requiring calibration. All responsibilities during Test shall be addressed in this section.

11. Security Requirements:

Provide the security classification of equipment, test, test-results, documents and other material related to the test program.

12. Specific Test Objectives:

Include or reference the list of those objectives, which are necessary to fulfil the applicable requirements contained within the system specification and any applicable functional specifications.

13. Test Methods and Descriptions:

Outline in general terms the test execution to fulfil each of the objectives identified in the specifications, in order to provide guidance for the preparation of more detailed test descriptions.

14. Data Collection, Reduction and Analysis:

Provide an analysis plan which, considering the test objectives, indicates the type of data required and its processing. Specify the form in which the reduced data is to be presented: outline analysis methods, criteria, and the presentation of results. Relate results to specified objectives described in the specifications. Include requirements for data processing equipment (including approximate computer time required) and any special computer programs required for data collection/analysis. Identify Contractor's (and sub- Contractor's) responsibilities for their respective tasks.

15. Instrumentation:

Indicate the instrumentation required to collect the data indicated in item 10, above and the organisation responsible for acquiring it. A block diagram layout of the System showing instrumentation's points shall be included.

16. Defect classification:

In the event a test case within a Test shall fail, a report on the defects shall be prepared. To maximise test case results and to minimise problems attributable to defects, all reports on defects will be classified as follows:

- Category A: major defect;
- Category B: average defect;
- Category C: minor defect;
- Category D: test error;
- Category E: dispute concerning an incident.

All categories are described below:

16.1. *Category A: major defect*

Category A defects are defects which adversely affect the system components' or System's active operation to such an extent that, unavoidable, a major part of the System can no longer be used.

16.2. *Category B: average defect*

Category B defects are localised problems, which do not make the system components' or System's active operation impossible (non-serious errors, which do not seriously affect the System). Category B defects shall be no reason to discontinue the test.

16.3. *Category C: minor defect*

Category C defects are related to appearance and do not have serious adverse effects on the system components or System, and its active operation could continue without eliminating the defects (such as unclear error messages, errors in reports and screen formats). Category C defects shall be no reason to discontinue the test.

16.4. *Category D: test error*

Category D defects are due to errors in the test method and/or test data, errors occurring while carrying out the test case, or errors in expected results. In the event of a conflict between Contractor and WMO, parties shall discuss the validity of the test case, and if the error is reclassified into Category E. Category D defects shall be no reason to discontinue the test.

It is emphasised that any Category B, C, or D defects occurring during a test shall not result in the discontinuation of that test. In the event of a Category A defect, both parties will have the right to decide independently whether to stop the test. In this case, a new date will be set, agreed to by both parties, on which the test shall be repeated. Except for category, A errors, during re-testing only those test cases that have not yet been successfully completed will be exercised.

At the end of each testing day, there will be a meeting in which the Contractor and WMO will record the findings of that day. This report shall be approved by both parties.

6. Maintenance, Warranty and Calibration

Definitions:

First-level maintenance

- daily and weekly checks of the System and System Components by system operators.

Second level maintenance

- preventive maintenance as required.
- corrective maintenance troubleshooting.
- repair by replacement of defective modules or sub-modules within the System and System Components.

Third level maintenance

- repair of defective modules or sub-modules of System and System Components by authorised personnel from the manufacturer.

Fourth level maintenance

- repair by the manufacturer.

Preventive maintenance

- User-maintenance, for instance, daily and weekly checks of the System with the use of only the on-line tools/software. Special site maintenance and higher preventive maintenance is not foreseen in this project.

Corrective maintenance

- Corrective site maintenance carried out by specialist personnel, with troubleshooting as far as defective Line Replaceable Units (LRU) and Repair by Replacement of the defective LRUs. This includes the replacing of chassis-level parts, minor assemblies, subassemblies and circuit card assemblies, splicing and patching of cables
- Corrective higher maintenance with troubleshooting as far as defective Shop Replaceable Units (SRU) and Repair by Replacement of the defective SRU's using Automated Test Equipment. Higher maintenance comprises the repair, modify, overhaul, reclaim and/or rebuild of parts, assemblies, subassemblies, components and items. It furthermore comprises of corrective site maintenance beyond the capability of WMO, due to lack of skills, test equipment or special tools.

