**4.2** **Step 2 - Analysis of existing GBON stations and their status against GBON requirements**

In this step, the peer advisor assesses existing stations in the country that could contribute to GBON. This includes stations operated by the National Meteorological and Hydrological Service (NMHS), other governmental agencies, and the private sector, which could contribute to GBON. The peer assesses the operational status of the stations, including the variables they measure and report, and provides a geographical visualization of the distribution of the stations. The networks are evaluated based on the mandatory GBON requirements.

The elements to be analyzed in step 2 are:

1. **NMHS network:** Number of stations managed by the NMHS and their reporting status against GBON requirements, i.e., reporting or to be improved. During this step, all GCOS Surface Network (GSN) and GCOS Upper Air Network (GUAN) in the country should be included and indicated. It is recognized that the reporting requirements for these 2 networks (see annex XX) does not meet the minimum GBON reporting requirements, but these stations are an ongoing commitment for the NMHS for climate monitoring and such should be prioritized if there are already meeting, or can be improved to, GBON minimum requirements. If it is decided to affiliate a non-GCOS station to GBON, even though there is a GCOS station in that country, the justification must be provided
2. **Third-party networks:** Number of surface and upper-air stations operated by the third party which could contribute to or become GBON stations and their reporting status against GBON requirements, i.e., reporting or to be improved.
3. **Station information:** Name, owner, and funding source of a station, and which variables a station is reporting and how regularly (see Table 4).

The status of existing stations is defined as follows:

* **Reporting to requirements:** The rationale for classifying surface and upper-air stations as reporting is based on the WIGOS Data Quality Monitoring System (WDQMS) for the chosen time period (WMO GBON Global Gap analysis, June 2023). Stations that were either green (GBON compliant), or orange (“potentially GBON compliant”) on at least 80% of days, are considered as reporting. Other listed stations are counted as having the possibility to be improved.
* **Improve:** Whether the station exists but is not fully operational and can be improved to report internationally as per the GBON requirements (e.g., the station is out of service, has broken instruments, reports on only some variables, or not as often as required, the observations are not exchanged internationally via WIS or other issues with the data transmission system). The actions for improvements should be assessed and outlined in the GBON National Contribution Plan.

Annex XX

The following text has been copied from the GCOS-144 publication (Guide to the GSN and GUAN), with the full publication available from the WMO e-library. (<https://library.wmo.int/records/item/48325-guide-to-the-gcos-surface-network-gsn-and-gcos-upper-air-network-guan?offset=2>)

## GSN and GUAN OBSERVATION REQUIREMENTS FOR STATIONS

The criteria for inclusion of stations in the networks are defined at two levels:

* Target Requirements (TRQs) are those that are ideally to be satisfied. Stations meeting all the TRQs shall have priority over stations that are deficient in that respect in some way.
* Minimum Requirements (MRQs) are the bare minimum that must be satisfied for inclusion.

The "required performance level" in commitment 2 (i) refers to the Target Requirements.

### Statement of commitment

A written statement of commitment by the responsible NMHS to operate the station on a long-term basis, and to provide data and metadata as documented below, is a Target Requirement.

### Observed parameters

1. For the GSN, the requirements are as follows:

MRQs:

* Monthly means of daily maximum, minimum and mean temperature.
* Monthly precipitation amounts.

TRQs (in addition to the MRQs):

* Pressure: monthly mean values, station level and mean sea level.
* Daily precipitation amounts
* Precipitation: number of days with precipitation if daily precipitation amounts are not provided.
* Temperature: daily mean, minimum and maximum.
* Pressure: daily mean, station level and mean sea level.
* Subdaily data: historical and real-time synoptic or hourly reports, with all the data normally reported in synoptic transmissions, for the full period of record for the station.

If only monthly values are available, the number of days used in the calculation should be provided as a Minimum Requirement.

Note:

Generating a monthly CLIMAT report is a Minimum Requirement for stations. CLIMAT reports are defined in WMO-No 306 (The Manual on Codes) as FM-71-XII CLIMAT. All sections of CLIMAT reports should be prepared and distributed, e.g. via the GTS. Further guidance on the preparation of the CLIMAT report can be found in the publication WMO/TD- No. 1188 and in GCOS-127[3](#_bookmark2). For best quality, the CLIMAT reports should be prepared by the station operations staff. (Adherence to the rules for dissemination of monthly CLIMAT

1. GCOS (2009):*Practical Help for Compiling CLIMAT Reports*. GCOS-127 (WMO/TD-No. 1477), <http://www.wmo.int/pages/prog/gcos/Publications/GCOS-127_EN.pdf>

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reports and individual-ascent TEMP reports includes the assignment of a WMO block and index number to the station.)

For those GSN stations producing SYNOP reports, providing the maximum and minimum temperature and total rainfall sections of the SYNOP reports is a Target Requirement. SYNOP reports are defined in WMO-No 306 (The Manual on Codes) as FM-12-XII Ext. SYNOP.

1. For the GUAN, the requirements should be interpreted such that every month at least one observation on each of at least 25 days should attain the MRQs. The observing frequency (1 or 2 per day) in itself is not a criterion, although the Target Requirement for observation frequency is 2 per day, in accordance with WWW regulations for radiosonde observations. Where possible, priority should be accorded to night-time ascents because these are less susceptible to radiative biases.

MRQs:

* Temperature up to 30hPa.
* Humidity up to the tropopause.
* Wind direction and speed up to 30 hPa.

TRQs (in addition to the MRQs):

* Temperature and wind up as high as possible.

Note:

Generating TEMP reports is a Minimum Requirement for stations. TEMP reports are defined in WMO-No 306 (The Manual on Codes[4](#_bookmark3), Part A, FM 35-XI Ext. TEMP) and all relevant sections should be prepared and distributed, e.g. via the GTS. Only radiosondes that have participated in WMO sponsored intercomparisons should be used.

With migration to BUFR format, transmission of the equivalent information as included at present in CLIMAT, TEMP and SYNOP reports will be required. BUFR reports are defined in WMO-No. 306 (The Manual on Codes2, Part B, FM 94-XIII Ext. BUFR).

### Accuracy of observations

(i) For the GSN and GUAN, the accuracy criteria are identical to the WWW requirements for synoptic observations as found in the Guide to Meteorological Instruments and Methods of Observations WMO-No 8 (‘CIMO Guide’)[5](#_bookmark4).

### Recommended procedure in case of transmission failures

Regular submission of all reports (CLIMAT, SYNOP, TEMP, as appropriate) is a Minimum Requirement. Global distribution of submitted reports can e.g. be achieved through the GTS. In case of GTS failures, other means (mail, facsimile, electronic mail, etc.) should be used.

1. <http://www.wmo.int/pages/prog/www/WMOCodes.html>
2. <http://www.wmo.int/pages/prog/www/IMOP/publications/CIMO-Guide/CIMO_Guide-7th_Edition-2008.html>

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### Historical record

For the GSN, the Minimum Requirements relate to Temperature and Precipitation, for which historical daily series should have a length of at least 20 years. The Target Requirements for all parameters are set at 50 years. The time series should be homogeneous, or should allow for homogenisation through the provision of appropriate metadata.

The GUAN criteria are defined through numbers of individual observations. The Minimum Requirement is 5,000 upper-air observations, equivalent to about 15 years of 1 observation per day (or 7.5 years at 2 per day). The Target Requirement is 15,000 observations.