WMO Activities on Met-Ocean Services Delivery

Submitted by WMO

SUMMARY

Executive Summary: This document provides a general outline on the most recent or planned activities of the WMO on Met-Ocean Services Delivery, implemented through the JCOMM/ETMSS, the WMO Strategic Planning and the WMO Information System (WIS).

Action to be taken: Paragraph 42

Related documents: None

WMO Strategic Planning

1. Fifteenth World Meteorological Congress (Geneva, May 2007) approved the WMO Strategic Plan (WMO-No. 1028), to replace the Sixth WMO Long-term Plan (2004-2011) as from January 2008. The Strategic Plan is the result of a planning process driven by the needs and priorities identified by WMO Members. It is a living document that, within a continuous planning process, further evolves through periodic planning, execution, evaluation and updating phases.

2. Using the WMO vision as a basis, the Strategic Plan defines the high-level and long-term objectives and strategies for WMO to effectively develop and coordinate plans and programmes for implementation, consequently enabling its 188 Members to collectively perform their key activities, mainly through their National Meteorological and Hydrological Services. These activities include monitoring, assessing and forecasting weather, air quality, climate, oceanic conditions, the global water cycle and hydrometeorological hazards. Suitable policy advisory services are also rendered at national and international levels. Such policies are, among others, on management and use of weather, climate, water and related environmental information for socio-economic planning and management. The Strategic Plan thus provides guidance and direction to ensure focused and coordinated approaches across the Organization.

3. A considerable proportion of Gross Domestic Product of developed and developing countries alike is sensitive to weather, climate and water conditions. Hence, the vulnerability of communities everywhere could be significantly reduced through the appropriate use of weather, climate and water information and services.

4. The Strategic Plan will help all Members by enhancing their policy-related strategies for meeting society's needs. Such strategies would be focused on how weather, climate, water and related environmental information and services could be harnessed to manage nature's risks and enhance social and economic development. The Plan will indeed enhance strategies

for the effective application of weather, climate and water information and related services within the framework of improving the safety and well-being of peoples, reducing poverty, increasing prosperity and protecting the environment for future generations. It is also expected to motivate, guide and coordinate the activities of Members, primarily through their National Meteorological and Hydrological Services, the Executive Council, regional associations, technical commissions and the WMO Secretariat. In summary, successful use of the Plan will contribute to the following desired societal outcomes:

- Improved protection of life, livelihoods and property;
- Improved health and well-being of citizens;
- Increased safety on land, at sea and in the air;
- Sustained economic growth in both developed and developing countries;
- Protection of other natural resources and improved environmental quality;
- Mitigation of natural disasters.

5. WMO has built its strategic planning on the results-based management (RBM) concept, which also steers the programme definition and implementation management in the Secretariat. This approach will enable the Organization to better achieve its objectives and assist Members in the realization of their own sustainable plans.

6. The WMO strategic planning process begins with the integration of Members' input into a high-level planning document that defines the objectives, strategies and expected results. This planning process in three fundamental documents:

- The WMO Strategic Plan, which provides a high-level statement of strategic directions and priorities of WMO in the form of the top-level objectives, strategic thrusts and corresponding expected results. It serves as the main basis for the WMO Operating Plan;
- The WMO Operating Plan converts the Strategic Plan into specific deliverables and related activities to be implemented by the WMO Programmes, and the corresponding timelines and key performance targets;
- The WMO results-based budget connects deliverables and activities to resources. The expected results connect the three documents and are reflected in each one of them;

Actual achievements are measured by performance indicators.

7. The desired societal outcomes are addressed by three top-level objectives, namely:

- To produce more accurate, timely and reliable forecasts and warnings of weather, climate, water and related environmental elements;
- To improve the delivery of weather, climate, water and related environmental information and services to the public, governments and other users;
- To provide scientific and technical expertise and advice in support of policy- and decision-making and implementation of the agreed international development goals and multilateral agreements.

8. The top-level objectives are derived from, and embedded in, the frameworks of sustainable development policies and global partnership strategies for development and thus contribute to meeting the targets of internationally agreed development goals, programmes and frameworks such as the The World Summit (2005), the UN Millennium Development

Goals (2000), the Johannesburg Plan of Implementation of the World Summit on Sustainable Development (2002), the Hyogo Framework for Action 2005-2015 (2005) and the Mauritius Strategy for the further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States (2005). They also draw on a series of agreements and working arrangements with other international organizations and relevant international conventions and agreements related to weather, climate, water and the environment.

9. These top-level objectives are achieved through a series of initiatives which emphasize five strategic thrusts: science and technology development and implementation; service delivery; capacity-building; partnerships; and efficient management and good governance. Expectations associated with each of these initiatives (see below) define a set of 11 expected results and associated performance indicators, which form the basis for the development of the WMO Operating Plan, the WMO results-based budget and the performance monitoring and evaluation measures.

Strategic thrusts and expected results
(as contained in the WMO strategic plan, Geneva, May 2007)

Strategic thrusts	Expected results
Science and technology development and implementation	1. Enhanced capabilities of Members to produce better weather forecasts and warnings
	2. Enhanced capabilities of Members to provide better climate predictions and assessments
	3. Enhanced capabilities of Members to provide better hydrological forecasts and assessments
	4. Integration of WMO observing systems
	5. Development and implementation of the new WMO Information System
Service delivery	6. Enhanced capabilities of Members in multi-hazard early warning and disaster prevention and preparedness
	7. Enhanced capabilities of Members to provide and use weather, climate, water and environmental applications and services
Partnership	8. Broader use of weather, climate and water outputs for decision-making and implementation by Members and partner organizations
Capacity-building	9. Enhanced capabilities of NMHSs in developing countries, particularly least developed countries, to fulfil their mandates
Efficient management and good governance	10. Effective and efficient functioning of constituent bodies
	11. Effective and efficient management performance and oversight of the Organization

WMO Marine Meteorology and Oceanography Programme (MMOP) aligned with the WMO Strategic Plan

10. The WMO Marine Meteorology and Oceanography Programme (MMOP) has developed its Operating Plan aligned with the WMO Strategic Plan. Due to its cross-cutting nature, MMOP is contributing to WMO Expected Results 1, 2, 4, 5, 6, 7, 8 and 9. Paragraphs below describe the major outcomes of the sixty session of the WMO Executive Council on Met-Ocean activities that contribute to WMO Expected Results 6 and 7, relevant to the activities of the CPRNW.

Major Outcomes of the Sixty Session of the WMO Executive Council on Marine-related Hazards Early Warning Systems and Coastal Risk Management (WMO Expected Result 6)

Multi-Hazard Early Warning Systems (EWS) and Emergency Response Operations

11. The Council noted that specifically, EWS and services related to coastal risk management (including observations, telecommunications, detection, forecasting and warning systems related to tropical cyclones, storm surge, waves and extreme waves, sea level, tsunami and coastal flooding) depend on the crosscutting cooperation of several scientific disciplines and programmes with specific attention being given to the needs and capabilities of Least Developed Countries (LDCs) and Small Islands Developing States (SIDS). The Council:

(a) Requested the regional Tropical Cyclone Programme bodies, the regional associations and the technical commissions concerned, foremost Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), Commission for Hydrology (CHy), Commission for Atmospheric Sciences (CAS) and Commission for Basic Systems (CBS), to set up or strengthen existing collaboration mechanisms for developing and improving the service delivery in coastal risk management;

(b) Invited UNESCO/IOC to participate in the emerging crosscutting coordination mechanisms;

(c) Requested the Secretary-General to coordinate this approach with the Intergovernmental Oceanographic Commission (IOC) Secretariat with a view to advancing coastal risk management activities.

12. The Council recalled the environmental catastrophes during 2007-2008 resulting from tropical cyclones and their associated coastal marine hazards (mainly storm surges), including the recent tropical cyclone Nargis that caused major devastation and loss of lives in the most populous and low-lying areas of Myanmar in May 2008.

13. The Council recognized that storm surge warnings are a national responsibility. The Council noted that some tropical cyclone Regional Specialized Meteorological Centre (RSMC) advisories did not include storm surge information. It agreed that a storm surge watch scheme would help to increase advisory lead-time and thus contribute to saving lives and properties, and would be the first step towards a comprehensive and integrated marine multi-hazard forecasting and warning system for improved coastal risk management.

14. The Council therefore:

(a) Requested the Secretary-General, in consultation with UNESCO/IOC to facilitate development of such schemes for regions subject to tropical cyclones;

(b) Urged regional associations concerned to incorporate a storm surge watch scheme in the tropical cyclone advisory arrangements and in the Tropical Cyclone Programme (TCP) Regional Operating Plans and/or Manuals;

(c) Noting that some RSMCs with Activity Specialization in Tropical Cyclones were not equipped to function as a storm surge forecast producing centres, requested the Secretary-General, based on the technical advice of JCOMM, to examine the capabilities and willingness of such Tropical Cyclone RSMCs and other storm surge forecast producing centres to participate in regional storm surge watch schemes, and to develop proposals for consideration by the concerned regional Tropical Cyclone Programme bodies and regional associations;

15. The Council recognized that sea level observations are critical for enhancing storm surge forecasting and invited the Members to continue efforts to collect routinely and share such observations.

16. The Council recognized that storm surges are not only caused by tropical cyclones but may also originate by extra-tropical systems and other causes. Furthermore, the severity of impacts could be amplified due to river flooding. In this regard, the Council requested JCOMM, CAS and CHy, in close cooperation with other relevant UNESCO/IOC subsidiary bodies, to implement the scientific/technical recommendations from the First JCOMM Scientific and Technical Symposium on Storm Surges (Seoul, October 2007), including coastal inundation and linkages to storm surge forecast and warning operations in all relevant regions. The list of recommendations from the Symposium is available on the web at: http://www.SurgeSymposium.org.

17. The Council noted that the Fifth TCP/JCOMM Regional Workshop on Storm Surge and Wave Forecasting would be convened in Melbourne, Australia, from 1 to 5 December 2008 and that RMSC-New Delhi could be considered for conducting training workshops for South Asian countries. With reference to the JCOMM Guide to Storm Surge Forecasting, the Council urged the completion and publication of the Guide and the expansion of training workshops on storm surge and wave forecasting for the benefit of all Members exposed to these risks.

Major Outcomes of the Sixty Session of the WMO Executive Council on Met-Ocean Services (WMO Expected Result 7)

User Focus

18. With respect to the provision of user-focused marine meteorological and oceanographic services as documented in the SOLAS Convention, the Council requested to enhance collaboration with international organizations and other entities representing users' interests, such as the International Maritime Organization (IMO), International Hydrographic Organization (IHO), International Association of Oil and Gas Producers (OGP), International Chamber of Shipping (ICS),and national and international high Seas Search & Rescue and

Hazardous Materials (Hazmat) response operations etc. These efforts should improve the collection and assessment of requirements for products and services identified by marine users and improve service delivery to meet those requirements including the development of guidelines for promulgation of maritime safety information.

