



WMO INFORMATION SYSTEM (WIS)

Background

Measurements and observations as well as value-added information derived there from, is the foundation on which our knowledge of the Planet Earth is built. Data exchange systems and data management practices ensure effective and efficient international use of the data regardless of location or language. Nearly all programmes dealing with the Planet Earth collect data, transmit data to one or more processing centres, perform quality control, generate and exchange products, and archive data and products for future use.

In pursuing its mandate to provide and coordinate a standardized information exchange system along with compatible and efficient operating practices that facilitate the needs of an increasingly multi-disciplinary international user community, WMO developed the concept of an integrated WMO Information System (WIS). The WIS should meet the requirements for data exchange of all WMO Programmes, affiliated international organizations, programmes and programme centres, as well as relevant national non-NMHS users such as disaster prevention and mitigation agencies and research facilities.

The Fourteenth World Meteorological Congress (Cg-XIV, 2003) approved this concept, and the WMO Executive Council (57th session, 2005) identified the WIS as a major contribution of WMO to the GEOSS ¹/ with respect to data exchange and management services.

WIS concept and structure

The main functional components of WIS are: National Centres (NC), Data Collection or Product Centres (DCPC), Global Information System Centres (GISC) and data communication networks connecting the components. The terms are used for describing the necessary functions, not actual organizational entities. There may be organizations, such as some of the NMHSs, which combine all three functions within their structure.

The WIS will be based on an improved GTS and integrate satellite two-way systems, alternative dissemination services provided by environmental satellites and the coordinated and free use of the Internet. WIS will offer:

- Routine collection and dissemination service for time- and operation-critical information: This service is based on real-time “push” mechanism including multicast and broadcast; it will be implemented essentially through dedicated telecommunication means providing a guaranteed quality of service, e.g. managed data communication networks and satellite-based data-distribution systems;
- Data discovery, access and retrieval service: This service is based on a request/reply “pull” mechanism; it will be implemented through the Internet (HTTP, FTP,...);

¹ Global Earth Observation System of Systems (GEOSS)

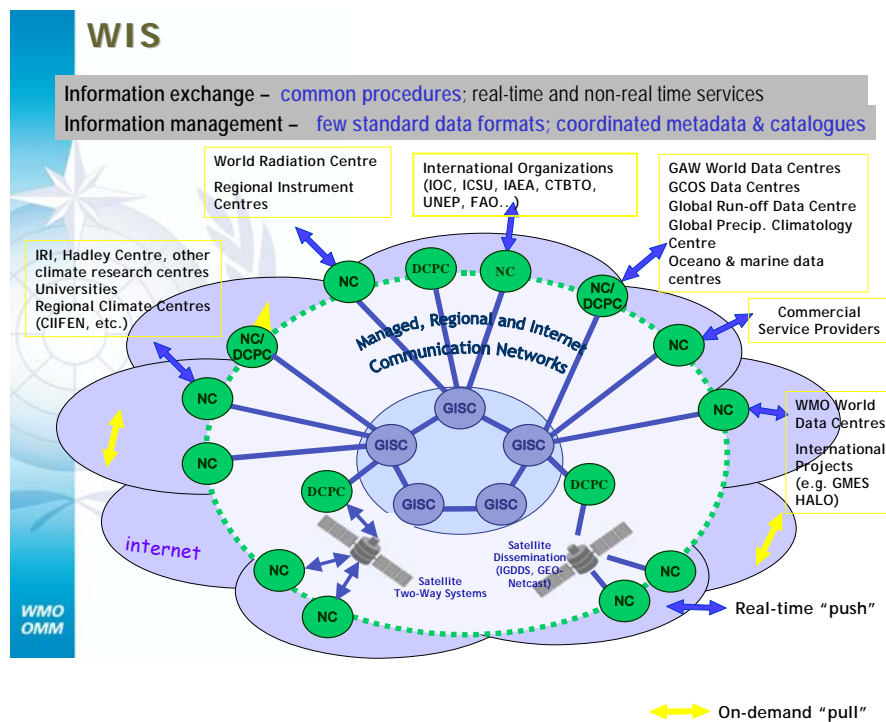


Fig. 1: Functional Structure and Examples of the International User Community of WIS

- Timely delivery service for data and products: This service is based on a delayed mode “push” mechanism; it will be implemented through a combination of managed data communication networks and the Internet.