1. Maintenance Requirements

- 1- The Contractor shall guarantee that maintenance of the System and System Components will be carried out in such a way that it will not interfere with the operation of the remaining parts of the System and

- System Components, nor with the maintenance of the other System Components in the System.
- 2- System Components shall be equipped with protection against hazardous voltages.
 - 3- System Components shall have MTBFs as specified in the Statement of Work.
 - 4- The System and System Components shall be built in a modular way. Replacement, cleaning and/or other maintenance activities of modules shall be easy and fast, with a minimum risk of damage.
 - 5- Test facilities to control the operation of the System and System Components shall be provided.
 - 6- The time between consecutive maintenance and/or calibration (if applicable) of System Components, shall be at least twenty-six (26) weeks.
 - 7- Enough, accurate and reliable control of the main functions of System Components shall be possible with field maintenance systems at the sites where the System Components are located for operational purposes.
 - 8- The maintenance concept for the System is repaired by the replacement of Line Replaceable Units (Lures). The repair of Lures shall be accomplished by sending defective Lures to the manufacturer by the Contractor.
 - 9- A proposal for spare parts shall be supplied by the Contractor in the Recommended Spare Parts document.

Requirements for Contractor Logistic Support (CLS)

- 10- For reliability evaluation, the Contractor shall provide reliability block diagrams and mathematical models showing failure rates and redundancies for the main components in an end-item.
- 11- The Contractor shall furthermore present quantitative values for the reliability parameter: Mean Time Between Failure (MTBF)⁴.

Maintainability Evaluation

- 12- For maintainability evaluation, the Contractor shall provide to the subsystem level of Mean Time to Repair (MTTR) in man-hours. Specified to the main components of an end-item.

Requirements for the provision of the maintenance plan

- 13- WMO holds the right to make their own arrangements for maintenance contracts other than those proposed by the Contractor. In that case, the Contractor shall be consulted, and without reasonable ground, shall not reject WMO's proposal. Warranty conditions for the System and System Components will not be affected in any way by such arrangements.
- 14- The Contractor shall present a Recommended Maintenance Plan. This plan is subject to WMO's review and approval. The Contractor shall use the following items to establish a Recommended Maintenance Plan:

⁴The MTBF calculations shall be provided by the Contractor.

- 15- The System shall demonstrate high reliability and require minimal preventive maintenance. The equipment shall meet the reliability and availability figures that are provided in the Requirement Specifications document.
- 16- The Recommended Maintenance Plan shall be based on Contractor Logistic Support, which means that the Contractor shall base its Recommended Maintenance Plan on:
 - preventive site maintenance that shall be performed by WMO's site personnel and shall be performed without having an impact on operational availability.
 - corrective site maintenance up to the level of exchanging Lures shall be performed by specialist WMO's site personnel.
 - corrective higher maintenance shall be performed by Contractor personnel, the Turn Around Time for to be repaired or to be exchanged items shall be two months or less.
 - faults that endanger the operational availability and that cannot be solved by corrective site maintenance require corrective higher maintenance with the on-site intervention of the Contractor, a reaction time of 12 hours during service hours.
 - providing emergency telephone maintenance assistance to on-site maintenance activities, during normal office hours of the Contractor.
 - the Contractor's responsibility for supplying the quantity of spare material to meet the requirements of site maintenance and operational availability, and to permanently keep the level of spare material up to the level required.
 - a spare part stock on-site shall ensure a 7-day period of normal operation. This requirement shall be the basis for the level of initial spares starting at PAT.

