

STATUS OF THE WIGOS DEMONSTRATION PROJECTS

Demonstration Project Morocco – Strengthening Moroccan RIC Capacities

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February 1st, 2011

WIGOS Demonstration Project in Morocco – Strengthening Moroccan RIC Capacities

1. Introduction

WIGOS Demonstration Project in Morocco consists on standardization and traceability project that include:

- Strengthening material capacities and human knowledge of the Moroccan Regional Instrumentation Center (RIC) for AR-I and improving its technical procedures to allow it to accomplish its task of calibration in link to recognized Metrological International chain ,
- Establishment of Metadata catalogues of the whole synoptic, marine, aeronautic and automatic weather stations constituting the Moroccan Meteorological Surface observing Network.

The first project aims to improve means and capabilities of the NMS of Morocco concerning standardization and traceability, to be able to achieve measures of good quality. This objective will be achieved via the reinforcement of the RIC of Morocco that is the responsible of the quality and the conformity of the measurement instruments.

The starting point for the achievement of this project is based on the recommendations of WMO convention and those of the CIMO related to the reinforcement of the RICs in standardization and traceability and especially those of developing countries (CIMO, XIV session, Geneva-2006).

In fact, the CIMO recommended, in its report of RIC assessment, to improve the capacities of these organisms concerning data traceability, technical measurement and standardization facilities, quality control by audits and inter-comparisons, and also in terms of accreditation and quality certifications: "The CIMO underlined the importance and the interest of the RIC reinforcement, being sensible that an aid should be procured them in four big domains:

- a) Setting up of laboratories and purchase of standardization devices;
- b) Quality Insurance and control;
- c) Training;
- d) Assessment of the RIC. "

Standardization and meteorological data quality is a concept of WIGOS which concern instrumentation and also procedures.

The second project concern the establishment of Metadata catalogues of the Moroccan Meteorological Surface observing Network. Seeing the rapid expansion of cities, more and more synoptic station had seen their sitting environment modified and in some cases not fulfilling to standards. Moreover, information related to calibration, instruments renewed and sensor exposure is not archived.

By this project, it's expected to produce documents describing instrument metadata, as well as, equipment life-cycle:

- o Instrument/network sitting,
- o Calibration, renewing and maintenance.

2. Progress of the Demonstration Project

To achieve Moroccan RIC reinforcement in the four domains as recommended by CIMO, NMS of Morocco conduct several actions:

2.1 Strengthening RIC material capacities:

In 2007, the following preparatory actions have been achieved:

- Upgrade of existing laboratory equipments (*repairing existing equipments and connecting sensors and standards used with the different equipments to a computer in order to optimize data collection*). This action was accomplished but there is a need to determinate uncertainties due to the introduced system.
- Civil works were conducted to fit laboratory local to standards. This action was achieved but the NMS of Morocco is still planning to provide new building for RIC. Special measurements are to be made to prove that atmospheric conditions inside the laboratory are quite stable.
- Calibration of mercury barometers references in Météo-France (RIC for AR-IV) (*barometer Fortin SN: 2090, 3046 and 3050*).