Service Delivery

19. Recognizing the increased use in the Arctic region by the marine community (including commercial, military and scientific), and noting the coordinated initiative by WMO, IMO and IHO to expand the Global Maritime Distress and Safety System (GMDSS) and the World-Wide Navigational Warning Service (WWNWS) into the Arctic waters, the Council approved the establishment of five new METAREAs for the Arctic region with the same boundary limits as the corresponding NAVAREAs, recently approved at the 83rd session of the IMO Maritime Safety Committee (Copenhagen, Denmark, October 2007). The Council welcomed and endorsed the commitments by the following NMHSs to serve as METAREA Issuing Service as follows:

- Environment Canada for METAREA XVII and XVIII;
- Norwegian Meteorological Institute for METAREA XIX;
- Roshydromet for METAREA XX and XXI.

20. The Council noted with appreciation the expansion of the GMDSS-weather Website to include navigational warnings in the various NAVAREASs (http://weather.gmdss.org/navareas.html). The Council therefore thanked all the contributors, particularly Météo-France, who was managing and hosting this website.

21. In the context of maritime safety services, the Council emphasized the continuing importance to mariners of receiving graphical products via radio transmissions. The Council noted the gradual demise of HF radiofax as a means of disseminating these products and the considerable resources required for software development and distribution in developing alternative methods of transmission, as well as for the ongoing communications costs. It therefore requested JCOMM to continue researching methods for transmitting graphical products to marine users, and requested the Secretary-General to promote resource mobilization to further develop these activities and partnerships through national and international support.

Development of the WMO Quality Management Framework

22. The Council appreciated that the acceptance process of a formal agreement between ISO and WMO with the aim to grant WMO the status of a Standardizing Organization in the field of meteorology and related activities was concluded in June 2008 and available for distribution to Members. Such a status will enable Members to use the WMO technical publications in the same way as ISO documents in their quest for ISO 9000 certification, which would greatly facilitate and simplify this process for them and reduce cost. In this connection, the Council emphasized again the requirements for developing suitable technical publications to provide the necessary advice to technical commissions in reviewing the existing documents and adjusting them to Quality Management System (QMS) requirements and preparing and publishing the necessary updates. With regard to the ability to trace the

instrument record, the Council suggested to study the potential benefit of certification not only for ISO 9000 but also for ISO/IEC 17025:2005.

JCOMM GMDSS Web Site

23. Regarding the JCOMM GMDSS web site (http://weather.gmdss.org), the unique portal to identify the GMDSS "single official web voice" for met-ocean MSI for end-users worldwide, some improvements have been implemented since the previous session of IHO/CPRNW.

24. The integration of the products prepared for the International NAVTEX dissemination has started. It will certainly be a long process. Nevertheless, some products are already available online for METAREA II, III and XI (see figures 2 and 3 in the Appendix 1).

25. As requested by CPRNW during its 9th session, a specific page has been added, with all the available links to the NAVAREA websites (see figures 1 and 4 in the Appendix 1). This was presented as the first step of cooperation for the joint IHO/WMO/IMO use of the common URL ***"gmdss.org",*** web domain registered by WMO until January 2011, for the provision of both meteorological and navigational warning information in real time on the Web.

26. Some additional actions will be considered in the next months or year, including investigating the possibility to develop some graphic functionalities, like interactive maps (e.g., showing the METAREA(s) with warning(s) in force), and making the e-mail access more visible on the website.

27. Despite the reliability of this website, it is important to recall that this method to obtain the MSI shall not replace the official way(s) to get them for SOLAS vessels or others (SafetyNet or NAVTEX for GMDSS): it should be considered as an additional means to reach this information, without the same operational guarantee than the "official" means. A disclaimer clearly notes on each page of the website that: "*The Internet is **not** part of the Maritime Safety Information's operational data stream and should never be relied upon as a means to obtain the latest forecast and warning information. Access to the Site may be interrupted or delayed from time to time, update may also experience occasional gaps. Please refer to OFFICIAL sources, Inmarsat SafetyNET or international NAVTEX services, for more complete information.*"

28. There is no overlap or redundancy with the development of dedicated websites at a national or Metarea level: on each Metarea page, as appropriate and when they are available, links to the existing ad-hoc marine section of the Issuing or Preparation service(s)'s website are included.

29. The statistics, including the access to the NAVAREAs page, are also available in the Appendix. All National Meteorological Services (NMSs), but also other agencies involved in the provision of MSI or more generally the safety at sea, including IHO and National Hydrographic Services, are invited to add, as appropriate, a link to the GMDSS website on their own website. Training courses and articles are also potential ways to make this website more visible to mariners. WMO will prepare an *ad-hoc* information document and brochure for this purpose.

30. WMO reiterates its offer to coordinate the use of the URL domain "***gmdss.org***" for the provision of both meteorological and navigational warning information on the Web. Meteo-France, that developed and maintains the GMDSS web site for JCOMM, could provide technical assistance to the focal point that could be identified to build the equivalent website for the provision on Navigational Warnings on this portal. Some tools, pages or functionalities already developed could be used or adapted by this focal point.

31. If IHO decide to move forward and propose a tentative work plan for a feasibility study, some important issues will have to be considered, due to differences in operational systems and in the management of messages between met-ocean and navigational warnings MSI, in particular :

- Dissemination and collection of messages: the global WMO Global Telecommunication System (GTS), operational for decades for the exchange of data and products between NMSs, has been "naturally" used to gather the met-ocean products. But such a global network and switching system seems not to be available for Navigational Warnings at the moment. A FTP server and/or the WMO Information System (WIS)[1] (see Appendix 2) can be considered for such purposes.

- Management of the messages: for met-ocean MSI, it is quite simple as the retention can be considered as fixed for a dedicated message, that, in most cases, replace the previous one (if there is one in force for warnings). At least for SafetyNet products, the number of messages in force per Metarea is (very) limited. It is certainly more complicated for Navigational Warnings.

- Update frequency: the met-ocean information has to be made available in real-time but it is not supposed to be a problem with the GTS more than 99% of the time. It is to be defined for Navigational Warnings (real-time or "delayed" mode? If delayed mode, which update frequency? The same for all the messages?, etc.).

WMO Publication No. 9, Volume D – Information for Shipping, and other Publications

32. Marine meteorology and other related geophysical information necessary for safe and economic conduct of shipping operations, as well as for fishing and other marine activities, is

[1] The WMO Information system (WIS) is the pillar of the WMO strategy for managing and moving weather, water and climate information in the 21st century. WIS provides an integrated approach suitable for all WMO Programmes to meet the requirements for routine collection and automated dissemination of observed data and products, as well as data discovery, access and retrieval services for all weather, climate, water and related data produced by centres and Member countries in the framework of any WMO Programme. WIS is being designed to dramatically extend WMO Member's ability to collect and disseminate data and products, including the connection with other organizations and agencies. It will be the core information system utilized by WMO Members, providing linkages for all WMO and supported programmes associated with weather, climate, water, and related natural disasters. It is being built upon the WMO Global Telecommunication System, using standard elements and at a pace feasible for all Members.

An overview of the new WMO Information System (WIS) was provided to the CPRNW-9, which emphasized the possibility for the NAVAREA Coordinators to become Data Collection and Production Centres in the future system. Appendix 2 describes in detail the history of the WIS, including objectives, scope, vision, progress and implementation plan.

made available to the user by the various Meteorological Services of maritime countries. The provision of this information is co-ordinated by WMO. WMO-No. 9, Volume D comprises information on the meteorological broadcasts by radiotelegraphy and radiotelephony, meteorological broadcasts by radio-facsimile, global maritime distress and safety system, coastal radio stations and Inmarsat land earth stations accepting ships' weather and oceanographic reports, marine meteorological services available for main port, ship weather routeing services, and visual storm warning signals.

33. Maps showing limits of Metareas and sub-areas are also presented in the WMO-No.9, Volume D (e.g., see figure in the Appendix 3). It is of primary importance for WMO to consider, in addition to the existing graphic maps contained in this publication, to include and maintain the official numerical database of all Metareas and sub-areas used by Members for the provision of MSI, for use in ENC and more generally in E-Navigation. A system to visualize meteorological warnings using GISs, like Google Earth or others, is desirable. This possibility is being considered for the GMDSS web site.

34. In seeking to maintain a high standard of accuracy in the material published in WMO-No. 9, Volume D, the WMO Secretariat depends entirely on the goodwill of the meteorological services and their partners throughout the world. Their cooperation in keeping the WMO Secretariat fully informed of all changes is a decisive factor in attaining this aim.

35. WMO established contact with the International Telecommunication Union (ITU), due to the numerous questions of common technical interest for the WMO and the ITU, in which it is desirable for a mutual benefit, to regularly exchange views and technical material, such as the electronic versions of publications and manuals believed to be of common interest (e.g., WMO Publication No. 9 (Weather Reporting), Volume D (Information for Shipping)). ITU identified focal points on both technical and regulatory aspects and ITU publications, to work closely with the WMO Marine Meteorology and Oceanography Programme and regularly exchange views and technical material. A similar partnership with IHO, with identification of a focal point, is desirable.

36. Regulations and guidance material for the provision of met-ocean services are given in the WMO publications No. 558 (Manual on Marine Meteorological Services) and No. 471 (Guide to Marine Meteorological Services). WMO Congress, at its fifteenth session (Geneva, May 2007), requested the WMO Secretary-General to make available on-line publications these publications that describe guidelines, rules and procedures to prepare and broadcast MSI to ships at sea. These publications are currently under a thoroughly review and will be available at both the GMDSS website for JCOMM (http://weather.gmdss.org) and WMO web sites (http://www.wmo.int/pages/prog/amp/mmop/publications.html) before the end of 2008.

Arctic METAREAs' Focal Points

37. Canada - METAREAs XVII and XVIII:

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38. Norway - METAREA XIX:

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39. Russian Federation – METAREAs XX and XXI:

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Tsunami Messages

40. Delivery of tsunami warnings to mariners: the JCOMM/ETMSS at its second session (Angra dos Reis, Brazil, January 2007) agreed to set up a Task Team on Tsunami Products for Transmission as MSI, to work urgently on these matters. The Terms of Reference and General Membership of the Task Team are available in Annex IX to the ETMSS-II final report (http://www.wmo.int/pages/prog/amp/mmop/documents/Jcomm-MR/J-MR-46_ETMSS-II.pdf). This Task Team will consider only the *pre-tsunami message* (where the mariner is being warned of a potential or imminent tsunami) and not the *post-tsunami message* (information on damage to navigational aids, seafloor and shoreline changes, etc.). The major issues focused on the need to clarify the responsibilities amongst the various centres or agencies potentially involved, and enhance and adapt existing or proposed tsunami advisories/bulletins (e.g., PTWC, JMA) into the appropriate maritime dissemination channels, in accordance with the WMO Publications Nos. 471 and 558. This is especially important for the GMDSS (SafetyNET and NAVTEX) and the final service must be reconciled with marine users needs.

