EUMETNET (Segovia) Strategy for Observations

2020 - 2025

Vision

In 2025, the European NMHSs are able to take advantage of observations[1] with several levels of quality, from sensors on the Internet of Things (IoT) to high quality climate observations. Our core observation network is strengthened and maintained as a public infrastructure. The European NMHSs have adapted their observation systems to be interoperable with other observation systems. Their policies for management and availability are in line with the regulations and constraints given by the EU.

By 2025, the European NMHSs have taken a leading position in identifying critical data gaps globally and widening the EUCOS idea to the whole world. They collaborate with WMO, national development agencies and international organisations such as the World Bank, regional development banks and the Green Climate Fund to establish and maintain a global observation network.

Key drivers

International resolutions, policies and declarations

Several international resolutions underline the need to access as many observations as possible in order to fulfil basic tasks of meteorology, environmental monitoring, public safety and early warning systems. Already in 1995, the 12th Congress of the World Meteorological Organization adopted Resolution 40 concerning the exchange of real time atmospheric data and commercial meteorological activities. More recently, at the 17th WMO Congress Members adopted the WIGOS network design principles which further reinforce the commitment to global data sharing and a user driven approach. These guidelines address a number of data policy issues that are still relevant in 2019, stating that "Members shall provide on a free and unrestricted basis essential data and products which are necessary for the provision of services in support of the protection of life and property and the wellbeing of all nations".

Moreover, in order to complete the regulatory framework concerning observations, WMO adopted during the 13th Congress and the 17th Congress, Resolution 25, on exchange of hydrological data and products, and resolution 60, on exchange of climate data and products, respectively. In addition, the 18th World Meteorological Congress recently approved the "Geneva Declaration – 2019: Building Community for Weather, Climate and Water Actions" to ensure that partnerships amongst public, private and academic sectors are strengthened, with special regard to the collective contribution of all these sectors to the global infrastructure and to the free and unrestricted international data sharing including transparent arrangements on access to commercial data. One of the downstreaming effects of WMO resolutions has been the drafting of the WIS 2.0 Strategy 2017, with the vision "to provide users with seamless access to diverse information from a wide range of sources", through a strategy envisaging that WIS will be implemented and operated by the WMO community, incorporating services and solutions provided by public and private sectors and aiming at improving capacity building of least developed countries NMHSs.

The European NMHS strategy [1], adopted by the EUMETNET 16th Assembly in May 2016, underlines the active collaboration between the NMHSs in the area of monitoring and observation network. This is largely

[1] Observations: All data usable for forecasting, either in data assimilation or in post-processing, including derived parameters (i.e. humidity derived from electromagnetic signals)

organised through EUMETNET (ground based and air borne) and EUMETSAT (satellite based). The strategy states that the collaboration in this domain can be further strengthened by ensuring consistency of the European observation network to enable interoperability and organise collective procurement and maintenance of equipment. The strategy also includes statements regarding collaboration with the private sector, such as development of innovative services through public-private partnerships and establishing the distinct role of European NMHSs while at the same time stimulating collaboration with the private sector.

In the spirit of the "Oslo Declaration" approved in 2009 by EUMETNET Members, the 22nd EUMETNET Assembly meeting in May 2019 agreed to propose a common set of principles on data exchange referred to as the "Exeter Declaration" [2]. Following WMO guidelines, it emphasises the free and unrestricted exchange of essential meteorological and hydrological observation data to all users, acknowledging relevant contributions of intergovernmental organisations. Furthermore, based on technological progress mostly in the global IT, mobility and space industries which begin to offer data services on a commercial basis, it underlines the need for new approaches of cooperation between the public (NMHSs and what is referred to as their shared organisations[2]) and private sectors and supports the enhancement of data exchanges with third parties.

In parallel, the European Union has introduced policies with the aim to significantly increase the amount of data that is made available for re-use. The Infrastructure for Spatial Information in the European Community (INSPIRE) Directive requires public organisations to make their spatial data discoverable and accessible to citizens. The newly approved Directive on open data and the re-use of public sector information, also known as the 'Open Data Directive' (Directive (EU) 2019/1024) encourages the EU Member States to make as much information available for re-use as possible and defines meteorological data as high value dataset with important benefits for the society and economy being subject to a separate set of rules ensuring their availability free of charge. Legislative measures and harmonisation in EU Member States thus are expected to progressively lead to more meteorological observations data being made accessible.

The Copernicus programme established by Regulation (EU) No 377/2014 is the European Union's Earth observation programme, which envisages that the vast majority of environmental data and information delivered by the Copernicus Space infrastructure and the Copernicus services are made available to any citizen and any organisation around the world on a free, full and open access basis.