Main functional elements of WIS

NC (National Centre)

In each country a national centre (NC) will be responsible for collecting and distributing observational data and products at national level and for the information exchange with the associated GISC or DCPC. The NC is also the national administrative centre responsible to coordinate and authenticate access of the users.

DCPC (Data Collection and Production Centre)

Centres that fulfil within specific Programmes an international responsibility for the generation and international distribution of data, forecast products, processed or value-added information, and/or archiving services, are referred to as Data Collection and Production Centres. DCPCs also provide metadata catalogues, Internet portals and data access management. A DCPC can be operated by a NMHS or another institution that meets the requirements (see WIS Governance below).

GISC (Global Information System Centre)

The regional and global connectivity of the WIS structure is guaranteed by the existence of a small number of node centres called Global Information System Centres (GISC). They collect and distribute the information meant for routine global dissemination, and in addition, they serve as collection and distribution centres in their areas of responsibility, and provide entry points for any request for data held within WIS. Similar to the DCPCs, they maintain metadata catalogues of all information available within the WIS and provide a portal for data searching.

Network structure

The data communication networks connecting the various parts of WIS is based on international ICT standards and an agreed technology that is commonly available to the participating centres

and capable of handling the foreseen traffic. WIS will comprise satellite communication channels as well as terrestrial links or managed data network services. Generally TCP/IP is the preferred transmission protocol, but other agreed protocols would be possible, and the WIS can adjust to any evolving international protocol according to the technological progress. The portal structure provided by WIS would make it possible for programmes to present their data to their users in a programme specific query format. Industry standards, off-the-shelf hardware and software, including open source software, will facilitate cost-effective participation of all users in WIS.

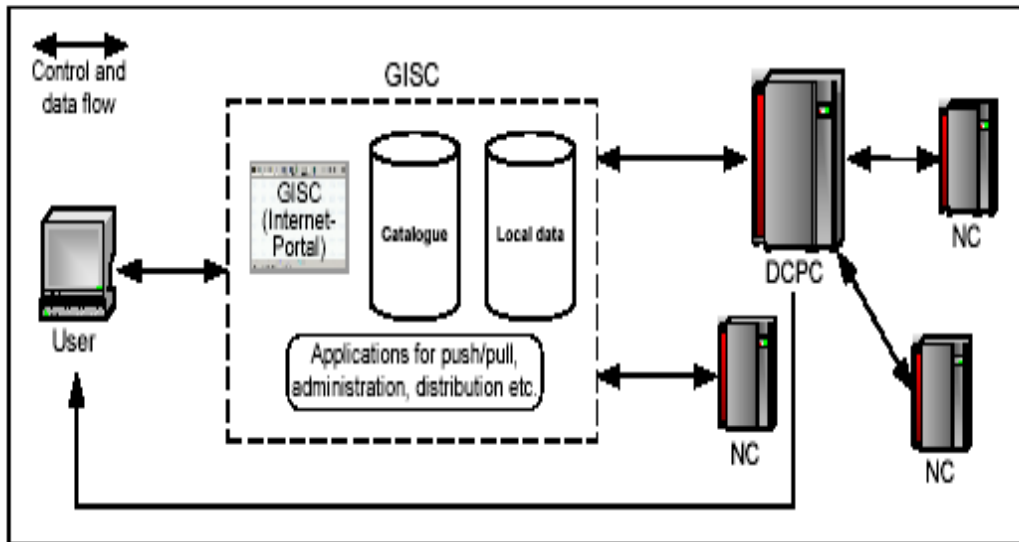


Fig.2: Structure of WIS

The satellite communication channels will initially be based on the Integrated Global Data Dissemination Service (IGDDS). The IGDDS has a near-global coverage and provides the following functions:

- Data acquisition (raw data from satellites, high-level products, inter-regional data exchange);
- Data dissemination (via telecom satellite broadcast, via Direct Broadcast, or, via point-to-point networks);
- Data access, on request, allowing data discovery and delivery to authorized users;
- Data and user management including user requirements review, interoperable catalogue, ensuring service quality and user support.

From a user point of view, the IGDDS system is fully integrated into the WIS, since it basically relies on the same data distribution mechanisms as other components of the WIS, unless there are particular needs or advantages to use specific.