41. Mr Peter Doherty, Chairman of the CPRNW and NAVAREA IV and XII coordinator, welcomed the initiative to have an IHO representative being part of some Task Teams defined by ETMSS, and accepted, with the approval of IHO, the role for the Task Team on provision of MSI in the polar regions. After discussions, and agreement by the Australian authorities, Mr Chris Payne, the NAVAREA X coordinator, was identified as the IHO

representative for the Task Team on Tsunami Products for transmission of MSI. No further progress has been done so far, since the previous CPRNW session.

Action Required

42. The IHO/CPRNW is invited to note the information provided, and to comment on topics of interest for the Group as appropriate. The IHO/CPRNW is also invited to identify other possible opportunities for collaboration between the IHO and WMO.

Appendices: 3

Appendix 1

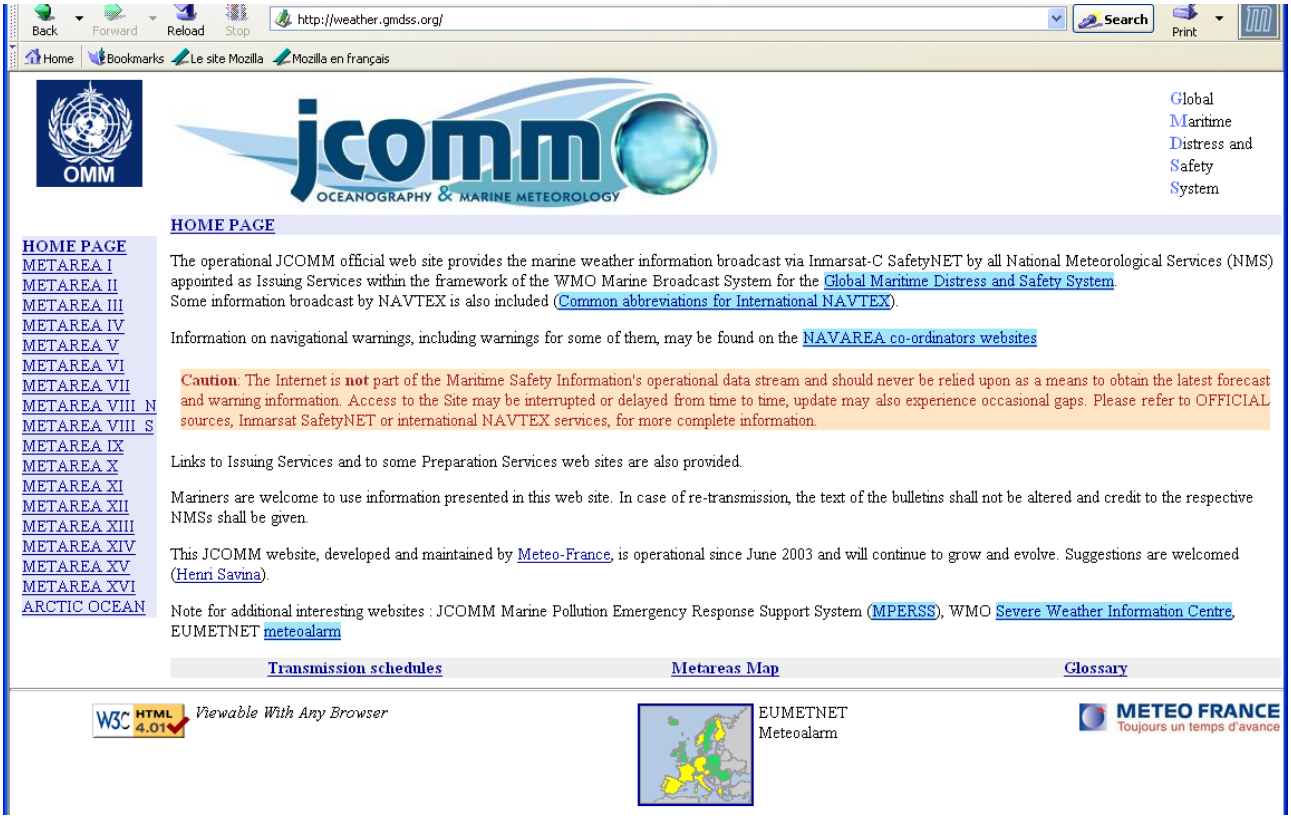


Figure 1: the current principle of the web site is to create frequently (every 5 minutes) each METAREA page containing the updated list of the bulletins available and to associate each new bulletin a single name (which it preserves as much as the bulletin is available – for example *METAREA3E.HIGH_SEAS_FORECAST.0930.181013346067.html*).

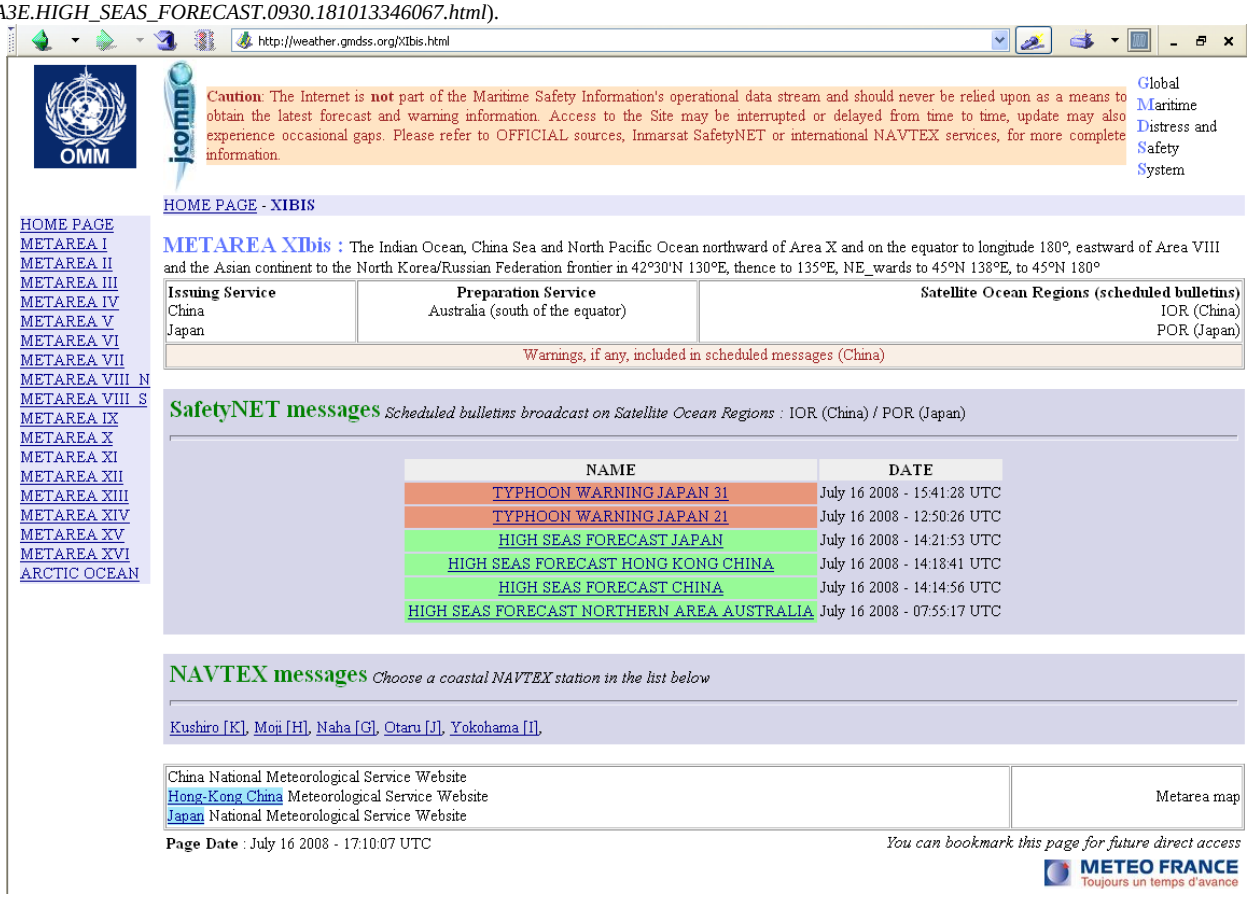


Figure 2 : the customer must make sure that the Metarea page posted at his place is per hour (+ - 5mn) and in this case it has the most recent information available (use the "reload" button). It is thus essential that customers consulting the web site pass initially by the Metarea page to ensure to have the last bulletins available. Retention, management & apparent name for each bulletin in a dictionary.