2. Calibration

Each instrument shall be supplied with a paper and electronic (pdf) calibration certificate that at least specifies:

- Manufacturer
- Model
- Instrument type/Principle of Operation
- Serial number
- Hardware/Software version [if applicable]
- Calibration Date
- Validity period of calibration/Recommended next date of calibration
- Calibration range
- Traceability of calibration (including applicable standard)
- Calibration method
- Calibration factor and uncertainty
- Name and signature of calibration technician that performed the calibration. [**]

7.Documentation

1. Based on the system specifications and the interface requirements, the Contractor shall produce the final design documents. These documents will be the basis for building the new meteorological network.
2. Manuals are required for the guidance of personnel, who will install, configure, operate and/or maintain the System and System Components. The information included in each manual shall convey all the information necessary to enable users to readily detect and correct any abnormal situations. The manuals will also serve the purpose of Reference, in which all technical and operational possibilities of System and System Components are described and how the reader can apply them. All manuals shall be written in the Arabic and English language and shall be supplied in hardcopy format as well as in the electronic format
3. All final documentation shall be supplied in hardcopy format as well as in electronic format on a USB stick in the following formats:
 - **Documents, spreadsheets, presentations:** Microsoft Office 2016, Office 365 or newer (Word, Excel, PowerPoint);
 - **Project Management (Gantt Charts):** Microsoft Project or Word or PDF

Installation Manuals

4. WMO's technicians must be able to install and/or dismantle the System Components. The Installation Manuals shall provide all information necessary to perform these tasks. The manuals shall be written in a clear manner and explain unambiguously what steps to follow to perform installation activities resulting in fault-free System Components. Debugging schemes shall be included.

System-Operator Manuals

5. This documentation deals with the instructions and procedures for the system -operators to handle System Components and System Parts. The manuals will describe in detail the operational performance and the means of control for the operators, for software as well as hardware components.

Configuration Manuals

6. Configuration of System Components shall be an important task in the new meteorological network: it determines the operation of the entire network and of the individual components. The configuration manuals shall contain clear descriptions of how various components of the network must be configured by persons qualified for these tasks.

User Manuals

7. The User Manuals consists of a set of documentation, starting with a description of the total integrated system. This document provides an overview of the operation of the total system.

8. The next set of manuals to be supplied shall 'descend' to lower levels of System Components.
9. The User Manuals shall contain instructions for users of the System and System Components (hardware and/or software) on how to operate them.
10. The User Manuals shall describe in detail the operational performance of the System and the means of control for operators. Additionally, the manuals will provide information on the interpretation of computer-generated diagnostics, analyses, and tools.
11. The User Manuals shall contain detailed descriptions of all software features, menus and graphics.
12. System References shall be included in the manuals.

Technical Reference Manuals

The Technical Reference Manuals shall describe all System Components in detail and shall at least contain the following information

13. A general description, including the major electrical characteristics and the equipment's physical construction and dimensions.
14. A detailed description of the electrical or electronic circuitry and its basic principles of operation; this description shall be adequate by including schematic diagrams, presented in a logical order together with tables or other indication of critical voltages (or other parameters) with emphasis on important checkpoints where and if necessary.
15. Although Installation Manuals have been mentioned separately, they may be part of the Technical Reference Manuals.
16. Operating instructions and methods for preventive and corrective maintenance to ensure that the equipment can be maintained to the standards that are demanded by the performance specifications of the equipment; a logical step by step process recommended for troubleshooting. The proposed maintenance procedures shall agree with the requested proposal for Maintenance of the integrated meteorological network, which will be given by the Contractor in the Maintenance Conditions

Software Manuals

17. The manuals provide complete descriptions and top-level flow charts of the software functions and a well-commented source code. The source codes will be used exclusively for operation and maintenance purposes.

Training Manuals

18. For each part of the System and System Components that requires training before it can be installed, operated, maintained or configured, Training

Manuals shall be supplied. The Contractor shall propose the contents of the Training Manuals.

19. The following documentation (MS Word document) shall be submitted, to the WMO for approval, at least 30 days before the installation and then shall be shared with Recipient Country agencies (representatives)

- Installation Manuals
- System Operator Manuals
- System-Configuration Manuals
- User Manuals
- Technical Reference Manuals
- Software Manuals
- Training Manuals

Validation of documentation by WMO

20. The Contractor shall send all documents to the WMO for review, within a certain period after contract award, mutually agreed upon by WMO and Contractor.

Reproduction

21. WMO reserves the right to reproduce for own use, in whole or in part, any or all technical publications supplied by the Contractor.

