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GCOS STEERING COMMITTEE
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Report from GCOS Networks: GSRN

The following report is the draft Quarter 2 (2024) highlight report from Task Team on GCOS Surface Reference Network (TT-GSRN).

Global Climate Observing System (GCOS) & **TT-GSRN**

World Meteorological Organization: COMMISSION FOR OBSERVATION, INFRASTRUCTURE, AND INFORMATION SYSTEMS (INFCOM)

GCOS Surface Reference Network Task Team (TT-GSRN)

Status, Progress and Plans: Report 2024 (Q2).

1. Primary deliverable

Report on the development of the GSRN, the Pilot phase and recommendations for an operational GSRN – February 2026 (INFCOM-4)

2. Approved documents

- GSRN 10-year goals (July 2022): Approved by TT-GSRN (Plenary).
- GSRN Pilot Network Requirements and Station Nomination (Oct 2022): Approved by GCOS (AOPC) and WMO (SC-ON).
- INFCOM-2 Decision (Oct 2022): Pilot Network Requirements and Station Nomination.
- GSRN Governance (Dec 2022): Approved by TT-GSRN (Plenary).
- Initial Terms Of Reference for GSRN LC (Sept 2023): Approved by TT-GSRN (Plenary)
- GSRN(Pilot) Station List (Oct 2023): Approved by AOPC and SC-ON chairs.
- GSRN(Pilot) Implementation Plan (Jan 2024): Approved by TT-GSRN (Plenary).
- GSRN Quality Management (Mar 2024): Approved by TT-GSRN (Plenary).

Documents are available on the GSRN WMO SharePoint site (approved documents) as pdf, with a separate folder containing the word document versions.

3. Key meetings

- GSRN-TT-1 (Dublin June 2022): Agreed on 10-year goal; GSRN governance, draft station and measurement requirements; draft terms of reference for GSRN-LC.
- INFCOM-2 (WMO, Oct 2022): Document on pilot network requirements and station nomination for approval.
- GSRN-TT-2 (Torino Sept 2023): In-person meeting with GSRN-LC staff to discuss progress & plans; GRSN(Pilot) stations assessment and recommended list; draft metadata and station level data; measurement uncertainty; draft GSRN(Pilot) implementation plan.
- GSRN(Pilot) station contacts: On-line meeting on; Introduction (1-Feb 2024); metadata (2-April 2024); station level data and GSRN processing (3-June 2024)

4. GSRN(Pilot) Implementation Plan

4.1 GSRN(Pilot) Stations.

- 17 stations, from 11 countries, selected for the GSRN(Pilot), with a potential to add several additional stations during the pilot phase. All nominated stations contacts were informed of the decision of GSRN-TT, through WMO (agreed governance).
- Several on-line meetings have been arranged with the 11 country contacts, starting with a kick-off meeting, and then focusing on priority activities (metadata, station level data).
- Station level metadata have been provided for all 17 stations, using either OSCAR/Surface or the nomination forms. The final check/update of the metadata held by the lead-centre, from the station contacts, has been delayed due to the GSRN website not being available/accessible.
- Test data from the 2 Chinese stations have been available many months. Test data from the 2 New Zealand data was provided to the GSRN-LC during March – June 2024, and have been used to refine the station level data/format.
- GSRN(Pilot) station contacts have been requested to provide the GSRN-LC with 'test' station level data according to the draft document.

4.2 Metadata database for the GSRN stations.

- Metadata database has been implemented by GSRN-LC within the processing system and is accessible through the GSRN website.
- Metadata for the 17 stations has been uploaded into the database, using either OSCAR/Surface and/or the nomination forms. Additional measurement metadata (as provided) has been added. Metadata still needs further checks, for consistency and completeness.
- 9 of the 17 stations are nominated to the GSRN in WMO/OSCAR surface.

4.3 Website/forum to support the implementation.

- A website (GSRN.pub) has been implemented by the GSRN-LC. There have been ongoing issues with the website accessibility, and the lack of security protocols (i.e. https), which has resulted in limited use and contents check by both TT-GSRN and the GSRN(Pilot) station contacts.

4.4 GSRN 'portal' for data/metadata to be uploaded, and its operational implementation.

- An initial data file document has been drafted by GSRN-LC which includes details on how to transfer data/metadata to the LC. During the testing/setup phase this is primarily a manual process using existing documents and email. Both FTP and WIS are being considered for the operational transfer of the data, and the FTP option has been tested by New Zealand. The website also allows for a manual upload of metadata (individual elements and file) but this is yet to be tested due to access issues to the website.