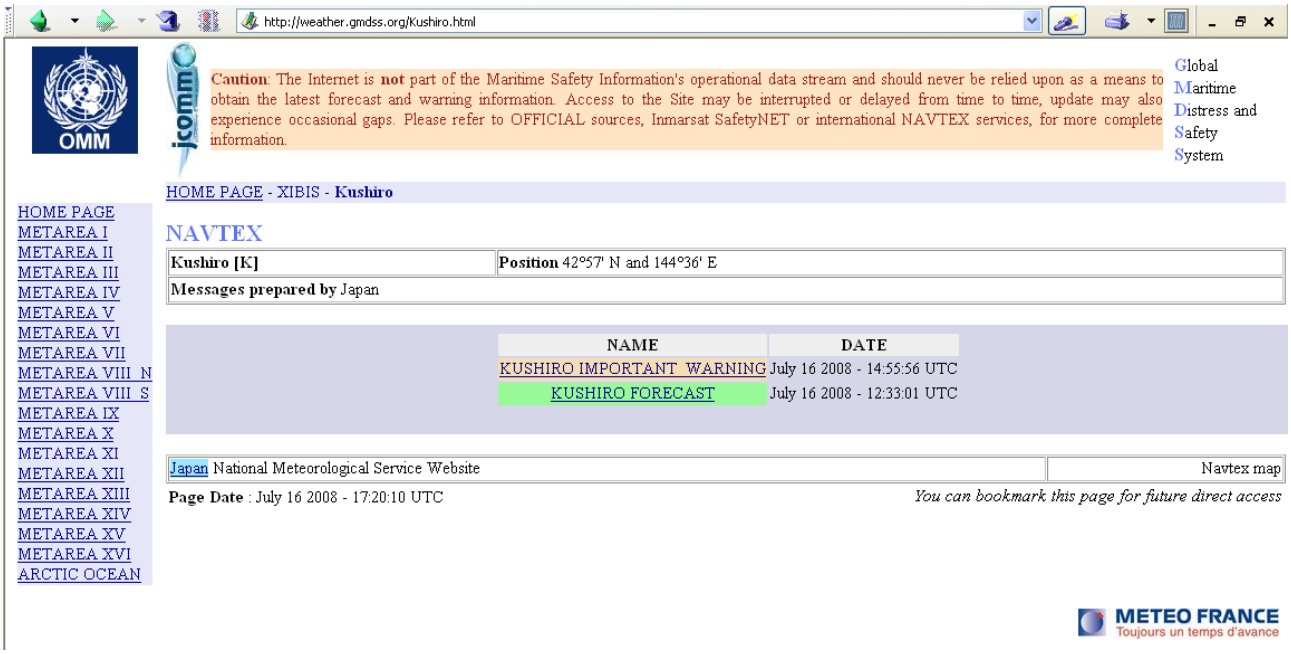


Figure 3 : sample of page prepared for product of a NAVTEX station

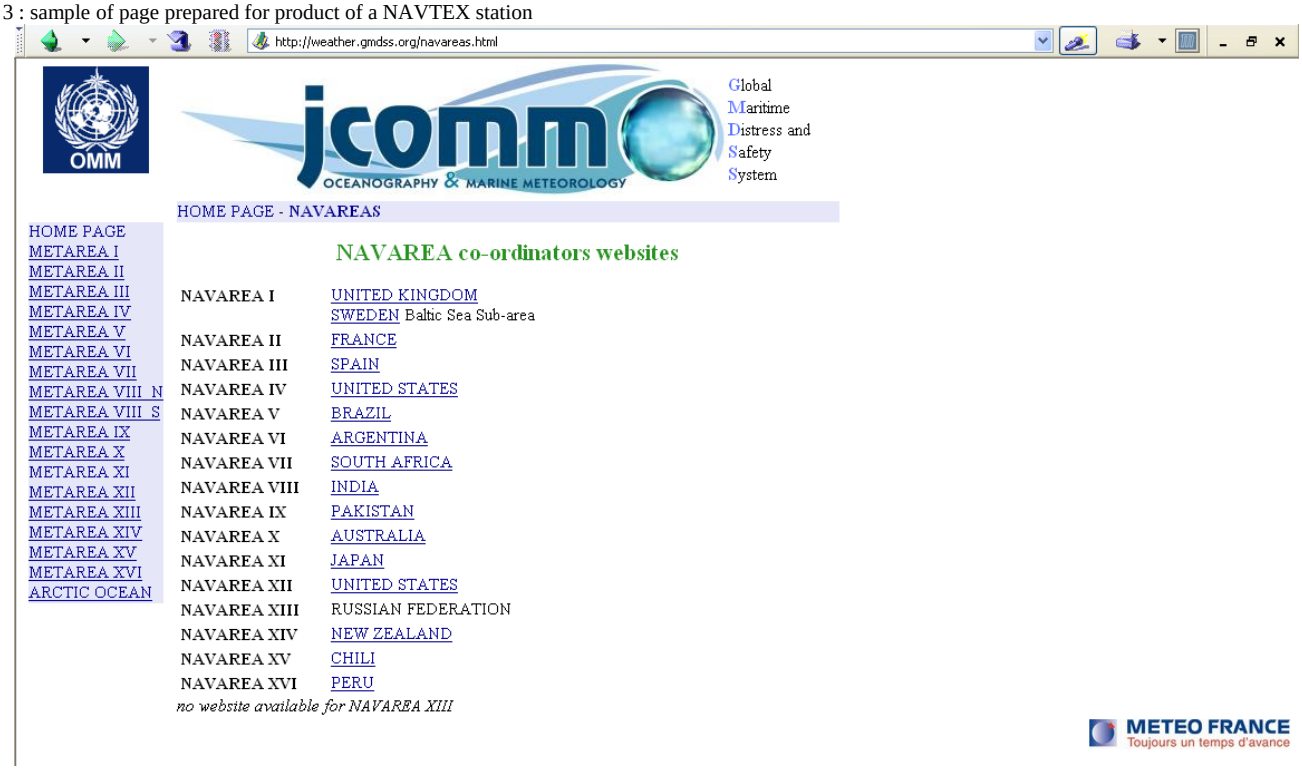


Figure 4 : NAVAREA Page

STATISTICS

Year 2007 - Web site hits

	Jan-2007	Feb-2007	Mar-2007	Apr-2007	May-2007	Jun-2007	Jul-2007	Aug-2007	Sept-2007	Oct-2007	Nov-2007	Dec-2007
Visits	8 372	7 928	8 574	7 745	9 629	11 048	11 947	18 310	14 708	13 065	12 889	11 447
Visitors	7 186	6 773	7 462	6 679	8 130	9 194	9 621	14 670	11 796	10 525	10 360	9 541
Visited pages	22 576	20 540	23 186	20 007	25 220	27 664	27 190	39 127	36 168	35 115	34 696	28 632
Homepage	4 535	4 156	4 706	4 017	5 589	5 577	5 520	6 572	6 779	6 885	7 101	5 849
Metareas pages	16 198	14 644	16 446	14 329	17 398	19 896	19 848	30 359	27 000	25 466	24 955	20 789
General information pages	1 843	1 740	2 034	1 661	2 233	2 191	1 822	2 196	2 389	2 764	2 640	1 994
Metareas chart	987	891	1 043	974	1 188	1 167	962	1 044	1 282	1 431	1 194	906
Transmission schedule	170	184	175	126	188	192	145	179	143	163	144	133
List of NAVTEX abbreviations	127	95	118	102	153	119	124	138	125	128	109	108
NAVAREAs page	0	0	0	0	0	0	0	0	71	253	364	287
Metarea I	1 554	1 146	1 281	1 150	1 592	1 704	1 678	1 966	1 982	1 545	1 843	1 483
Metarea II	1 605	1 458	1 676	1 446	2 059	2 117	2 169	2 658	2 903	2 575	2 725	2 148
Metarea III	3 316	3 369	3 601	3 034	3 969	3 524	3 908	4 690	5 013	5 684	5 598	3 587
Metarea IV	3 276	2 863	3 104	3 014	3 418	4 618	5 335	12 428	9 009	6 501	4 755	4 511
Metarea V	772	661	804	577	750	763	991	1 305	1 112	952	1 132	1 043
Metarea VI	789	603	687	557	579	608	452	683	575	715	809	831
Metarea VII	532	463	499	420	584	665	594	727	676	803	762	760
Metarea VIII N	611	447	551	550	742	1 303	1 132	1 099	1 218	1 253	1 514	997
Metarea VIII S	544	734	548	597	483	589	532	662	650	920	963	987
Metarea IX	589	497	580	543	489	1 190	676	798	623	639	1 039	809
Metarea X	362	295	434	341	373	406	366	421	416	423	573	612
Metarea XI	539	480	634	635	723	560	586	776	868	1 018	1 111	814
Metarea XII	276	272	361	294	313	351	260	362	373	450	395	415
Metarea XIII	199	194	250	203	225	273	217	328	279	286	272	278
Metarea XIV	315	381	461	298	303	372	318	435	371	606	573	519
Metarea XV	390	376	420	284	271	357	222	345	272	356	328	416
Metarea XVI	261	233	335	233	291	288	224	299	277	338	322	322
Arctic Ocean	268	172	220	153	234	208	188	377	383	402	241	257

STATISTICS

Year 2008 - Web site hits

	Jan-2008	Feb-2008	Mar-2008	Apr-2008	May-2008	Jun-2008	Jul-2008	Aug-2008	Sept-2008	Oct-2008	Nov-2008	Dec-2008
Visits	11 789	11 264	14 514	12 186	12 231	13 896						
Visitors	9 780	9 436	12 050	10 313	10 291	11 405						
Visited pages	27 930	27 776	35 034	28 820	28 848	31 007						
Homepage	5 898	6 152	7 252	6 103	6 448	6 380						
Metareas pages	19 998	19 748	25 279	20 660	20 339	22 676						
General information pages	2 034	1 876	2 503	2 057	2 061	1 951						
Metareas chart	879	858	1 037	890	979	794						
Transmission schedule	133	123	132	107	138	87						
List of NAVTEX abbreviations	101	88	162	130	132	156						
NAVAREAs page	317	281	360	335	324	327						
Metarea I	1 407	1 356	2 104	1 563	1 668	1 964						
Metarea II	1 711	1 519	2 193	2 161	1 857	2 172						
Metarea III	3 918	3 915	4 801	4 363	4 539	4 114						
Metarea IV	4 442	4 466	6 570	5 161	4 799	6 559						
Metarea V	796	802	908	671	660	727						
Metarea VI	799	730	779	642	520	529						
Metarea VII	764	740	816	618	563	658						
Metarea VIII N	956	871	1 147	998	1 123	1 111						
Metarea VIII S	948	1 037	1 231	623	670	666						
Metarea IX	650	752	727	732	727	907						
Metarea X	526	616	770	575	481	463						
Metarea XI	824	700	804	743	962	841						
Metarea XII	396	414	466	334	328	358						
Metarea XIII	286	290	312	260	254	293						
Metarea XIV	444	478	512	392	398	456						
Metarea XV	588	479	433	327	320	327						
Metarea XVI	285	338	376	289	273	327						
Arctic Ocean	258	245	330	208	197	202						

STATISTICS

Year 2007 – E-Mail requests (packages)