Review and approval

22. Upon receipt of the documentation, three weeks before the submission of the CoA, WMO shall review the documentation for adequacy, completeness and compliance with the requirement specifications. Within thirty (30) days after delivery, WMO shall notify the Contractor of approval or approval contingent on comment incorporation. WMO shall provide the Contractor with a description of necessary changes required for approval. WMO shall supply the description of required changes to the Contractor within thirty (30) days from the date of receipt of the documentation. If no comments are received within thirty (30) days, the documentation shall be considered approved. The Contractor will study the required changes and submit a substantive response to the WMO within thirty (30) days. After an agreement has been reached, the Contractor will incorporate the changes.

Annex-1: Country Initial Assessment Results

Benin - [Hydrological stations assessment report-BENIN.docx](#)

Burkina Faso - [Hydrological stations assessment report- VBA.docx](#)

Cote d'Ivoire - [Hydrological stations assessment report-Cote d'Ivoire.docx](#)

Ghana - [Hydrological stations assessment report-Ghana.docx](#)

Mali- [Hydrological stations assessment report-MALI.docx](#)

Togo - [Hydrological stations assessment report-Togo.docx](#)

Annex-2: Work Locations, Recipient Countries and Technical Sheets

i. Technical sheet for options

#	Groups	Country	-Organization with MCH in each country - Station Name	-Address for HQ with MCH -Latitude n Longitude for stations	Organization responsible for receiving the Hydrological station	Status			Goods and Services	Option 1	Option 2
						Station status	ICT Status	Installation Priority			
1	1.	Burkina Faso	Agence Nationale de la Météorologie (ANAM)	PO Box 54378 4321 Ave de la Paix, Ouagadougou, BURKINA FASO	Direction des Etudes et de l'Information sur l'Eau (DEIE)		DSL internet and LAN available for MCH DBMS		D to DCS I to MCH DBMS as detailed in section 3.2.		
2	1.1.	Burkina Faso	Tampelga	13° 7' 55" N, 1° 16' 59" W		Station location is available		1	D and I for full station set as detailed in section 3.1.		
3	1.2.	Burkina Faso	Bagre Aval	11° 27' 00" N, 0° 31' 48" W		Station location is available		2	D and I for full station set as detailed in section 3.1.		
4	1.3.	Burkina Faso	Nwokuy Upstream	12° 31' 41" N, 3° 33' 00" W		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
5	1.4.	Burkina Faso	Samandeni	11° 28' 1" N, 4° 28' 1" W		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
6	2.	Benin	Agence Nationale de la Météorologie du Bénin (METEO-BENIN)	Avenue Jean Paul II, Route de l'aéroport, BP 379 Cotonou Bénin.	Direction Générale de l'eau du Bénin		DSL internet and LAN available for MCH DBMS		D to DCS I to MCH DBMS as detailed in section 3.2.		
7	2.1.	Bénin	Porga	11° 03' N, 00° 58' E		Station location is available		3	D and I for full station set as detailed in section 3.1.		
8	2.2.	Bénin	Tiéélé	10° 43' N, 01° 12' E		Station location is available		4	D and I for full station set as detailed in section 3.1.		
9	2.3.	Bénin	TCHALINGA	06°23'18" N, 02°38'10" E		Station location is available		5	D and I for full station set as detailed in section 3.1.		
10	2.4.	Bénin	KORONTIERE	10°13'46" N, 00°59'20" E		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
11	3.	Cote d'Ivoire	Societe d'exploitation de Developpement Aeroportuaire Aeronautique Meteo (SODEXAM)	15 bp 990 Abidjan 15, Cote d'Ivoire	Direction des Ressourcée en Eau		DSL internet and LAN available for MCH DBMS		D to DCS I to MCH DBMS as detailed in section 3.2.		

