WORLD METEOROLOGICAL ORGANIZATION

_____

COMMISSION FOR BASIC SYSTEMS
OPEN PROGRAMMME AREA GROUP ON
INTEGRATED OBSERVING SYSTEMS

IMPLEMENTATION-COORDINATION TEAM ON INTEGRATED OBSERVING SYSTEM (ICT-IOS)
Eighth Session

GENEVA, SWITZERLAND, 7 – 10 APRIL 2014

CBS/OPAG-IOS/ICT-IOS8 / Doc. 4(1)
(27.03.2014)

_____

ITEM: 4

Original: ENGLISH

REVIEW OF THE STATUS OF THE SURFACE-BASED COMPONENTS OF THE GOS

STATUS OF THE SURFACE-BASED SUB-SYSTEM OF THE GOS IN REGION I

(Submitted by Henry Karanja (Kenya))

SUMMARY AND PURPOSE OF DOCUMENT

The document provides information on the Status of the surface-based sub-system of the GOS in Region I.

ACTION PROPOSED

The Meeting is invited to note the information contained in this document when discussing how it organises its work and formulates its recommendations.

_____

References: Regional Association I (Africa), Fifteenth session, Marrakech, 1–8 November 2010, Abridged final report with resolutions - WMO-No. 1068:
ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/ra_reports/english/pdf/1068_en.pdf

Appendices: **A.** Status of the surface-based sub-system of the GOS in Region I

DISCUSSION

1. During the 15th session, the Africa regional Association noted that the implementation of the RBSN and RBCN stations, both surface and upper-air, remains very poor. The list of approved RBSN and RBCN are provided in annexes I and II to Resolution 5 (XV-RA I) (see references on the cover page of this document, these annexes appear in pages 66 and 76 of the RA-I Session report respectively). The high cost of running upper air stations was cited as a reason for the low number of upper air stations which are operational. The Association stressed that the highest priority for each Member in the Region should be to: (a) Improve and restore surface and upper-air observational capabilities of the RBSN/RBCN; and (b) To improve data quality, regularity, and coverage of surface observations of the RBSN/RBCN.

2. The Association noted that problems existed in the mechanism for updating the designated National Focal Points (NFP) of both the RBSN/RBCN (GSN and GUAN) and Weather Reporting Publication, No. 9, Volume A (Observing Stations). Members were urged to ensure the timely and regular update of their designated NFPs and to ensure that Volume A correctly describes respective national observing stations.

3. Members are urged to comply fully with the global and regional coding procedures and data collection standards in accordance with procedures laid down in the WMO Technical Regulations and the Manuals on the GOS, on Codes, and on the GTS when operating the RBCN stations.

APPENDIX A

INTEGRATION OF THE WMO OBSERVING SYSTEMS

REGION 1 (AFRICA)

1 Regional Basic Synoptic Network of surface and upper-air observing stations

1.1 Composition of the Regional Basic Synoptic Network (RBSN)

The RBSN of surface and upper-air observing stations is reviewed and revised at each session of the Association. The list of stations constituting the current RBSN keeps on growing longer as new stations are continuously installed in different countries in the region. The most current list of RBSN is always given in the most recent session of the association (15th session of RA1, Nov 2010) and is shown as ANNEX I to Resolution 5 (XV-RA I) (see references on the cover page of this document, these annexes appear in pages 66 and 76 of the RA-I Session report respectively). An up-to-date list of Regional Basic Synoptic Network stations is available at http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm

1.2 Criteria for inclusion of stations in the RBSN

For the definition of criteria, two types of requirements are distinguished:

(a) Target requirements (TRQs) refer to desired characteristics of network stations;

(b) Minimum requirements (MRQs) refer to threshold characteristics which are decisive for inclusion or exclusion of a station.

The inclusion of a station in the network implies a clear commitment of the Member concerned to make fair efforts for (maintaining) compliance with the TRQs.

	TRQ Surface	MRQ Surface	TRQ Upper-ai	MRQ Upper-air
Parameters (measured and recorded)	Pressure; Temperature; Wind; Humidity; Weather; Visibility; Cloud cover; Cloud base.	Pressure Temperature; Wind; (not for buoys) Humidity. (not for buoys)	Pressure / geopotential; Temperature; Wind; Humidity	Pressure / geopotential; Temperature; Wind; Humidity
Level	Surface	Surface	Up to 10 hPa	Up to 100 hPa
Observations at main hours	4	3	(c) at 00 and 12	1 at 12
Observations at main and intermediate hours (3 hourly)	8	5	-	-
Availability of data	100	50	100	50

TRQ = Target requirements MRQ = Minimum requirements

1.3 Classification of station

Stations are classified according to their performance with reference to the above requirements:

(a) Those stations meeting all TRQs are classified as OK;
(b) Those stations meeting all the MRQs are classified as IP (incomplete programme);
(c) Operational stations not meeting all MRQs are classified as BC (Below criteria);
(d) Silent stations are classified as NO (not operating).