European meteorological organisations like EUMETSAT and ECMWF evidently follow the recommendations and guidelines of the EU and WMO. The tendency toward open data policy in Europe had a significant effect on the development of EUMETSAT's data policy. Last year EUMETSAT reduced fees for data access which results in more easily reachable data and gives the opportunity for more companies to use EUMETSAT's data in their services. EUMETSAT in its strategy called Challenge 2025 has committed to offer more and better products and services free-of-charge in order to expand its user base. Similarly, ECMWF also states in its Strategy 2016-2025 document that "in the future it is very likely that data will become freely downloadable via publicly accessible systems". This vision was confirmed in 2019 by the Council subgroup on Data Services Strategy that agreed, among others, on the statements that "ECMWF should commit to a future open and free data policy within a regulated and stepwise approach", implementing this gradually over a period of five years.

Trends

Innovation in science and technology will give new opportunities for weather forecasting and climate analysis. Examples include satellite miniaturisation, next generation computer architecture, science to model the earth system in more detail, Internet of Things (IoT), cloud computing and new methods to analyse large amounts of data (big data). Microsatellites, sensors attached to the Internet and big data analysis will be particularly important for our acquisition and use of observations. At the same time, there is a barrier for exploiting the

[2] Currently encompassing EUMETSAT, ECMWF, EUMETNET and ECOMET.

potential of the new types of data. We need to handle them differently from our traditional data and we need to develop new methods for using them in data assimilation and forecasting.

The economic and political framework conditions of the NMHSs are changing as a result of increased pressure on public sector budgets, open data policies and the desire to enable the private sector to realise added value. The private sector is moving into the whole meteorological value chain, including collection of observations. As a result, some observation will be available on a commercial market, possibly with restrictions on use and redistribution. Some companies may also wish to collect observations which are not made available on the open market. Rather, the observations are used to increase the value of downstream products and services in the meteorological value chain, giving the companies an exclusive advantage in the market for these products and services.

Nowcasting and high resolution forecasting requires higher density of observations and increased update frequencies. There is also an increasing requirement for global data coverage [3]. In order to increase the global coverage WMO has decided to develop an overarching design for the Global Basic Observing Network (GBON).

Moving towards Earth System Modelling (ESM) in weather forecasting will require new types of observations for initialising the models. Some of these observations are handled outside the NMHSs. ESM therefore calls for a closer collaboration with other organisations on observations, including harmonisation of observation programs and development of a coordinated earth system network.

In terms of technology, there is an increased use of cloud services for all parts of the meteorological value chain, including collection, exchange and handling of observations. Examples include both private clouds (internally at the NMHSs or in collaboration between them), community clouds such as Copernicus DIAS and the European Weather Cloud (EWC) being developed by ECMWF and EUMETSAT as well as commercially available cloud solutions.

Priorities

Based on the vision, taking into account the current state of the global meteorological observation system and the key drivers, the main strategic priorities of the European NMHSs are:

1. Strengthen the core observing system and keep data from this system as a public good;
2. Increase data coverage in data sparse areas globally and respond to growing requirements such as observations for earth system modelling;
3. Increase the amounts of data through access to new types of data (crowdsourcing, IoT, microsatellites etc);
4. Increase ease of access to data for monitoring, research and operational activities (e.g. EWC, WIS);
5. Maintain appropriate data quality - taking into account that high quality data are required for core observations while earth system modelling will benefit from additional data at several quality levels due to different origin and measurement philosophies;
6. Increase timeliness of data provision of existing stations and make existing data available to the whole community;
7. Develop innovative methods for use of data in forecasting and data assimilation.

Strategic choices

The European NMHSs need to work along several axes:

Globally - to meet the requirements for observations for medium and long range forecasting, climate monitoring and other services extending beyond the European region;

Regionally and locally - to meet the requirements for observations to support weather and climate services across Europe, including nowcasting and high resolution modelling;

Politically - to influence and understand relevant policy, ensuring that the European NMHSs are coordinated and use their common voice to improve access to and use of observations;

Technologically - to take advantage of new technologies and develop efficient and interoperable systems for collecting observations and sharing data.

Strategies on a global level

1. **Global EUCOS:** The experience we have in Europe with collaboration in EUMETNET and EUCOS in particular offers a potential model for establishing a "global EUCOS"[3]. Widening the EUCOS idea to the whole world will improve forecasting also in Europe.

   The European NMHSs and the EUMETNET Observations Programme Management Team (Obs-PMT) will support WMO in their effort to implement a Global EUCOS.

2. **Global collaboration:** NHMSs in Europe, including through ECMWF, EUMETSAT and mainly EUMETNET, should foster global collaboration and coordination with similar existing consortia and NMHSs of other countries, while at the same time should play a key role as world leaders in several meteorological activities, operational and research, in order to support WMO in setting standards and procedures based on best practices or regulations already implemented.

Strategies on a regional and local level

3. **Cooperation:** The NMHSs in Europe will cooperate in analysing requirements and impacts of observations, through the work of the EUMETNET Observations Capability Area Management Programme and other collaborative mechanisms. Building further on the EUCOS concept, EUMETNET will collectively invest in observation equipment and enter into agreements with third parties and develop best practices for collaboration with third parties - organised through the EUMETNET Observations Capability Area.