4.5 Processing software to manage, process and archive data, including the generation of GSRN data products, and its operational implementation.

- GSRN-LC have implemented a processing system based on/utilising the observation monitoring system used in CMA. The system has been demonstrated to TT-GSRN and provides many of the functions required for the GSRN(Pilot) phase. Some of this functionality will also be available within the GSRN website environment. To date the testing/use of this system has been limited to the data from the Chinese stations, and very recently the tests of the data from the New Zealand stations. The system remains in a test/development phase, being further evaluated during the tests of the initial data from GSRN(Pilot) stations.

4.6 GSRN 'facility' to display network/station monitoring, measurement time-series and allow access to data.

- See point 4.5 above, the processing system and the ability to display/monitor data is the same process. Access to this 'facility' is provided by the GSRN website, and also includes restricted/public access. This requires further testing/evaluation by TT-GSRN and GSRN(Pilot) station contacts.

4.7 Data quality assessment methods and software that can be made available to members.

- Not started yet, although limited quality checks of the metadata/station level data have been included in the processing system demonstrated by GSRN-LC.

4.8 Capacity Development / Training courses, as required.

- Information on the metadata, processing system, station level data, has been provided by the GSRN-LC during the on-line calls with the GSRN(Pilot) station contacts and members of TT-GSRN. Several information documents have also been provided. Currently training is provided as a 'learn as we implement', with the LC experts available to support the station contacts as they develop the data files, data transfer and use of the website information.
- During the GSRN(Pilot) station selection process, a few countries were identified as having a potential to operate/support a station for the pilot phase. This will require support from TT-GSRN and GSRN-LC to assist them and develop their understanding/capability.

4.9 Implement a GSRN monitoring and incident management system, reporting to relevant bodies.

- Not started yet, except for some initial metadata/data checks in the GSRN processing system.

4.10 Outreach

- GSRN summary/update presentations have been provided at meetings (Regional sessions/Technical & Scientific meetings) by TT-GSRN experts as follows: Regional meeting in RA-II (Q4 2023); GRUAN ICM (Bern March 2024); 5th International Arctic Metrology Workshop (Svalbard June 2022); GCOS Conference (June 2022); WMO TECO (Geneva September 2022); MMC (Torino September 2023); SC-ON, SC_MINT, AOPC regular updates.

4.11 Transition from Pilot to Operational

- Not started yet.

4.12 Research Facility

- Measurement tests are being conducted at 'test facilities' in Italy (BIPM) and China (CMA), with some technical support from TT-GSRN (SG3)

5. GSRN Lead Centre (GSRN-LC)

- Regular on-line meetings (approx. monthly) are held between GSRN-LC, TT-GSRN co-chairs and GCOS Secretariat to discuss progress of GSRN-LC workplan, GSRN(Pilot) implementation and issues/risks.

6. Measurement Requirements/Uncertainty (SG3)

- GSRN Measurement Metadata (on-line meeting 8th Jan 2024)
- GSRN Measurement Uncertainty (on-line meetings 25th Jan, 19th Feb, 19th Mar 2024)
- Dedicated meeting on CMA Measurement Uncertainty experiments (10th Apr 2024)
- GSRN Data File requirements (on-line 9th & 20th May 2024)
- Dedicated meeting on Measurement Uncertainty with GSRN(Pilot) contacts (18th Jun 2024)

Q1/Q2 work from SG3 has focused on defining the necessary metadata and measurement requirements to enable a best estimate of the uncertainty to be calculated. This has involved collaboration with the WMO Standing Committee on Measurement, Instrumentation and New Technology (SC-MINT) and will be a key item in discussions with the GSRN(Pilot) station contacts.

7. GSRN Data Product (SG7)

There were no dedicated meetings of SG7 during the period, as much of the work of this subgroup is linked to that of SG3 and thus many of the meetings listed in section 6 were joint meetings.

8. Outlook (Q3 & Q4 – 2024)

- Ongoing implementation of GSRN(Pilot) according to the implementation plan.
- GSRN presentation at WMO TECO (Vienna, Sept 2024)
- Planning for TT-GSRN-3 (Xian, China, 14th – 18th October 2024).

9. Issues and Risks

- Availability of GSRN website (GSRN.pub) and lack of security protocols which presents some experts/station contacts from access.
- Integration of the network metadata into WMO OSCAR/SURFACE (issue)