12	3.1.	Cote d'Ivoire	Zola à Kamala	-2.729444 / 8.482222		Station location is available		6	D and I for full station set as detailed in section 3.1.		
13	3.2.	Cote d'Ivoire	Koulda à Pouon	-2.959175/ 9.364206		Station location is available		7	D and I for full station set as detailed in section 3.1.		
14	3.3.	Cote d'Ivoire	Station de Volta-Noire à Vonkoro	-2.735405/9.15912		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
15	4.	Ghana			Ghana Hydrological Authority		DSL internet and LAN available for MCH DBMS		D to DCS I to MCH DBMS as detailed in section 3.2.		
16	4.1.	Ghana	Lawra -Dikpe camp. Border village. Lawra Municipal	10° 38' 00" N, 02° 55' 00" W, [-2.933868/10.647982]		Station location is available		8	D and I for full station set as detailed in section 3.1.		
17	4.2.	Ghana	Chache Border between Ghana Ivory Coast, Bole District	09° 10' 00" N, 02° 43' 00" W [-2.734548/9.157706])		Station location is available		9	D and I for full station set as detailed in section 3.1.		
18	4.3.	Ghana	Yarugu/Bazua-Zebila Bawku West District	10° 58' 59" N, 00° 23' 25" W (-0.384897/11.002564)		Station location is available		10	D and I for full station set as detailed in section 3.1.		
19	4.4.	Ghana	Pwalugu. Border between North East and Upper East Regions. On a highway bridge	-0.841595 / 10.585617		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
20	4.5.	Ghana	Nawuni-Kumbungu District	1.054759/9.659792		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
21	4.6.	Ghana	Daboya-Tidrope, a fishing camp, North Gonja District	-1.348116/9.5162		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
22	4.7.	Ghana	Yapei. On a bridge through a highway. Central Gonja District	-1.159593/9.141109		Station location is available		Contingency	D and I for full station set as detailed in section 3.1.		
23	4.8.	Ghana	Kpasenkpe On a bridge from Kpasenkpe to Yagaba	(-1.082903/10.442664)		Need Rehabilitation		Contingency	D and I for full station set as detailed in section 3.1.		
24	5.	Mali	Direction Nationale de L'hydraulique (DNH)	Square Patrice Lumumba, BP 66 · Bamako · Mali	Direction Nationale de L'hydraulique (DNH)		DSL internet and LAN available for MCH DBMS		D to DCS I to MCH DBMS as detailed in section 3.2.		
25	5.1.	Mali	Plétou	13° 22' 19" N, 3° 28' 34" W		Station location is available		11	D and I for full station set as detailed in section 3.1.		
26	5.2.	Mali	Baye	Long: 04,57344° Lat 15,06527°				12	D and I for full station set as detailed in section 3.1.		
27	5.3.	Mali	Goéré	Long: 04,51141° Lat.14,93248°				Contingency	D and I for full station set as detailed in section 3.1.		
28	6.	Togo	Méteo Togo	Rue 35 HDN, Lomé, Togo	Division gestion des Ressources en Eau (DRE)		DSL internet and LAN available for MCH DBMS		D to DCS I to MCH DBMS as detailed in section 3.2.		
29	6.1.	Togo	Bongoulou	09° 01' 00" N 00° 41' 00" E		Station location is available		13	D and I for full station set as detailed in section 3.1.		
30	6.2.	Togo	Kpéssidè	09° 38' 00" N 00° 57' 00" E		Station location is available		14	D and I for full station set as detailed in section 3.1.		

Annex-3: MCH Technical Specifications

The following are the existing ICT specifications that are available at HQ of the Recipient Countries. The bidders offering option 1 and/or 2 shall integrate their systems to the following system.