WIS and GEO-Netcast

GEO-Netcast is an initiative led within the GEO framework by EUMETSAT, NOAA and WMO to address the global dissemination needs of the GEO Information Exchange System of Systems (GEO-ISS). GEO-Netcast is to use the multicast capability of a global network of communication satellites to transmit environmental satellite and in situ data and products to users within all the nine GEO societal benefit areas. GEO-Netcast builds on the experience gained by the IGDDS and relies initially on the IGDDS infrastructure and services. This enables WMO, in collaboration with GEO, to achieve cross-system interoperability between the data dissemination services of WIS, IGDDS and GEO-Netcast.

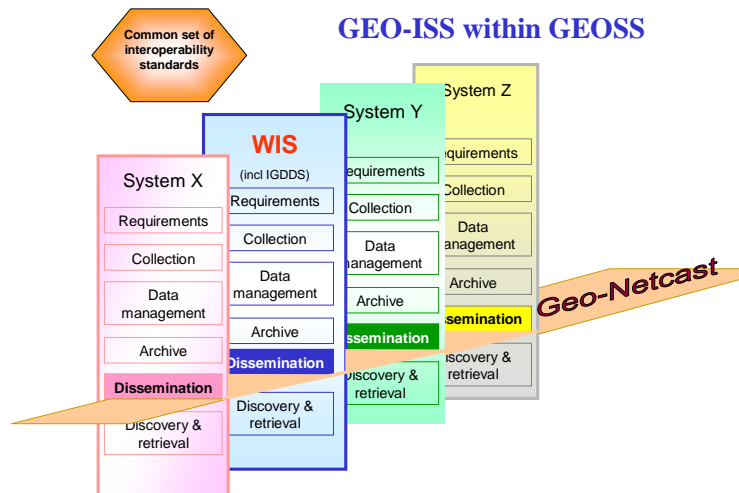


Fig. 3 The GEO Information System of Systems includes a dissemination component referred as GEO-Netcast; system interoperability between WIS (incl. IGDDS) and GEO-Netcast is a coordinated objective of WMO and GEO

WIS Governance

Meeting the fundamental requirement for a stable 24/7 global operation of the WIS depends also on a clear and efficient governance framework. WIS policy aspects and decisions invoking WIS commitments of Members (in particular those with financial implications) are mandated to the Executive Council. The Council relies on advice and recommendations of an inter-commissions coordination group that involves all WMO technical commissions, including JCOMM. Currently, the vice-president of the Commission for Basic Systems (CBS) chairs that group. The overall technical coordination of development and implementation is attached to CBS. That commission also ensures the direct links to the Regional Associations, whose WIS coordinators are incorporated within the CBS working structure. In addition, collaborative arrangements are in place with the programmes such as THORPEX, IPY, GCOS, and several others.

Central to the reliable functioning of WIS are the GISC and DCPC. WMO has set up a coordinated mechanism for the designation of these centres. Several centres established under the WWW Programme could meet the specifications of a DCPC (e.g., the World Meteorological Centres (WMC) and several of the Regional/Specialized Meteorological Centres (RSMC), among them the ECMWF). In addition, numerous other centres have been established over the years under other Programmes for the purpose of collecting and providing programme-specific data and products in real- or non-real time. Their information exchange services will need to be included in WIS so that the requirements of all relevant programmes would be met. The total number of DCPCs is, a priori, not limited, provided the GISCs are able to handle the data synchronization and other communications with their attached DCPCs.

The designation mechanism will serve WMO as tool to determine which centres should be integrated in WIS. The mechanism is transparent to the user and provider community, independent and high-level. It is based on the well-proven designation procedure for centres of the WWW Programme. Depending on the nature of the demand for services of a proposed WIS centre, the procedure involves the user community, co-sponsored Programmes, regional associations, technical commissions and eventually the Executive Council as the body that approves the designation of a WIS centre. For example for a DCPC, the designation process includes the following steps: Statement of WIS requirements by the parent programme bodies; service offer by a potential DCPC; demonstration of DCPC capabilities to CBS; recommendations of CBS to EC; designation of the DCPC by the EC.