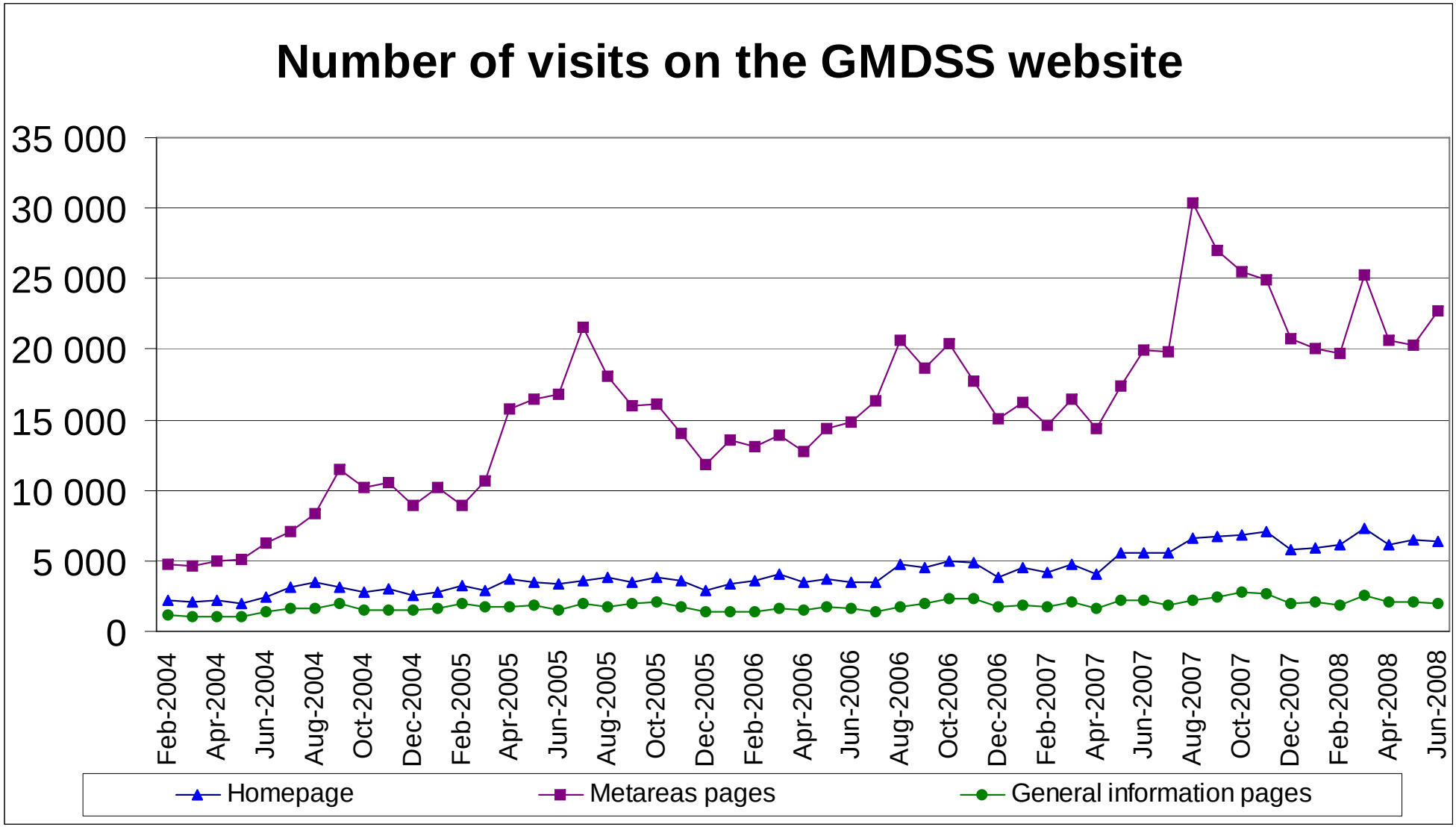
	Jan-2007	Feb-2007	Mar-2007	Apr-2007	May-2007	Jun-2007	Jul-2007	Aug-2007	Sept-2007	Oct-2007	Nov-2007	Dec-2007
GMDSS_METAREA1_INMARSAT	461	416	443	382	448	452	470	433	454	463	445	461
GMDSS_METAREA1_OFFSHORE	462	415	442	392	464	465	472	452	475	465	462	464
GMDSS_METAREA2_INMARSAT	470	426	451	398	494	493	507	492	566	505	468	542
GMDSS_METAREA3-E_INMARSAT	497	454	473	441	545	517	526	514	488	504	474	502
GMDSS_METAREA3-W_INMARSAT	474	475	459	390	463	459	524	495	467	468	445	465
GMDSS_METAREA4_INMARSAT	484	424	455	406	489	454	483	446	452	490	463	486
GMDSS_METAREA5_INMARSAT	470	423	444	386	437	452	466	436	452	427	297	397
GMDSS_METAREA6_N-60_INMARSAT	465	413	436	378	436	348	466	435	449	461	439	458
GMDSS_METAREA6_S-60_INMARSAT	450	68	0	0	0	0	0	0	0	0	31	0
GMDSS_METAREA7_INMARSAT	549	494	536	463	529	528	564	544	545	559	533	560
GMDSS_METAREA8-N_INMARSAT	457	413	436	376	437	450	475	435	459	471	433	462
GMDSS_METAREA8-S_INMARSAT	556	515	558	458	534	528	599	556	552	559	511	564
GMDSS_METAREA9_INMARSAT	394	365	401	359	414	404	424	360	401	366	370	337
GMDSS_METAREA10-NE_INMARSAT	459	413	438	378	434	447	465	439	451	460	443	458
GMDSS_METAREA10-N_INMARSAT	456	413	441	378	435	446	457	433	448	459	442	458
GMDSS_METAREA10-SE_INMARSAT	456	413	437	376	435	446	457	433	449	459	438	476
GMDSS_METAREA10-W_INMARSAT	456	413	439	376	436	447	466	433	448	460	438	464
GMDSS_METAREA11-IOR_INMARSAT	456	413	437	376	434	449	466	438	452	465	440	458
GMDSS_METAREA11-POR_INMARSAT	456	414	437	376	435	447	466	435	452	465	440	458
GMDSS_METAREA11-S-EQUATOR_INMARSAT	456	413	437	376	435	446	457	434	454	459	438	459
GMDSS_METAREA12_INMARSAT	456	414	439	376	434	446	465	432	448	459	438	458
GMDSS_METAREA13_INMARSAT	0	0	0	0	0	0	0	0	0	0	0	0
GMDSS_METAREA14-SOUTH_INMARSAT	456	414	438	376	434	447	465	435	450	460	444	465
GMDSS_METAREA14-TROPICS_INMARSAT	457	413	440	379	434	465	476	445	458	460	439	462
GMDSS_METAREA15_INMARSAT	449	413	420	374	438	448	435	433	432	457	438	451
GMDSS_METAREA16_INMARSAT	458	417	440	380	435	449	470	438	451	467	440	464
GMDSS_ARCTIC_OCEAN	0	0	0	0	0	0	0	0	0	0	0	0
Total of requests	11660	10264	10777	9350	10909	10933	11521	10826	11153	11268	10649	11229

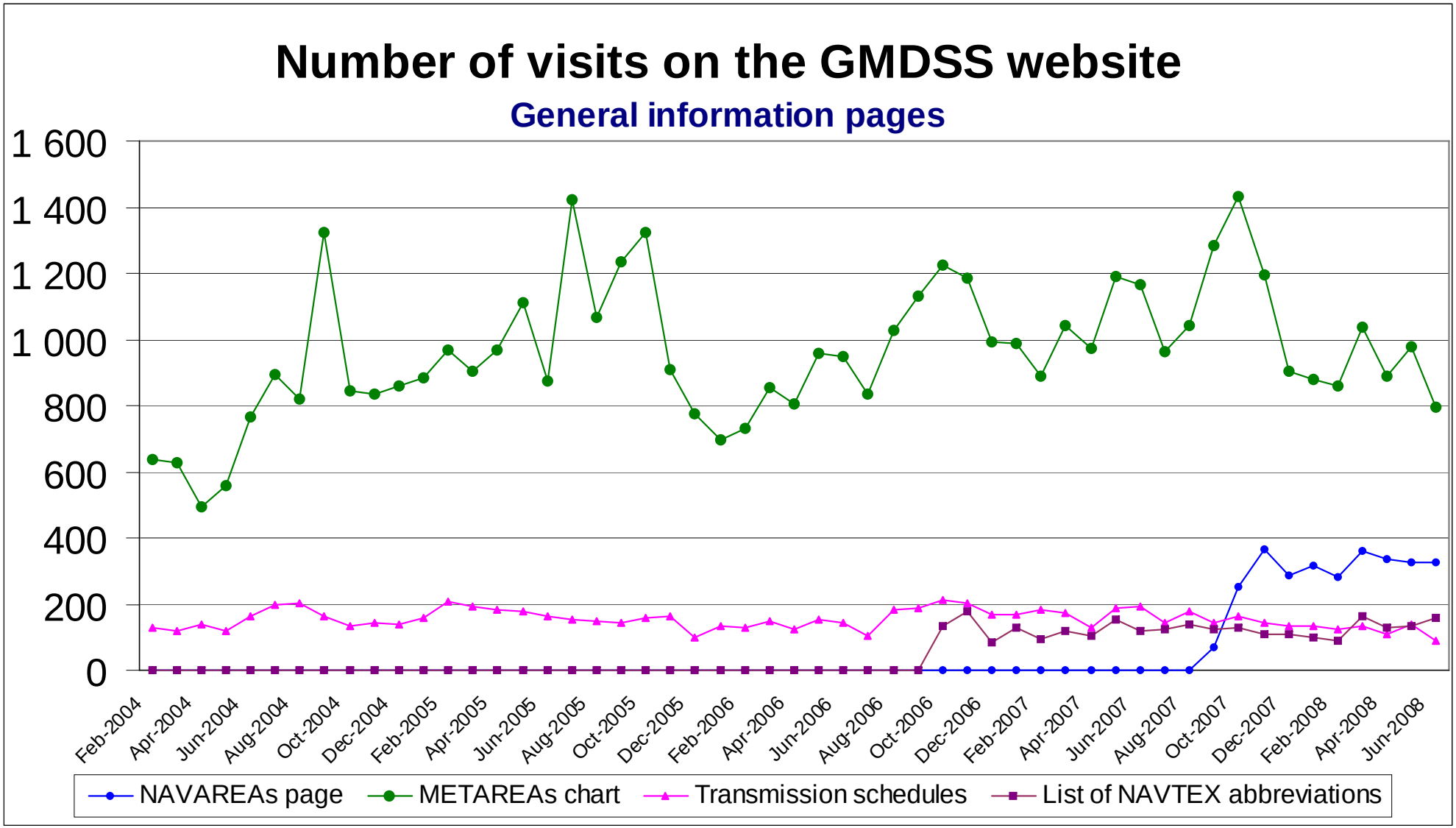
STATISTICS

Year 2008 – E-Mail requests (packages)