Ref.: 09736/2023-L25

#	Existing System Specifications
1	<p>Server Rack</p> <p>Dust and moisture resistance cooled server rack (IP55);</p> <p>19-inch dept, minimum 12 U (1U= 44,45 mm) height with adjustable mounting brackets;</p> <p>Wall mounted, cable entries made with glands;</p> <p>Server, storage, surge protector, connection rack, battery systems are available</p>
s2	<p>DBMS Server</p> <p>Xeon E-2000 series with 4 cores, 3200Mhz;</p> <p>4 drives, hot-swapping, 1TB (total) storage supporting SSD, RAID</p> <p>Operating SQL database</p>
3	<p>KVM Switch</p> <p>Mouse, keyboard, 17 inch LED, railing system, with 4 ports, USB, PS/2, VGA, RS232, mounted in server rack</p>
4	<p>Firewall/router/access point</p> <p>350Mbps package inspection, LAN (10/100/1000) 8 ports (4x POE), Secure VPN Tunneling, IPSEC, RJ-45, IEEE 802.1x, IEEE 802.3af. support, Gigabit802.11b, WPS</p>
5	<p>Server power and UPS system</p> <p>APC Smart-UPS 1000VA LCD 230V 85044030 21 23,8 PH 1 0,00</p> <p>Line Interactive UPS</p> <p>Output Capacity: 700 Watts / 1000 VA</p> <p>Voltage: 220/230/240V</p> <p>Frequency 47-53/57-63 Hz</p> <p>Output Connections: 8 x IEC 320 C13, 2x IEC Jumpers</p> <p>Input Connecions: IEC-320 C14</p>
6	<p>Client PC:</p> <p>Desktop Intel i5, 10th Gen (or equivalent), 2900 MHz, 8GB DDR, 3200Mhz, Windows 11 OS, 500GB SSD, mouse and keyboard (En), Antivirus, antispam and malware programs installed,</p> <p>21 inches FHD, LED screen, with UPS (minimum 20 minutes),</p> <p>TeamViewer license available</p>
7	<p>Cabling</p> <p>EIA/TIA 568B standards</p> <p>Cat-6, UTP, 23 AWG, ANSI/TIA/EIA-568-B.2-1 and ISO/IEC 11801</p> <p>IEC 60906-1 (for A and V)</p>

Annex-4: Documentation requirements, methods, and timing

S/N	Document and items	Method	Timing
1	Agreement on providing all requirements of the tender document and Cost Sheets (Annex-2)	A signed letter stating specifications and requirements fully understood and agreed	Bidding File
2	Technical documents, brochures and original catalogues of the bidden equipment and related services	Electronic copies	Bidding File
3	ISO 9001 Documents of the company. Compatibility documents for the International and National standards and regulations	Electronic copies	Bidding File
4	List of the manufacturers Certificate of origin (EUR1 and EUROMED or Declaration of origin for every item) Original Brochures and technical specifications for every item in the Bidding File List of any software which is going to be used in the system	Electronic copies	Bidding File
5	-A detailed document indicating installation and unit prices for every equipment, related services and training packages a for Lot-1 and Lot-2 -Maintenance requirements for all equipment	Electronic copies	Bidding File
6	Implementation plans (e.g. project plan, and delivery and installation schedules)	Electronic copies	Bidding File
7	Detailed delivery information (list) - Size, weight, brand, model, serial number, price, certificate of origin declaration etc. for shipping and customs processes	Electronic copies	Before shipment (15 days)

8	Calibration certificates	Electronic copies	Before delivery
9	Any needed intermediate instrument for calibration or test (cable, connection apparatus, connector, software or etc.)	Electronic copies	Before delivery
10	Provide approved training materials, documents, applications beneficiary country representatives All software and hardware guidebooks, brochures and materials	Electronic copy	Before installation (15 days)
11	Fieldwork completion report shall be provided for each installation, and shall include minimum the following details and shall be signed by the Contractor and delivered WMO: -Type of construction and fieldwork -Amount of equipment, material etc -Photographic report for before and after the installation	Electronic copies of a report signed by a local agency representative and Contractor	Before CoA (After every site fieldwork and installation)
12	A detailed mapping, schedule and schemes of the periodic system maintenance (daily, monthly, yearly) guides shall be provided.	Hard and electronic (DVD)copies	Before CoA
13	All software used(needed) in the system together with related licenses.	Electronic copies	Before CoA (30 days)
14	Datalogger test and calibration methods	Electronic copies	Before CoA (30 days)
15	All system diagrams and all connections shall be mapped and documented in detail.	Electronic copies (USB, Email and DVD) PVC hardcopy of the mapping shall be mounted interior places such as the power line panel door, connection box door etc. for every station	Before CoA

16	PAT Report to be approved and signed by WMO, the Contractor, Recipient Country representative	Original and scanned copies	After the PAT
17	CoA Report to be approved and signed by WMO, the Contractor, Recipient Country representative	Original and scanned copies	After the CoA