WIS complies with the WMO data policy approved, for essential and additional meteorological data and products, in Res. 40 (Cg-XII), and for hydrological data in Res. 25 (Cg-XIII). Procedures for managing access rights, control of data retrieval, registration and identification of users, etc. will be defined as and when required. Anonymous downloading is technically possible, but

depends on whether a NC permits that feature. WIS has no system-inherent features that would challenge international legal practice, laws, treaties, conventions, copyrights, or patents.

Implementation of WIS

The implementation of WIS builds upon the most successful components of existing WMO information systems, and a smooth and coordinated transition is crucial. The first phase of the WIS implementation has been focusing on continuous upgrades and improvements of the GTS to ensure the exchange of time- and operation-critical information. This includes expansion of the service to meet operational requirements of other programmes. The second phase will provide the data discovery, access and retrieval services for all authorized users, as well as more flexible timely delivery services. A realistic target date for the start of operation of at least one GISC and several DCPCs is mid-2008.

WMO Core Metadata Profile

According to the request by Fourteenth WMO Congress (2003), all WMO Programmes have joined efforts in the development of Version 1.0 of the WMO Core Metadata Profile of the ISO Metadata Standard ⁽²⁾. It is now available on the WMO server in the three formats, text description, XML representation based on ISO 19139 standard, and UML representation. That version uses simple catalogues for its information: in addition to those required by the relevant ISO standard, a thesaurus for keywords, a list of the “four-character” country codes and a gazetteer to allow the translation of station names, station identifiers and station number into the geographical position. Improvements will be developed for representing more comprehensive information related to observing stations using the metadata sources such as key words/key phrases based on International Meteorological Vocabulary (WMO-No. 182), Technical Regulations (WMO-No. 49), and station history records. Experts have identified the need for developing some extensions to the ISO 19115 to fully cover WMO necessities.

Tools will be provided for automated “harvesting” metadata from routine data, an essential function for the GISCs. An editor for manually creating metadata will also be developed. WMO is planning training activities for users on the generation and applications of metadata, and a “best practice” guide is also foreseen.

Pilot Projects

Pilot Projects and Prototypes have been selected as the main building blocks for developing and testing required WIS services and tools. If confirmed successful and mature, they will be cost-effectively transitioned to the operational phase. Under the leadership of the corresponding technical commissions, the following projects are currently developed and implemented:

- WMO Core Profile version of metadata and reference implementation (CBS);
- RA VI Virtual GISC project, involving Exeter, Offenbach, and Toulouse (CBS);
- DCPC prototypes including the ECMWF and EUMETSAT, which are associated with the RA VI Virtual GISC project and include the EU-funded SIMDAT project (CBS);
- DCPC E2EDM marine-meteorological and oceanographic data prototype involving Belgium, France, United Kingdom and Russian Federation (JCOMM);
- DCPC prototype (NCAR, USA) for the research community (CBS).
- CliWare Climate Data Management and Handling developed by World Data Centre, Obninsk, Russian Federation (CCI);
- WAMIS World Agrometeorological Information Service developed by the Republic of Korea (CAgM);
- THORPEX/TIGGE Interactive Grand Global Ensemble (CAS).

² The standard may be found at <http://wis.wmo.int>

Pilot Project for handling marine-meteorological and oceanographic data (E2EDM Prototype)

The E2EDM prototype is designed to provide a direct link for the ocean community to WIS. The Flanders Marine Institute (VLIZ, Belgium), IFREMER (France) and the Met Office (UK) under the overall coordination by RIHMI-WDC/NODC, Obninsk, Russian Federation develop an end-to-end data management pilot project for developing and handling metadata for marine-meteorological and oceanographic data from the North Atlantic Area. The prototype, referred to as E2EDM, is centred on JCOMM/IODE users. The functions developed include data assembly, quality control and assurance, real- and non-real-time data integration of data in different formats, which are provided from geographically distributed, multi-disciplinary sources. Its data management services offered include discovery metadata, physical location registry, managed data and metadata elements, coded lists, managed dictionaries/vocabularies, end-user external application registry, end-user specific data delivery (scheduling, delivering mechanisms, push/pull). It handles historical marine meteorological data, historical ocean cruise data, real-time BATHY, TESAC, ARGO and SHIP reports, monthly climatic fields of ocean parameters (imageries), ocean SST satellite data.

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