The cost of those actions is almost: **35.000 Euros.**

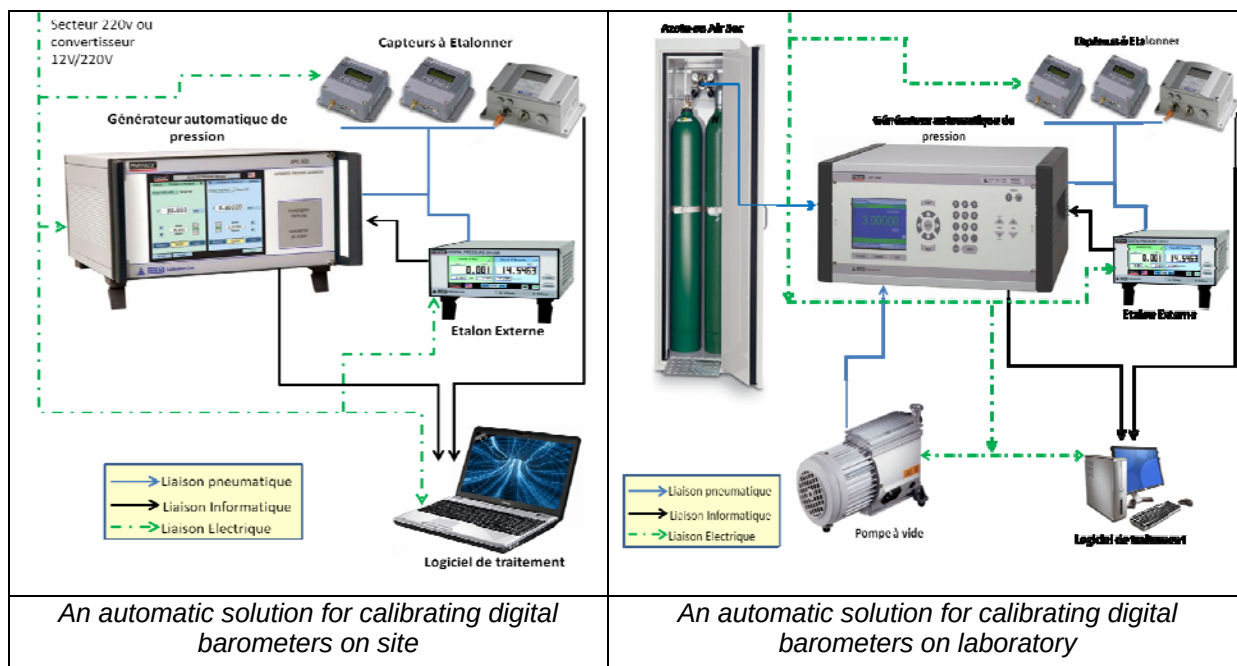


Pressure and humidity existing test chambers

For the strengthening of RIC capabilities, three stages were defined:

1. Acquisition of standards and calibrating equipments to calibrate instruments measuring atmospheric pressure,
2. Acquisition of standards and calibrating equipments to calibrate instruments measuring temperature and humidity,
3. Acquisition of calibrating equipments for rain gages.

In August 2008, the first phase was accomplished and allows the acquisition of complete automated solution for calibrating analogical and digital barometers in site and at laboratory and also the development of Software with respect to COFRAC standards. (The cost is about **150.000 Euros**).



In 2009, a first part of the second stage was achieved which consist on the acquirement of liquid bath for temperature sensor calibration, reference temperature sensor SPRT, automatic humidity generator and two laboratory conditions (T and Hu) readout. (The cost of this action is about **70.000** Euros).



Liquid bath for temperature
(WIKA-CTB 9400)



Humidity generator
(ROTRONIC- HYGROGEN-2)



Temperature and humidity readout
equipment for monitoring
atmospheric condition at the
calibrating laboratory

By the year 2009, The NMS provide an additional sum of **280.000** Euros to achieve the second part of the stage 2 which consist on the acquisition of the following laboratory equipments:

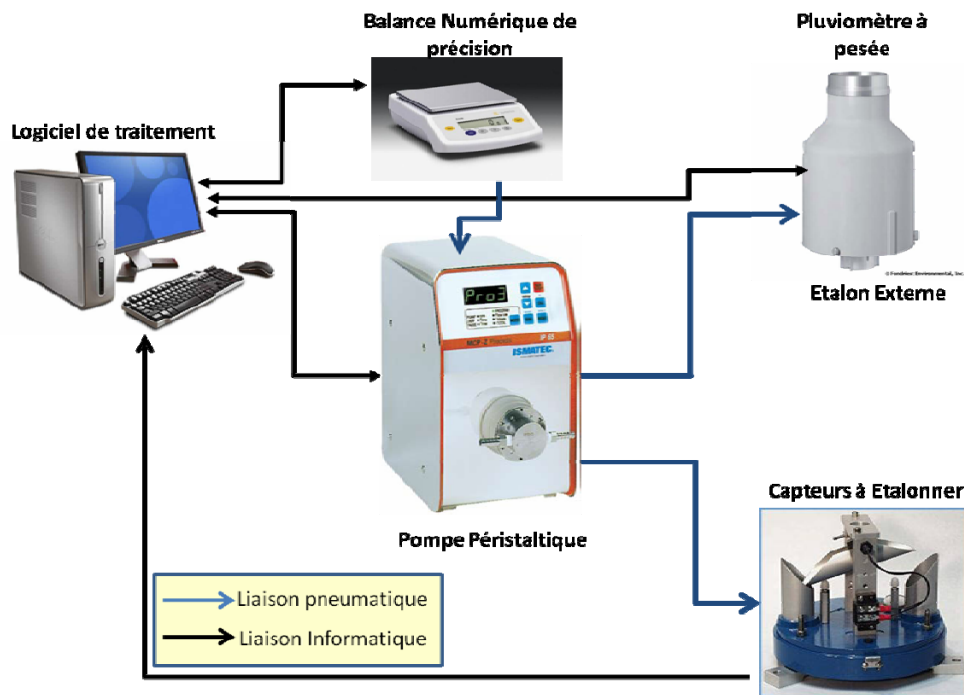
- for temperature: acquisition of one key solution including :
 - Liquid bath with two SPRTs (laboratory and work standards),
 - Acquisition unit (ADSL bridge and height precision thermometer) calculating resistances for two values of currents 1.mA and 1.41 mA to avoid self-heating,
 - Specific software to command the liquid bathy and also generate calibrating certificates,
 - Two fixed cells standards (gallium, Triple points of water) and associated necessary equipments to maintain these points.
- for humidity:
 - Acquisition of climatic chamber,