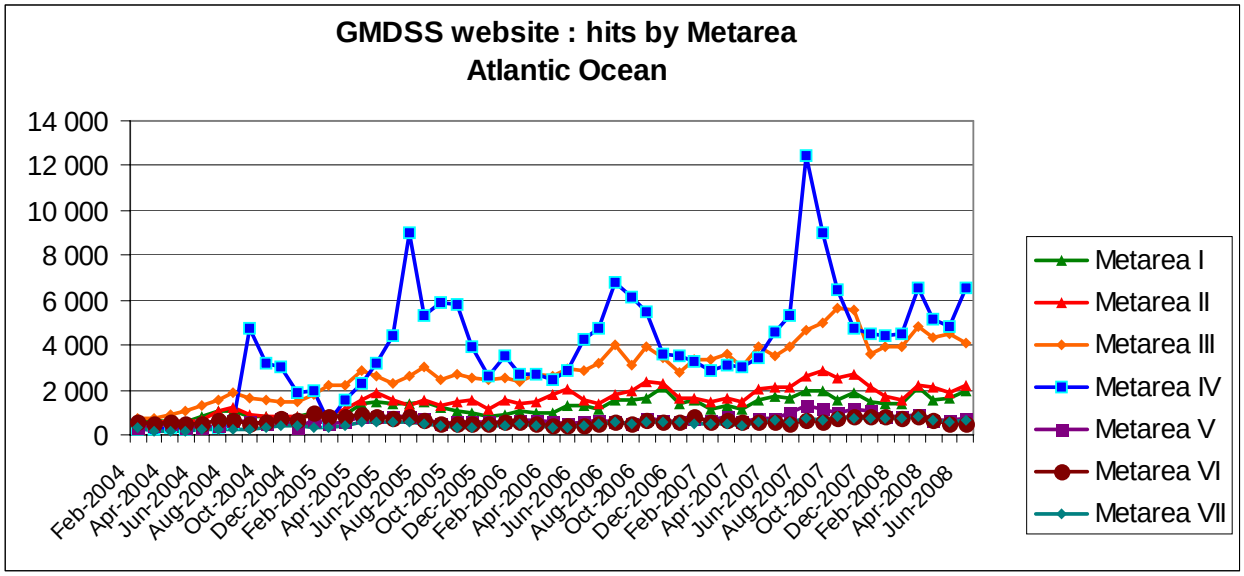
	Jan-2008	Feb-2008	Mar-2008	Apr-2008	May-2008	Jun-2008	Jul-2008	Aug-2008	Sept-2008	Oct-2008	Nov-2008	Dec-2008
GMDSS_METAREA1_INMARSAT	447	425	326	448	561	541						
GMDSS_METAREA1_OFFSHORE	453	426	320	443	577	563						
GMDSS_METAREA2_INMARSAT	470	438	325	478	576	557						
GMDSS_METAREA3-E_INMARSAT	481	466	360	497	669	635						
GMDSS_METAREA3-W_INMARSAT	455	432	329	458	587	563						
GMDSS_METAREA4_INMARSAT	469	429	333	468	582	566						
GMDSS_METAREA5_INMARSAT	436	400	292	180	560	539						
GMDSS_METAREA6_N-60_INMARSAT	443	426	321	444	554	538						
GMDSS_METAREA6_S-60_INMARSAT	14	15	14	0	0	0						
GMDSS_METAREA7_INMARSAT	620	545	439	558	678	662						
GMDSS_METAREA8-N_INMARSAT	449	419	315	440	538	531						
GMDSS_METAREA8-S_INMARSAT	620	544	440	558	678	666						
GMDSS_METAREA9_INMARSAT	370	349	208	283	485	467						
GMDSS_METAREA10-NE_INMARSAT	446	424	317	439	558	538						
GMDSS_METAREA10-N_INMARSAT	447	424	317	439	557	538						
GMDSS_METAREA10-SE_INMARSAT	445	424	317	439	554	538						
GMDSS_METAREA10-W_INMARSAT	449	424	317	439	554	538						
GMDSS_METAREA11-IOR_INMARSAT	456	424	317	439	554	538						
GMDSS_METAREA11-POR_INMARSAT	453	426	319	439	557	541						
GMDSS_METAREA11-S-EQUATOR_INMARSAT	450	424	321	439	556	538						
GMDSS_METAREA12_INMARSAT	447	425	322	439	554	538						
GMDSS_METAREA13_INMARSAT	0	0	0	0	0	0						
GMDSS_METAREA14-SOUTH_INMARSAT	449	424	323	440	555	540						
GMDSS_METAREA14-TROPICS_INMARSAT	448	424	320	442	556	540						
GMDSS_METAREA15_INMARSAT	446	428	323	440	554	499						
GMDSS_METAREA16_INMARSAT	447	425	323	441	554	540						
GMDSS_ARCTIC_OCEAN	0	0	0	0	0	0						
Total of requests	11110	10410	7858	10530	13708	13254						

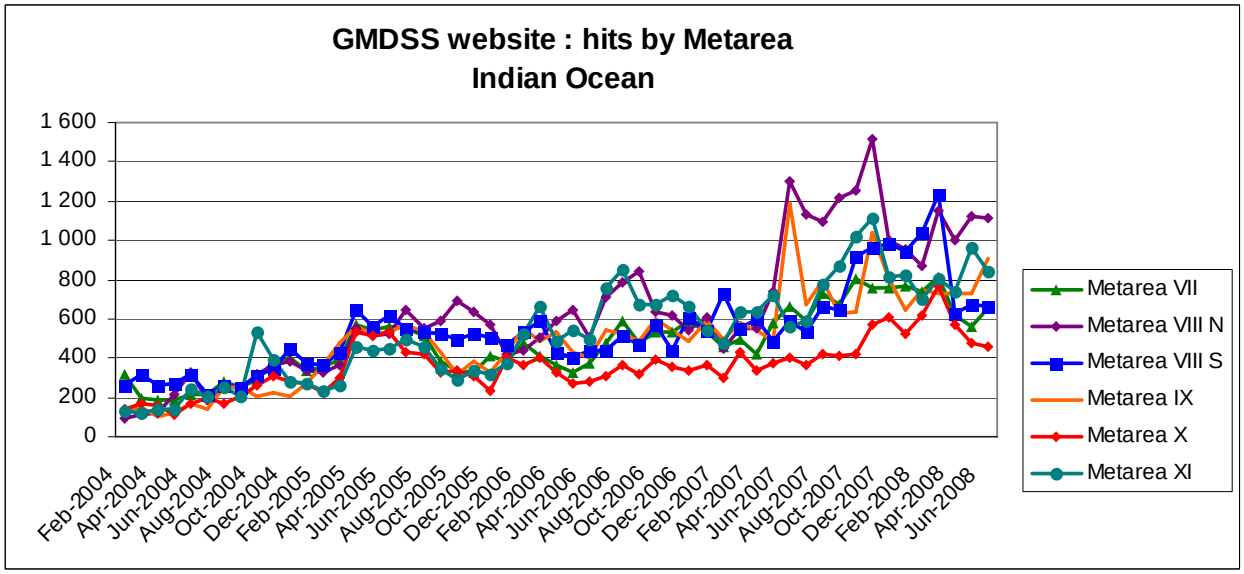
STATISTICS – GMDSS WEB SITE HITS

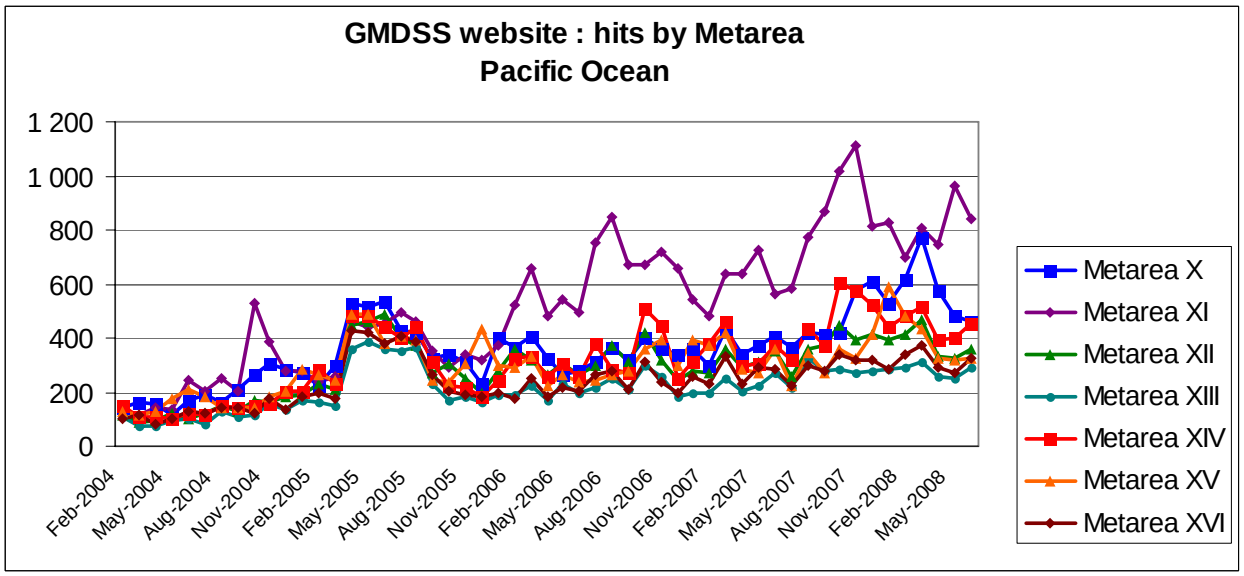



Number of visits on the GMDSS website
General information pages
1 600
1 400
1 200
1 000
800
600
400
200
0
Feb-2004
Apr-2004
Jun-2004
Aug-2004
Oct-2004
Dec-2004
Feb-2005
Apr-2005
Jun-2005
Aug-2005
Oct-2005
Dec-2005
Feb-2006
Apr-2006
Jun-2006
Aug-2006
Oct-2006
Dec-2006
Feb-2007
Apr-2007
Jun-2007
Aug-2007
Oct-2007
Dec-2007
Feb-2008
Apr-2008
Jun-2008
NAVAREAs page
METAREAs chart
Transmission schedules
List of NAVTEX abbreviations

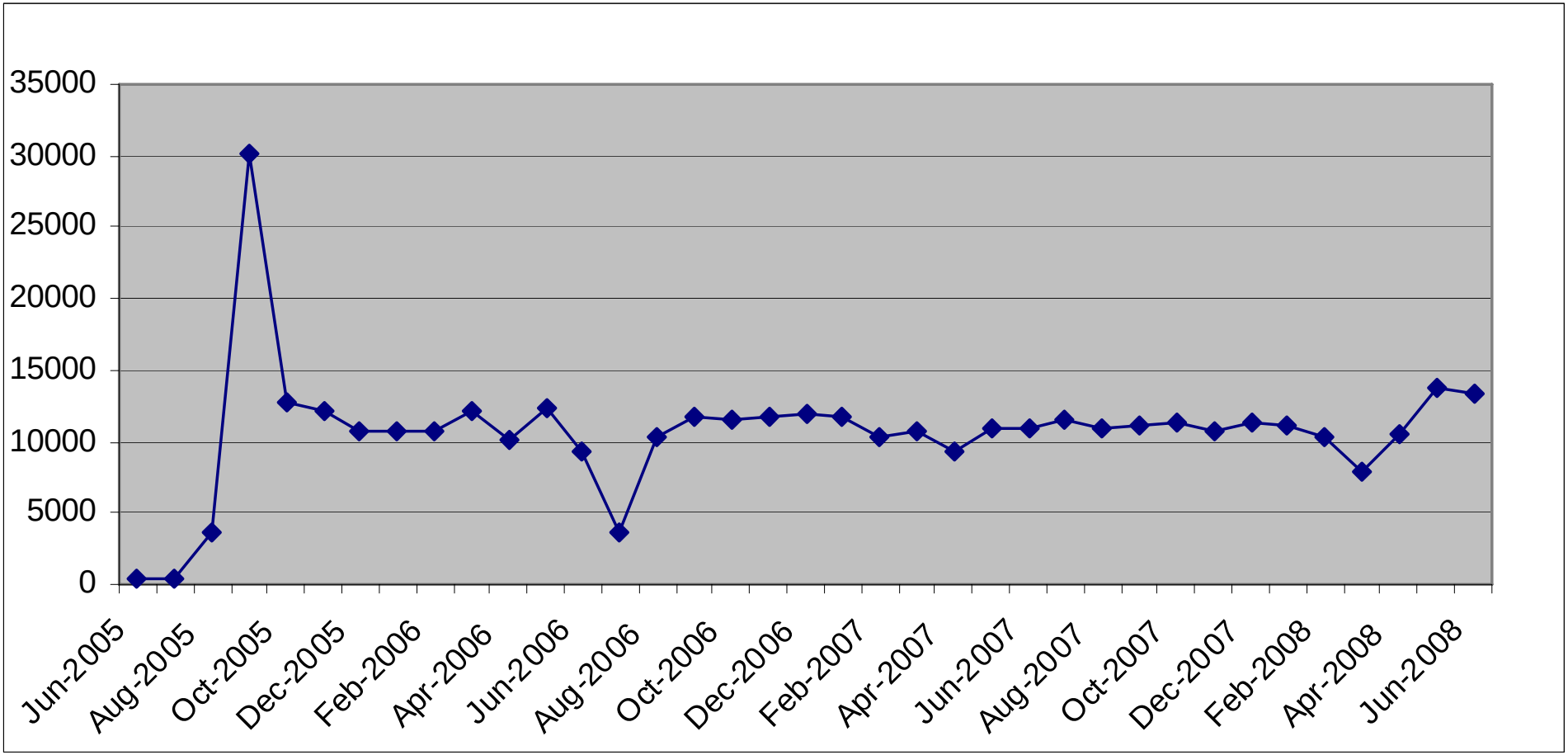
STATISTICS / GMDSS WEB SITE HITS







STATISTICS – E-Mail access (packages)



Appendix 2

WMO Information System

History of the WMO Information System

The communications needs of the WMO for data collection and information exchange have been met largely through the implementation and development of the Global Telecommunication System (GTS). Originally based on a telegraph network topology, telex formed the backbone of international sharing of WMO data and products. This system was built around the connectivity to countries and consisted of three world meteorological centres (Moscow, Washington and Melbourne) and a series of Regional Telecommunication Hubs (RTH) which connected members to the Main Telecommunication Network (MTN). This network developed a data management framework that included detailed catalogues of metadata for observation stations and distribution catalogues that detailed where information originated and which member states subscribed to which information. These catalogues allowed messages containing only the dynamic data to be sent thereby increasing the efficiency and speed of the system.