1.4 Spatial distribution for surface stations

(a) As an ideal target over land areas the RBSN should have a spatial resolution of 150 km for the surface and 250 km for upper-air stations;

(b) As an optimal target over land areas the RBSN should have a spatial resolution of 250 km for the surface and 500 km for upper-air stations;

(c) OK stations are acceptable if at a distance of at least 60 km from the nearest network station.

2 Regional Basic Climatological Network of surface and upper-air observing stations

2.1 Composition of the Regional Basic Climatological Network (RBCN)

The RBCN was established by the Regional Association to provide a comprehensive network of CLIMAT reporting stations. It is based primarily on RBSN stations and includes all GCOS (GSN and GUAN) stations. The RBCN also includes all other stations that report CLIMAT needed for description of regional climate features, except those that are within 60 km of another network station.

The RBCN of surface and upper-air observing stations is reviewed and revised at each session of the Association. The list of stations constituting the current RBCN is given in the report of the most recent session of the Association. The list of stations constituting the current RBCN is always given in the most recent session of the association (15th session of RA1, Nov 2010) and is shown as ANNEX II to Resolution 5 (XV-RA I) (see references on the cover page of this document, these annexes appear in pages 66 and 76 of the RA-I Session report respectively). An up-to-date list of Regional Basic Synoptic Network stations is available at http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm

2.2 Ground weather radar observations

Considering the usefulness of exchanging, on a bilateral or multilateral basis, meteorological information obtained by ground weather radar stations, the region is continuously urging members to continue their efforts to install ground weather radar stations for detecting precipitation, including heavy rain, hail and other severe weather phenomena, and to exchange on a bilateral or multi-lateral basis the meteorological information so obtained using the appropriate WMO code form (e.g., FM 94-IX Ext. BUFR).

3 Global atmospheric Watch (GAW) stations

Africa is poorly represented in observations of reactive gases. Algeria, Egypt, Kenya, and South Africa perform surface ozone measurements. It is noted that Measurements of other compounds related to surface ozone are highly desirable.

4 Marine and Oceanographic Observations

Dramatic progress has been made in the implementation of the ocean observing networks in the last decade, and implementation of a marine observing network in RA I has continued to expand.

5 Calibration

5.1 Regional Instrument Centers (RICs)

Considering the need for regular calibration and maintenance of meteorological instruments to meet increasing needs for high-quality meteorological and hydrological data, the need for standardization of meteorological measurements, the need for national, regional and international instrument comparisons and evaluations, and for training of instrument experts, a number of Regional Instrument Centers have been established according to the WMO Guide to Meteorological Instruments and Methods of Observation (WMO-No. 8). The designated Regional Instruments Centers are in **Algiers (Algeria), Gaborone (Botswana), Cairo (Egypt) and Nairobi (Kenya)**. Among the activities which have been carried out in the region are: the training in instruments calibration and maintenance in Nairobi for 23 member countries in September 2013 and Morocco and Kenya participated in inter-comparison of temperature measurement in November 2013.

5.2 Regional Radiation Centers (RRCs)

Considering the usefulness of the calibration of national and regional standard pyrheliometers against pyrheliometers of the World Standard Group (WSG) at five-year intervals for guaranteeing the high quality of radiation Regional Radiation Centers have been established according to the WMO Guide to Meteorological Instruments and Methods of Observations (WMO-No. 8), Annex 7.C. The designated radiation centers in **Tamanrasset (Algeria), Cairo (Egypt), Lagos (Nigeria), Khartoum (Sudan), Tunis (Tunisia) and Kinshasa (Democratic Republic of the Congo).**

5.3 Regional Marine Instrument Center (RMIC)

There is no designated Regional Marine Instrument Centre (RMIC) in the region. However through the JCOMM future priority activities there is a plan to establish RMICs in every Regional Association. Through collaboration of Morocco, Kenya and South Africa, there are plans of establishing a RMIC in Casablanca, Morocco.

6 Monitoring

6.1 Quantity Monitoring

Regional Basic Synoptic Network (RBSN) and Regional Basic Climatological Network (RBCN)

The Annual Global Monitoring (AGM) and the special MTN Monitoring (SMM) of the WWW are carried out respectively, in October and on a quarterly basis each year, and provide information on the performance of the observing systems. Overall, during the inter-session period, the implementation of the RBSN surface and upper-air observational programme in the Region shows 63% of surface stations performing the full observational programme and only 28% of upper-air stations carrying out observations at the two main standard times as shown in the table below.. There were still deficiencies in the implementation and operation of the RBSN/RBCN stations in many areas of the Region.

The reduced availability of upper-air data over the Region has a negative impact on the
Quality of medium-range forecast products over all regions, not just over Region I itself. The Association stressed that the highest priority for each Member in the Region should be to: (a) Improve and restore surface and upper-air observational capabilities of the RBSN/RBCN; and (b) To improve

data quality, regularity, and coverage of surface observations of the RBSN/RBCN. For details on AGM and Special MTN monitoring results, see: http://www.wmo.int/pages/prog/www/ois/monitor/index_en.html.