- Acquisition of a mirror chilled humidity standard,
- Acquisition of a calibrating set based on fixed point solution.

The acquisition and the implementation processes of these equipments were achieved by December 2010.

<i>A new and completely automatic solution for calibrating temperature probes</i>	<i>Two fixed points cells (Gallium and Triple point of Water)</i>
<i>A new climatic chamber</i>	<i>A chilled mirror hygrometer as a humidity standard and Saline solutions for four fixed points (11%, 33%, 75% and 97%)</i>

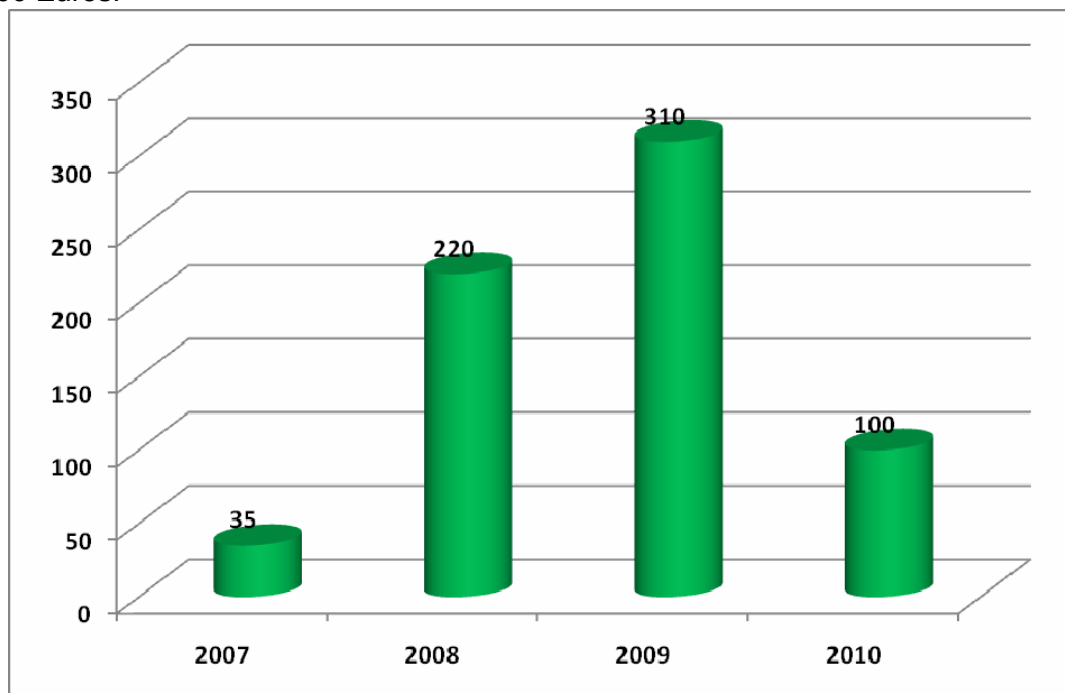
In addition, dedicated equipments were acquired to implement an automatic solution to calibrate tipping bucket rain gages.