Extensive international collaboration allowed the development of message standards and codes which further improved the GTS functionality and efficiency. In particular, special coding known as Traditional Alphanumeric Codes (TAC) were developed to allow observations and messages to be passed around the network efficiently. Originally telex based, the GTS evolved using a series of private international links to connect the RTH. The GTS was further enhanced by the inclusion of facsimile graphics technology for the sharing of scanned and image based products. The migration to ITU-T X25[2] communications protocol then allowed the GTS to handle binary data as well as TAC and facsimile. The exchange of binary information, as well as text, enabled codes to be developed utilising binary compression based on tables which allowed even more information to be exchanged for a given bandwidth.

The communications pipes connecting the RTH also evolved with the rapidly advancing technology including in more recent years Frame Relay[3], Asynchronous Transfer Mode[4] (ATM), Multi-Protocol Label Switching[5] (MPLS) and other advanced Managed Data Communication Networks. Aside from being cheaper to run, these networks allowed the utilisation of Internet Protocol thus enabling even more sophisticated and commercial off the shelf message switching capabilities. This in turn allowed the use of different networking technologies including, when necessary, the internet being used to supplement the GTS private links. Despite the rapid improvements of the GTS as it adapts and makes use of new technologies and sophisticated data management practices, it is still fundamentally a private communications system connecting WMO's National Meteorological and Hydrological Services (NMHS) on a wide area network, as depicted in figure 1.

2 http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/x25.htm
3 http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/frame.htm
4 http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/atm.htm
5 http://en.wikipedia.org/wiki/Multiprotocol_Label_Switching

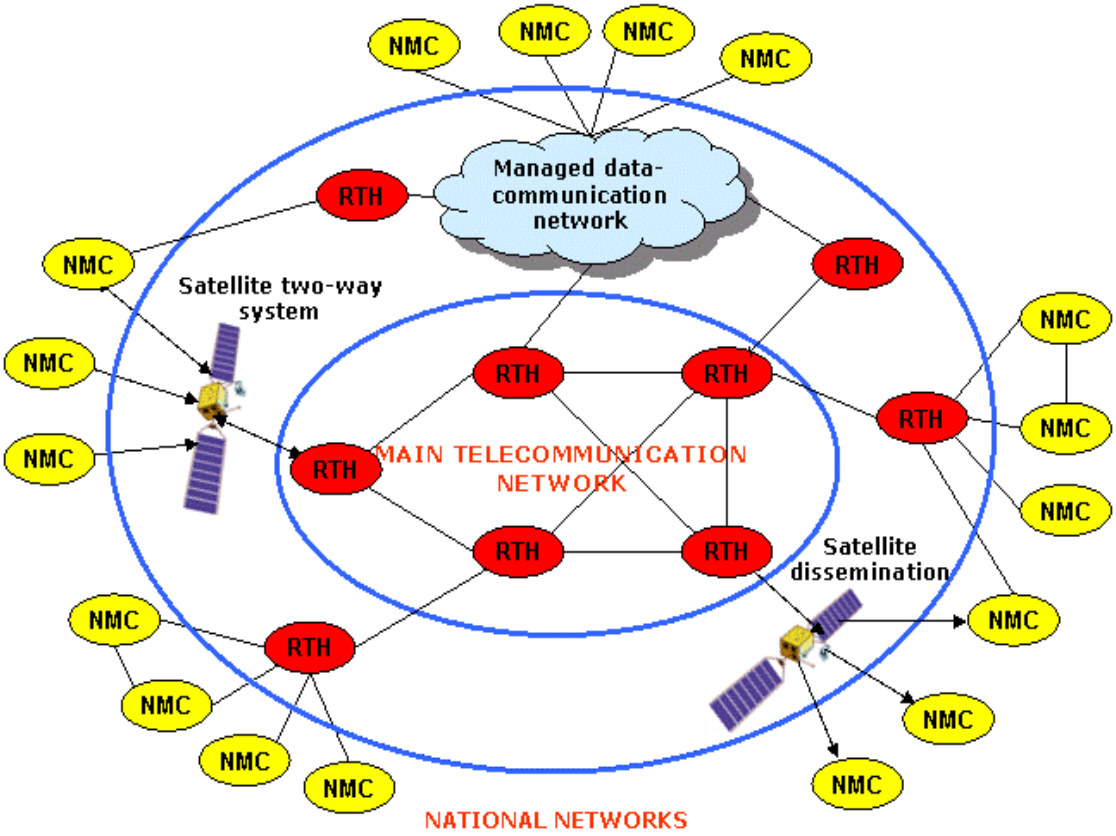


Figure 1 The Global Telecommunication Network.

One drawback of maintaining a closed wide area network such as the GTS is that its capacity to handle information volumes is limited by the cost of the connectivity between the centres. In contrast, the internet has been rapidly expanding and, since the early 1990's driven by the growing information volumes associated with improving Numerical Weather Prediction (NWP) models and the rapidly increasing data volumes associated with remote sensing from new improved satellite systems, many NMHS established bilateral links for exchanging information. Being outside of the GTS data management framework, NMHSs' information management systems had to cope with multiple sources of information, while the GTS catalogues no longer represented all information that was available to WMO members. In addition, considerable duplication was apparent as information circulated on the GTS was also being distributed via bilateral links and in more recent years, the internet. Eventually, it was recognised that the cost savings from utilising the internet and bilateral links were quickly being lost by inefficiencies and duplication.

It was in this environment that the WMO information system model (WIS) was developed (CBS 1992). WIS incorporates the connectivity of the GTS, the flexibility of new systems such as the internet, whilst ensuring that the data management framework encompassed all WMO information. This new model simply moves the focus from the connectivity through the GTS and Internet to the data and products and their data management. (i.e. Shift in perspective from communications centric to data centric).

In 2003, the World Meteorological Congress (Cg-XIV) formally adopted the concept of WIS, stating that an overarching approach for solving the data management problems for all WMO and related international programmes was required.

As the single coordinated global infrastructure, the WMO Information System (WIS):

- Will be used for the collection and sharing of information for all WMO and related international programmes;
- Will provide a flexible and extensible structure that will allow the participating centres to enhance their capabilities as their national and international responsibilities grow;
- Implementation will build upon the most successful components of existing WMO information systems in an evolutionary process;
- Development will pay special attention to a smooth and coordinated transition;
- Core communication network will be based on communication links used within the World Weather Watch (WWW) for the high priority real-time data;
- Will utilise international industry standards for protocols, hardware and software.

The fundamental design of WIS was developed by an Inter-Commission Task Team (ITT-WIS) and several key pilot projects were initiated to test and develop some of the principles of WIS. Following recognition of the need for WIS to be implemented, and due to the overarching nature of WIS across all programs, Congress set up an Inter Commission Coordination Group on WIS which met for the first time in January 2005. Technical Commissions were instructed to provide resources and support for the development of WIS. Congress XV reinforced the need for WIS and for accelerated implementation and emphasised a requirement for WIS to work closely with and facilitate the communications and information management needs of a WMO Integrated Global Observing System (WIGOS).

Objectives

The mission of the World Meteorological Organization (WMO) is to provide world leadership in expertise and international cooperation in weather, climate, hydrology and water resources, and related environmental issues, thereby contributing to the safety and well-being of people throughout the world and to the societal and economic benefit of all nations.

This mission aims to achieve the following five outcomes:

1. Improved protection of life, livelihoods and property;
2. Improved health and well-being of citizens;
3. Increased safety on land, at sea and in the air;
4. Sustained economic growth in both developed and developing countries; and
5. Protection of other natural resources and improved environmental quality.

In order to achieve these outcomes, WMO's strategic plan has three top level objectives:

1. To produce more accurate, timely and reliable forecasts and warnings of weather, climate, water, and related environmental elements;
2. To improve the delivery of weather, climate, water, and related environmental information and services to the public, governments and other users;
3. To provide scientific and technical expertise and advice in support of policy and decision-making and implementation of the agreed international development goals and multilateral agreements.

To address these objectives, WMO has five strategic thrusts:

1. Science and technology development and implementation to monitor and observe the environment, to forecast and warn of significant weather, water and climate conditions, and to understand the Earth system;
2. Service delivery to ensure that society can realize the full benefit of the weather, water and climate information and services that WMO Members produce;
3. Capacity-building to sustain and improve the ability of all Members, with a particular focus on developing and least developed countries, to provide essential environmental services to their societies;
4. Partnership to work with international agencies, other organizations, academia, the media and the private sector to improve the range and quality of critical environmental information and services;
5. Efficient management and good governance to ensure environmental information and services are affordable.

In order to be able to measure the success of the strategic plan, eleven expected results have been identified. Five of these expect results are within the Science and Technology strategic thrust and include the 'Development and implementation of WIS' as Expected Result 5. Furthermore, the Expected Result 4 the 'Integration of WMO observing systems' has WIS as a major component for the integrated collection and sharing of observations.

Underlying the Strategic Plan 2008-2011 and beyond is a fundamental need within meteorology, oceanography, hydrology and climate for understanding past and present states of the environment. This requires the collection and open sharing of information. In the case of the production of real time warning services this exchange of information needs to be rapid and reliable. Hence, the high profile of WIS within the expected results 4 and 5. WIS will also be a main component of GEOSS for the weather, water, climate and natural disaster Societal Benefit Areas (SBA) and provide potential connectivity for WMO members to all other societal benefit areas of GEO. WIS is a key enabler of WMO's three top level objectives and is a key deliverable of the Science and Technology strategic thrust.