Availability of SYNOP, TEMP and Climatological data at MTN centers from RA I
AGM: 1 to 15 October (2007–2009) and AGM-IWM-SMM (October 2010)

year	Surface (SYNOP)		Upper-air (TEMP)		CLIMAT		CLIMAT-TEMP	
	Number of stations	Reports Received	Number of stations	Reports received	Number of stations	Reports Received	Number of stations	Reports received
2006	**611**	**54%**	**89**	**33%**	**637**	**33%**	**28**	**64%**
2007	**740**	**54%**	**96**	**29%**	**728**	**33%**	**31**	**58%**
2008	**744**	**56%**	**94**	**29%**	**730**	**36%**	**31**	**55%**
2009	**744**	**59%**	**94**	**28%**	**737**	**29%**		

6.2 Quality monitoring

In the region, Nairobi is only quality monitoring lead centre and is responsible for surface pressure monitoring on monthly and six monthly basis.

6.2.1 Possible sources of errors

1. Coding errors.
2. Incorrect sea-level adjustment for height of barometer.
3. Corruption during transmission.
4. Position errors.
5. Barometric errors: - Wrong calibration.
   - Faulty barometer etc.

6.2.2 Methodology

The monitoring of surface pressure for Regional Association I being carried out at RMC Nairobi is based on the results of the UK Meteorological Office Numerical Weather Prediction (NWP) Model. The UK MET Office runs a six-day forecast twice a day plus other two-day forecasts grid point model with a horizontal resolution of 25 km in mid-latitudes with 70 levels in the vertical. Data assimilation is performed in a continuous six-hour cycle using a 4-dimensional variation system.

The basis of the data quality monitoring is the observation and background difference (O-B) often referred to as the bias where O = observation at station, B = *background* or the *first guess*. Systematic errors from the observations can be identified by taking averages of the (O-B) over a sufficiently long period e.g. one month. By this method, persistent poor quality observations are detected. Besides the differences (differences of the observation (O) and first guess (B), calculation of the means and the root mean squares (RMS) are also done. All these analyzed for a reasonably sufficient length of time (at least one month) are used to detect stations with persistent erroneous reports.

6.2.3 Error detection criteria

The O-B statistics having been obtained i.e. mean, RMS, number of observation and percentage gross errors for all the reporting stations for the period under consideration, the criteria for error detection are applied as set up in the Global Data Processing System (GDPS) manual. The cut-off values for error detection are entirely objective depending on the availability of data and the length of time being monitored. The monitoring is done on monthly and six-monthly periods, each of which has its error detection criteria.

For monthly monitoring

Number of observations = or > 20 and one of the following:

- Mean (O-B) = or > 4 hPa or
- (ii) Standard deviation = or > 6 hPa or

Percentage gross error at least 25%

NB: The gross error is defined as an observation that departs from the background by at

Least 15 hPa.

For six-monthly monitoring:

Number of observations = or >40 and one of the following.

(i) Mean (O-B) = or >3.5 hPa. or one of the following

(ii) - (a) Standard deviation = or >5 hPa or

- (b) Percentage gross error of at least 25%.

6.2.4 Monitoring Results for July-December 2011

The results of this monitoring (July – December 2011) period are shown in table 1

Table 1: Suspect stations for July-December 2011

	Stn No.	Stn Name	Stn Elev (m)	Country	First date	Last date	Lat	Lon	NOB	Mean	Std Dev	% Gross Error
1	63330	Makale	2070	Ethiopia	01/07/2011 12:00	30/12/2011 12:00	13.5	39.5	47	5.2	7.7	53.1
2	63687	Kakamega	2133	Kenya	01/07/2011 00:00	27/07/2011 00:00	0.3	34.8	42	-5.0	0.6	92.8
3	68185	L/Nburge	1433	S/Africa	01/07/2011 00:00	22/12/2011 12:00	-25.1	30.5	297	-8	3.1	97.3
4	68268	Warmbad Towoomba	1143	S/Africa	01/07/2011 12:00:00	31/12/2011 00:00:00	-24.9	28.3	331	-1.4	5.2	29.3
5	68674	Cape Hermes	47	S/Africa	01/07/2011 00:00:00	31/12/2011 00:00:00	-31.63	29.5	332	3.9	3.3	51.5

Monitoring Results dissemination

The results and sent directly to the Secretary General, WMO, who then distributes them to the countries with suspect stations.

Monitoring effectiveness

Surface SYNOP data quality monitoring has been going on in the region for quite sometime especially on six monthly basis. The recurrence of suspect observations in the same suspect stations has been observed from time to time in some countries.

The region suggests that more emphasis should be on the importance of good quality data as many suspect stations remain unchecked .

7. WMO Integrated Global Observing System (WIGOS)

The region appreciates the WIGOS Concept of Operations (CONOPS) and the WIGOS Development and Implementation Strategy (WDIS). The region has developed regional and Sub-Regional WIGOS Implementation Activities through the RA1 TT on WIGOS taking into account existing and future regional priorities and the identified Strategic Goals for the region for strengthening of observing capabilities of NMSs.