Furthermore, the NMS decide to hold RIC in the main building of the Direction. For this purpose, civil works will be conducted to prepare the new RIC locals (cost: **25.000** Euros).

By the year 2010, the NMS of Morocco purchase new equipments to start the implementation of the Regional Marine Instrumentation Center especially for tide measurements with a cost of 60.000 Euros.

A contract was also established with consultant to prepare the accreditation of the laboratory with respect to the ISO 17025. The duration of the contract is 14 months with a cost of 40.000 Euros.



Evolution of the annual cost for the acquisition process of the new laboratory equipment

2.2 Training:

- May 2008: RIC Staff received training on metrology of pressure and on installing and handling the new pressure calibrating system,
- December 2009: NMS of Morocco hold the French session of the WMO course on metrology for the AR-I French speaking countries,
- May 2010: The technical staff of the calibrating laboratory follows the training in matter of metrology organized by the African Commission of Metrology (CAFMET).

2.3 Conducting calibrating operations:

RIC of Morocco already conducted calibrating operations in 2007 and 2008:

- Calibrating 15 digital barometers installed in the principal airports (*achieved with the support of Meteo-France calibrating laboratory*)
- Calibrating 24 mercury barometers installed in the synoptic stations.

The conclusion of the operation made is that almost 40% of mercury barometers calibrated has uncertainties near or superior of WMO tolerances.

A new calibrating campaign will take place by the year 2011.

2.4 Quality approach:

In matter of Quality insurance, NMS of Morocco has engaged a quality approach since 2007. The fundamental processes such as observation, general forecast, marine meteorology and meteorological assistance to aeronautic navigation are in the final stages. Quality manuals are prepared.

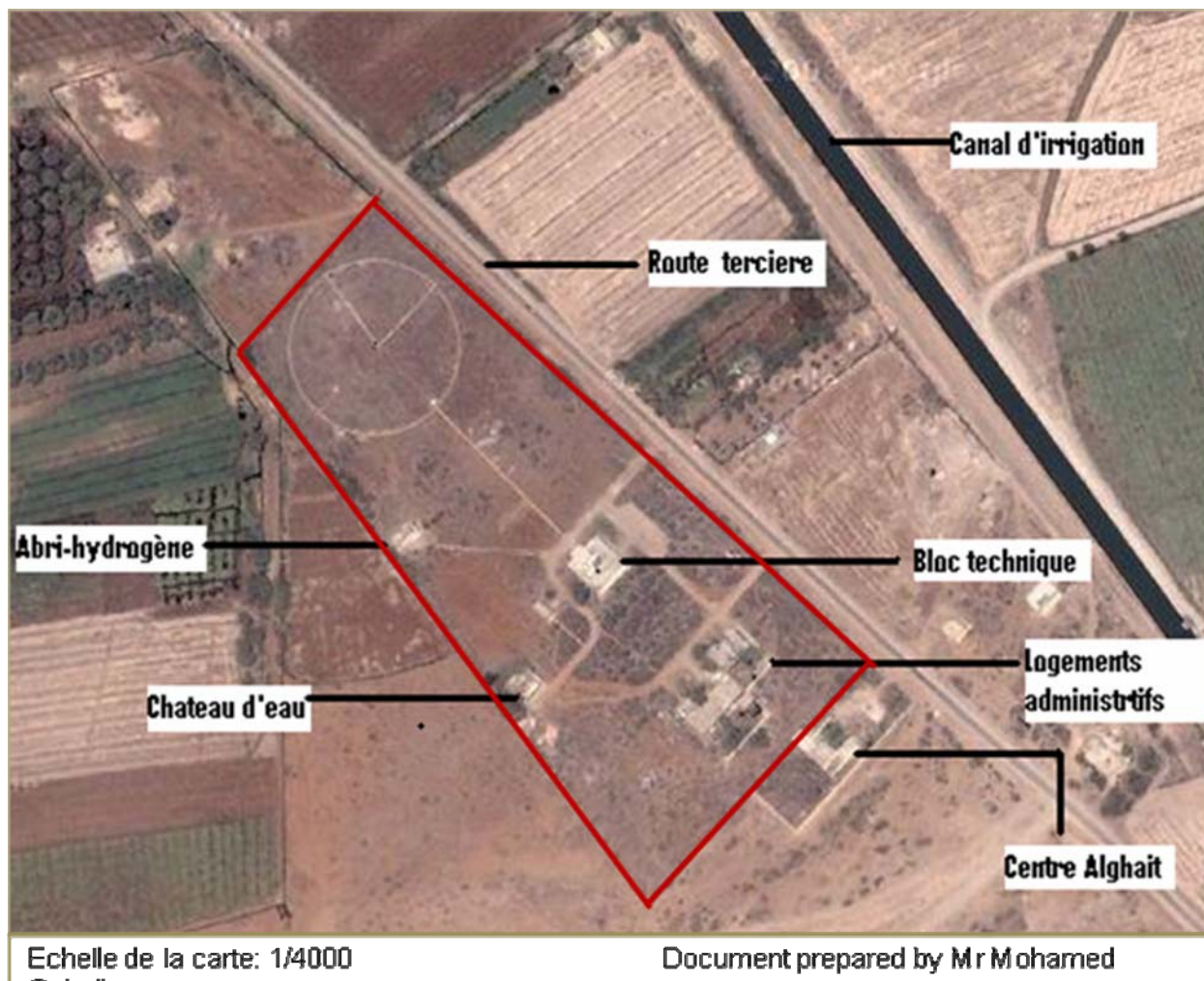
During 2008, NMS of Morocco start quality circles for support processes like maintenance and calibration. Furthermore, a Consultant contractor was engaged to provide quality circles, training and technical assistance for RIC staff in matter of 17025 requirements.