4. **Regional collaboration:** The NMHSs in Europe will collaborate with private companies that may benefit from improved observations, forecasts or algorithms and companies for which the meteorological data are derived products. The collaboration should be based on the European Commission guidance for access to private sector data for public interest purposes, which includes making data available for non-commercial purposes. The NMHSs in Europe will have to adapt their methods and standards in order to be interoperable with the external communities, and they have to implement systems in order to ensure appropriate data protection of third party observations.

5. **Local collaboration:** The NMHSs in Europe encourage local collaboration between NMHSs and third parties and our common efforts should not prevent or compete with such initiatives. Local ownership and governance is a key to successful research, development and innovation. They will collaborate to develop best practices on rules of engagement with third parties which, when appropriate, should enable data sharing with the wider NMHS community in order to preserve the WIGOS network design principle of 'making data available'.

6. **Crowdsourcing:** Crowdsourcing should be carried out by the NMHSs, preferably in joint cooperation, to take advantage of the close ties between the NMHS and the public that exists in many countries. A common base system for reporting and distributing observations will facilitate data dissemination and assimilation in numerical weather prediction and impact models.

[3] global EUCOS: global collaboration on gap analysis for observations and in closing the gap.

7. **Third Party Data Exchange:** Data exchange practices should protect and maintain the current capabilities of the WIGOS as well as enhancing observations provision in an affordable manner, to address identified gaps and deficiencies and deliver the WMO Vision for WIGOS 2040. EUMETNET Members have agreed a set of principles under the 'Exeter Declaration' [3] which will form our policy and guide our approach when engaging with third parties.

8. **Earth system modelling:** As weather forecasting develops into earth system forecasting, the European NHMSs will increase the collaboration with national institutes and regional organisations representing other earth disciplines in order to develop a coordinated earth system observing system.

Strategies on a policy level

9. **Adapt to take advantage of external (third party) data:** The meteorological community will maintain and operate its own core observing system, while at the same time increase the use of third party data to address expanding gaps in observing capability [4] as user requirements become more demanding and the need for improved forecast quality grows. Thus, the European NMHSs will become increasingly dependent on data from external sources for cost efficiency and quality. European NHMS will therefore seek to find incentives for third party data owners to make all data available in order to avoid pools of exclusive data not available for the common benefit.

10. **Regulatory frameworks:** When governments establish regulations for exploiting natural resources, the European NMHSs will advocate to include in the regulations the requirements for taking observations and making the data available for public use.

11. **Role of the European meteorological organisations:** The NMHSs in Europe will encourage and cooperate with EUMETSAT to take part in the collaboration with third parties on observations. EUMETSAT is in a position to explore the use of new types of satellite data and enter into agreements with other satellite operators on behalf of its members. Similarly, ECMWF has world class expertise in analysing impact of additional observations and use of new types of observations in the data assimilation at ECMWF will benefit all users.

12. **Control:** Whilst encouraging free and unrestricted exchange of data, we will respect the licensing conditions set by observations data owners and promote the implementation of the necessary controls to enable compliance.

13. **Incentivisation:** EUMETNET Members will enhance their commitments to share and exchange observations and support the efforts of WMO to improve global data exchange by establishing the GBON and monitoring WMO Members compliance with data exchange policy (e.g. Resolution 40).

Strategies on a technological level

14. **Role of the cloud technology in observation exchange**: The European NMHSs will support the development of cloud solutions, including the European Weather Cloud (EWC), establishing a common federated approach to achieve the seamless exchange of observations including those with external partners, working in accordance with the WMO WIS 2.0 strategy.

15. **Observations from campaigns research infrastructures:** The NMHSs in Europe will collaborate with academia in using data from observation campaigns and research infrastructures in operational forecasting. The collaboration includes issues such as choice of location, use of standards, access to new types of data and emerging technologies and sustainable operation of infrastructures. A good dialogue with academia and private companies could lead to innovative solutions. The focus should remain on those opportunities that have successfully demonstrated proof of concept and have a sufficiently mature technology readiness level for demonstration in a representative environment.

16. **Interoperability:** European NMHSs and the Obs PMT will promote the adoption of internationally recognised data standards, implementing these to facilitate access for those outside the meteorological community.

References

1. 2016–2025 Strategy of the European National Meteorological and Hydrological Services: Towards a network of European NMHSs: Collaboration & Complementarity, May 2016.
2. Exeter Declaration - EMN/A22/Doc4, "Common Set of Principles for Data Exchange', 7th May 2019.
3. M. Staudinger for the GWE: Data policy today and tomorrow. Available from Michael Staudinger
4. J. Sugier, EUCOS Science & Projects Manager, EMN/STAC19/Doc3, "EUMETNET Obs CA Research & Development Plan", 29th Oct 2019

Annex A Implementation plan

Note: As per Action A23.06, Assembly asked the Task Force together with the OBS Programme to elaborate a clear action plan and bring back to Assembly in Spring 2020 the associated Implementation Plan.