THE GLOBAL BASIC OBSERVING NETWORK CONCEPT

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1. Preamble

Global numerical weather prediction (GNWP) and climate reanalysis play an essential role as the backbone for all products and services provided by the NMHSs of the WMO Members to their constituencies, even at regional and local levels. Within the WMO Rolling Review of Requirements (RRR) process, nearly all 14 application areas currently listed have some level of dependency on GNWP and climate reanalysis.

These global application areas depend on access to globally consistent sets of observations provided by surface- and space-based observing systems. WMO facilitates, coordinates and monitors the collection and international exchange of such observations.

Preliminary reports from the WIGOS Data Quality Monitoring System (WDQMS) NWP pilot, show continued poor availability of surface-based observational data coverage over many areas of the global domain. This limits the ability of all WMO Members to provide weather and climate services to their constituencies.

In order to ensure that observational requirements for GNWP and climate reanalysis are met more effectively, a new approach is proposed, in which the basic surface-based observing network that is essential to support these applications is defined at the global level. This network is the Global Basic Observing Network, or GBON.

2. Concept of Global Basic Observing Network (GBON)

The GBON will be a subset of the surface-based subsystem of WIGOS, used in combination with the space-based subsystem and other surface-based observing systems of WIGOS, to contribute to meeting the requirements of GNWP, including reanalysis in support of climate monitoring. Design, execution and management of a GBON will be made in the context of the WIGOS through a global design process. GBON will respond to GNWP requirements that cannot currently be met, or fully met, by space-based systems.

GBON is the foundation upon which the Regional Basic Observing Networks (RBONs) are built to respond to requirements of a broader range of WMO application areas.

Note: The space-based component of WIGOS is defined by the CGMS Baseline, as included in the Manual on WIGOS.

2.1 Key attributes of the GBON (not exclusive):

GBON stations/platforms have to comply with the following:

(a) Requirements for real-time and near-real-time data exchange at the global level;

(b) Requirements for regular updates of WIGOS metadata in the Observing Systems Capability Analysis and Review tool (OSCAR);

(c) Requirements for data exchange in defined WMO formats;

(d) Requirements for complying with the WIGOS quality management according to the *Manual on WIGOS*;

(e) Requirements for change management according to the *Manual on WIGOS*;

Note: GBON stations/platforms are not limited to those under the responsibility of the National Meteorological and Hydrological Services (NMHSs).

2.2 Design, implementation and management of GBON

Assuming that Congress-18 will adopt the governance structure in a form close to what was endorsed by EC-70, the new Commission for Observations, Infrastructure and Information Systems (COIIS) will be tasked to design and manage the GBON. Members and WMO partner organizations will implement the GBON. COIIS will also consider necessary capacity development actions.

The GBON will be designed starting from the technology-free requirements from the Rolling Review of Requirements, and it will employ available technologies that can help address these requirements. The design will take into account the cost-effectiveness of the various technologies, how they complement each other, and the contribution made by space-based observations.

The GBON design will be based on the specifications listed in the table below (see section 2.3), and the overall aim is to ensure that the GBON observations, together with satellite data and other sources of observations available, adequately address GNWP requirements.

COIIS will establish a consultative process to ensure that the design will be done in consultation with Members and WMO partner organizations responsible for observing systems contributing to GBON.

The proposal for GBON, including an action plan for phased implementation and filling identified gaps, will be submitted to Congress for consideration and adoption through a resolution. Congress will request Members, and invite WMO partner organizations to implement the GBON design.

In response to the GBON design detailed in the Congress Resolution, Members and WMO partner organizations will commit specific observing stations/platforms with specific observing programmes (variables and schedules) to be part of the GBON, or take steps nationally or regionally to develop capacity as needed.

2.3 Criteria for the selection of stations/platforms into GBON

In establishing the GBON, the emphasis is put on a set of specific variables that currently depend on observations provided by surface-based systems.

Candidate GBON stations/platforms will be selected according to their availability for global data exchange and their expected contribution to forecast skill and/or analysis accuracy.
The specifications for GBON are as follows:

Type of Station	**Parameters measured**	**Required commitment by Members**
Surface – Land (manual or AWS)	Surface pressure; near-surface air temperature, humidity and wind; precipitation; snow[1]	- SHALL implement - 500 km, hourly[2]; - SHOULD implement - 100 km, hourly
Surface - ocean (drifting	Surface pressure, sea surface	- SHOULD implement - 500 km, hourly, or better

buoys, ships)	temperature	
Upper air – land (radiosonde, profiler, aircraft)	Temperature, humidity and wind profile	- SHALL implement - radiosonde - 500 km, 12-hourly - vertical resolution - 100 m or better - top - 30 hPa or better - SHOULD - implement complementary observing systems - radiosonde, aircraft, profiler - up to density of 50 km, hourly – radiosonde to 10 hPa, 1000 km, 24-hourly - aircraft - ascent/descent, vertical res - 300 m or better; - aircraft - flight level, horizontal res - 100 km or better
Upper air – ocean (radiosonde, aircraft)		- SHOULD implement - radiosonde, 500km, 12-hourly - aircraft - flight level - 100 km or better

Notes:
1 – observations of snow depth shall include observations of no snow; observing cycle for snow depth may be daily
2 – recognizing that manual observations are taken less often, the requirement for hourly observations is waived for manual stations and is replaced by "as frequently as possible, up to hourly"

Additionally, for all GBON platforms listed above, Members SHALL disseminate what is observed (and available for dissemination) up to a resolution of 15 km horizontally and hourly temporally (the current *goal* requirements for Global NWP).

2.4 Monitoring of GBON design and implementation.

The responsibility for defining the tasks necessary for monitoring the implementation and functioning of GBON monitoring falls to COIIS. The Regional Associations in collaboration with COIIS will coordinate the actual monitoring activities *(see note below).*

The monitoring is expected to include the following functions:

Progress of implementation

Progress with regard to GBON implementation and commitments of Members and WMO partner organizations to GBON will be monitored.

Effectiveness of the design

GBON will be routinely monitored globally to assess adequacy and effectiveness of the design of GBON to address GNWP requirements.

Monitoring and incident management

Incident management, and some monitoring functions will be coordinated through WDQMS.

Note: In the new WMO Governance Structure to be proposed to Congress-18, all Regional Associations will have similar working structures, including Regional Working Groups on Observations, Infrastructure and Telecommunication (name TBC). COIIS will form a number of Standing Committees, including a Standing Committee on Observing Networks (name TBC). The structure calls for a set number (2 or 3, TBD) of experts from each of the Regional Working Groups to be matrixed into the appropriate TC Standing Committees in order to ensure (i) strong involvement of all regions in Technical Commission work, (ii) close and direct coordination between the work of Regional Associations and Technical Commissions by using the same experts.

3. Further background and reference material for the Global Basic Observing Network concept

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- NWP Obs. Impact Workshop reports
- EGOS-IP
- Manual on WIGOS, incl. OND Principles

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