Standards Intercomparison at Meteo-France calibrating Laboratory (RIC for AR VI) was also planned and results are under analysis.

During the meeting of the CIMO-ET on RICs held in Casablanca, the participants have engaged an assessment test of the RIC of Morocco with regards to the ISO 17025 requirements and RIC TOR using the new template evaluating Scheme developed by the ET.

2.5 Metadata Catalogue

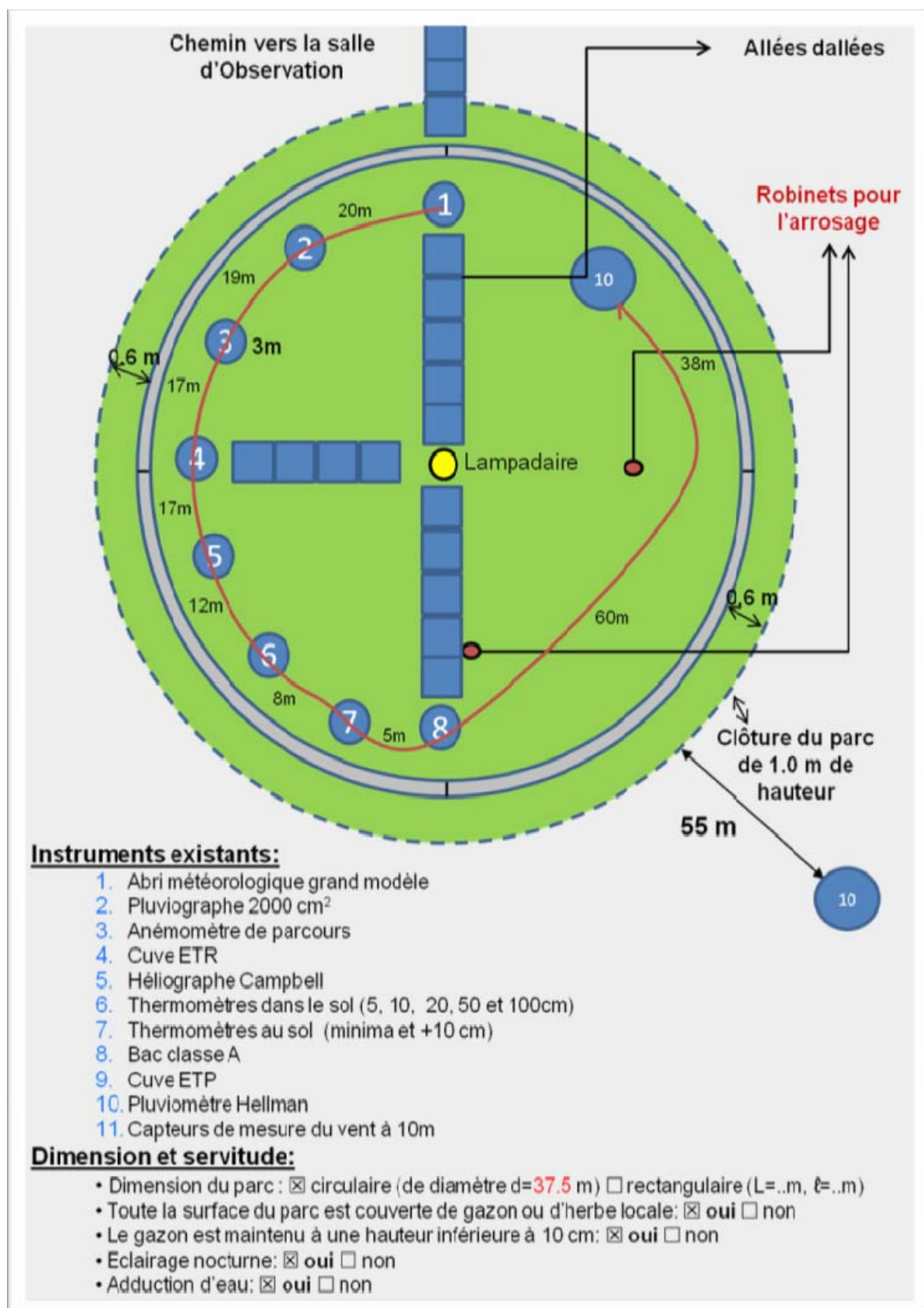
For the second project, official letter with questionnaires was send to different synoptic station to help in collecting METADATA. The data collected from the whole meteorological manned station are under process and a database should be established by 2011. Following, an example of a response returned by one of the synoptic station:



A spatial view of the station



A photo of the equipments installed outside in the enclosure



Another example of collected Metadata

3. Experiences gained, problems encountered, implementation constraints

The NMS of Morocco and especially its calibrating laboratory considers that experiences have been acquired in the following areas:

- Making benefit from WIGOS values and taking part, while being satisfied, to its implementation,
- Definition of needs and establishment of technical specifications of each materiel to be acquired,
- Management of the acquisition process (budget, acquisition project achievement...),
- Acquiring knowledge in matter of standards and processes related to the calibration of meteorological instruments,
- Implementing quality control process.

Several difficulties were encountered during the execution of the Demonstration Project. Following examples of some problems encountered and lessons learned:

- A real difficulty was encountered during the development of calibrating software. In fact, there was a need of help of technical expert for providing the way to calculate and determine metrological parameters (uncertainty, hysteresis, repeatability...). To overcome this problem, a technical assistance was provided RIC of AR VI.
In this context, WIGOS should encourage cooperation between RICs of developing and developed countries. This cooperation should lead to a real knowledge transfer.
- Difficulties were also encountered when bringing barometers from station to laboratory (need of replacement). RIC acquired, to resolve this problem, necessary digital barometers with LCD screen to replace mercury barometers not fulfilling WMO standards. (18 digital barometers were acquired in 2009; total cost of this action is 60.000 Euros). **The WIGOS should emphasize the practical application of its terms of reference. Indeed, the implementation of the concept of WIGOS at different levels (observation, coding and transmission, modeling, dissemination ...) will generate some friction that may be exceeded by the definition of clear and comprehensible procedures and deliverables.**

As a conclusion, the NMS of Morocco took into charge the actions mentioned above and the progress of the project is consistent with the timetable presented to the EC WG on WIGOS. In addition, the NMS of Morocco has just completed a large part of the project with regards to the IP and more efforts are now oriented to develop, to practice and to assess technical procedures for calibrating processes according to ISO 17025 standards. During the accreditation process, a certified consultant will assist the RIC staff. However, Experience of developed and certified RICs will be a precious aid seeing the fact that, in general, RICs uses to calibrate similar instruments working in same ranges and responding to the same WMO tolerances.