The WIS Vision

Data management lies at the heart of the WIS and is supported by connectivity through a wide area network, the internet and broadcast systems. Much like modern library systems, WIS is designed around a series of catalogues that contain metadata describing what information and information access services exist within the WMO communities, what they contain, where they are and how to retrieve the required information. Synchronised copies of these catalogues, along with at least 24 hours of the entire set of WMO data and products available for routine global exchange, will reside in a series of Global Information System Centres (GISC). As well as hosting the catalogues and information, the GISCs will collect and disseminate information from and to Data Collection or Production Centres (DCPC) and National Centres (NC) within its area of responsibility and distribute that information onto the other GISCs. Thus the GISCs form the central hub within the WIS vision. See figure 2 below.

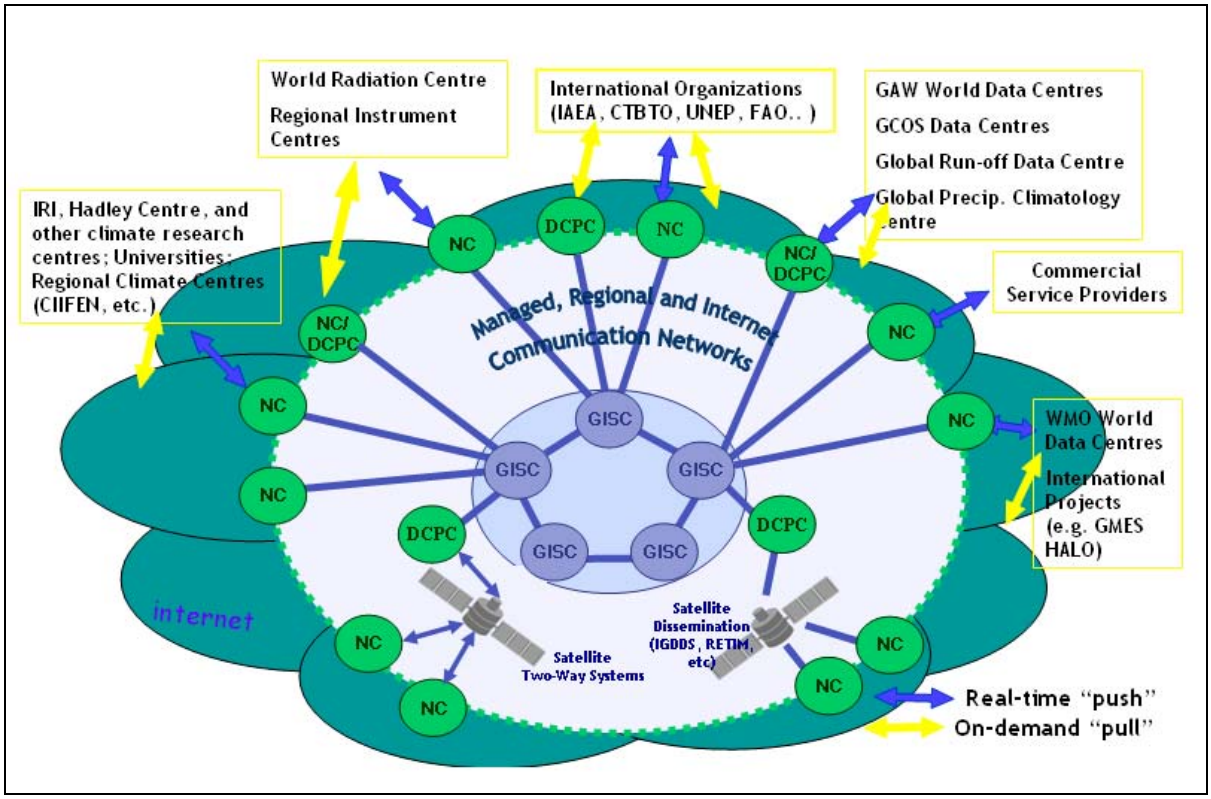


Figure 2 WIS Vision

As well as supporting the subscription and push mechanisms under WIS, the GISC will also provide pull mechanisms so users can make ad hoc requests for data. This will be facilitated by information Discovery, Access and Retrieval (DAR) capabilities at each GISC. In the long term, such facilities will allow internal and external users to be able to tailor their requests and subscriptions based on combinations of information held at the GISC.

Within the next layer encircling the hub are the NCs and DCPCs. The NCs depicted in the above diagram represent existing WMO members' National Meteorological and Hydrological Services (NMHS) as well as other specialist centres that members may wish to have connected directly to WIS. Thus, several NCs in a country are possible. NCs feed information collected/generated in the country to a GISC or DCPC. They also serve as portal for national users.

DCPC's collect, disseminate, add value to and archive regional or programme specific data and products as well as producing regional or specialized information. They also provide related data and products for international exchange. DCPCs may stand alone utilising their own data collection process or, when necessary, can act as the connection point between NCs and GISCs, relaying/receiving information to/from NCs in their region. DCPCs, like GISCs, support information 'Discovery', 'Push' and 'Pull' mechanisms and maintain metadata catalogues of their holdings and services. These catalogues will be accessible to the GISC catalogues harvesting processes. Access to DCPC or NC specific information and to global exchange information up to and beyond 24 hours old will, subject to data policies, be available through DCPCs and NCs.

Many of the WIS components will be NMHS already connected to the GTS which will act as NCs and DCPCs or in some cases NC, DCPC and GISC, however, some DCPC and NC will be new entries into WIS and will include many of the World Data Centres and/or Specialized Centres depicted in the figure 2.

If data management is at the heart of WIS, it is the communication links that form the vascular system enabling the routine collection and dissemination of time-critical and operation-critical data and products. These and the timely delivery of all other data and products are the life blood of WMO activities. The communications links of WIS will be the GTS Improved Main Telecommunication Network (IMTN) as well as other technologies such as the internet and satellite broadcast systems. To this end, the ongoing improvements of the IMTN in conjunction with the connectivity and information distribution systems under the satellite program Integrated Global Data Distribution Systems (IGDDS) are leading to the WIS implementation.

WIS will start to be in existence with the bringing online of the first GISC metadata catalogues. Metadata will be created by information and service owners or originators and will be based on the WMO profile of ISO19115. This profile is being adapted by the WIS Expert Team on Metadata Implementation. WMO will also work with ISO to ensure the international standards evolve to meet WMO members' needs. Metadata entry tools will be adapted to the WMO profile and made available to participants.

The new information discovery, access and retrieval (DAR) components of WIS are dependant on the existence of the GISC catalogues, and can be made accessible to the public opening up access to WIS information to the world. As with access to books and articles in a library, the level to which WIS is opened will be a matter of policy, not technology. Enabling WMO Members to create metadata and to take advantage of these new capabilities will be a major component of the implementation of WIS. This capacity building and training will be based on a 'Guideline on WIS' and other guidance material created by the implementation team and will take place through coordinated training and capacity building programs and be aided by pilot projects within special interest groups.

Scope

The following table provides the outline of the scope of WIS, noting also marginal issues that could be in scope but at this stage are not.

Table 1 Scope

	In Scope
1	Routine collection and automated dissemination of time-critical and operation-critical information ('push').
2	Timely delivery service for information (appropriate to requirements) including delayed mode data.
3	Information subscription services (subscribe to 'push') by authorised users.
4	Ad-hoc requests for information ('pull') by authorised users.
5	Integration and management of duplicated files or messages (information entity) including version control (i.e. corrections and duplicates) The blending of real time and delayed mode information is handled in other processes of information custodians.
6	Integration of data collection and distribution systems either in place or under development within the WMO programmes including the satellite programme's Integrated Global Satellite Data Distribution System (IGDDS) and the use of the internet via all programmes.
7	Access to WMO registries and catalogues, including a portal for metadata discovery (Information Discovery)
8	Discovery, Access and Retrieval Service (DAR) to information serving directly from GISCs of current content (as distinct from only providing metadata)

9	Interoperability with other user communities including earth sciences and the various GEO societal benefit areas (GEOSS).
10	Assurance processes for ensuring adherence to data and information usage policy.
11	Identification and authorisation processes
12	Network security
13	Information security including exchange over open and closed networks. i.e. Ensure the quality of the information is maintained while in the transit and communications components. e.g. quality of service according to GTS manual
14	Merit assessment of new and existing communication technologies (i.e. solution should be flexible and scalable to allow for taking advantage of new technologies).
15	Information collection and distribution systems within Member states. Although internal collection and distribution practices within countries are totally under the control of the Member state, these are a part of WIS. Also, WIS should be able to register national systems should members desire international access to them.
16	Quality and performance monitoring of collection and distribution services and systems
17	Metadata profiles for describing information and information services.
18	Management of metadata & effectiveness of metadata, system handling of metadata
	Not in scope at this time.
1	Who decides what information passes on WIS. This comes back to the information provider.
2	User registration and shared user registers, virtual organisation issues.
3	Information visualisation and integration. This is a value added service available through NC and DCPC. Available and future API may enable users to achieve this function.
4	Information subsection and creation of new products. Too hard at present and will come in later development stages
5	Quality control and assurance processes for data and products. These are being managed within other stages in the information creation and collection at present, especially within the NC.

Table 1 Scope

Timelines and Key Milestones

As described previously, WIS has been under development for over ten years. In 2006, CBS noted the need for a central project manager if WIS were to be successfully implemented. The following timelines and discussion are based from the commencement of the project manager in March 2007 and are presented in a Gantt chart in figure 3 below. In the light of Congress's requirements, the project can be viewed as six main milestone roles including consolidation of WIS plans, establishment of the metadata, development of regulatory documents, two implementation parts, and a coordination role with other major projects.

This project and implementation plan is the first component, and will be reviewed by ICG/WIS in September 2007. Feedback from this meeting will be included prior to being presented to the first EC WG WIGOS-WIS later in 2007, then finalised for CBS and the EC in 2008. The next key deliverable will be the WMO metadata profile of ISO19115. Version 1 has been approved, but has still to be documented in full. An appropriate metadata entry tool and Version 2 of the profile are under development. The development of the regulatory documents will aim for a revision of the Technical Regulations related to information management (WMO No. 49 and 9) and the associated manuals (e.g. Manual on GTS). The governance documents for GISC and DCPC have been approved. Other deliverables will be the guidelines for metadata entry and management, and a guideline on WIS, which will lead to a Manual on WIS. The development of regulatory documents will be closely aligned with WIGOS.

Congress has required WIS to be implemented in two parallel parts: Part A being the continued evolution of the GTS. A key activity in this role is being undertaken within the Improved Main Telecommunication Network project. It is also necessary to manage Part A with no interruption to GTS functionality. Implementation Part B is the new functionality of WIS, and includes the above activities as well as the implementation of GISCs and DCPCs. The connectivity between NMHS and their becoming NCs under WIS is also important. Each of these areas will involve detailed capacity building and training programs.

The last component of the activity is coordination with related major projects: especially IGDDS which is a core component of WIS, WIGOS which is dependant on WIS, and GEOSS in which WIS will be an exemplar operational system.

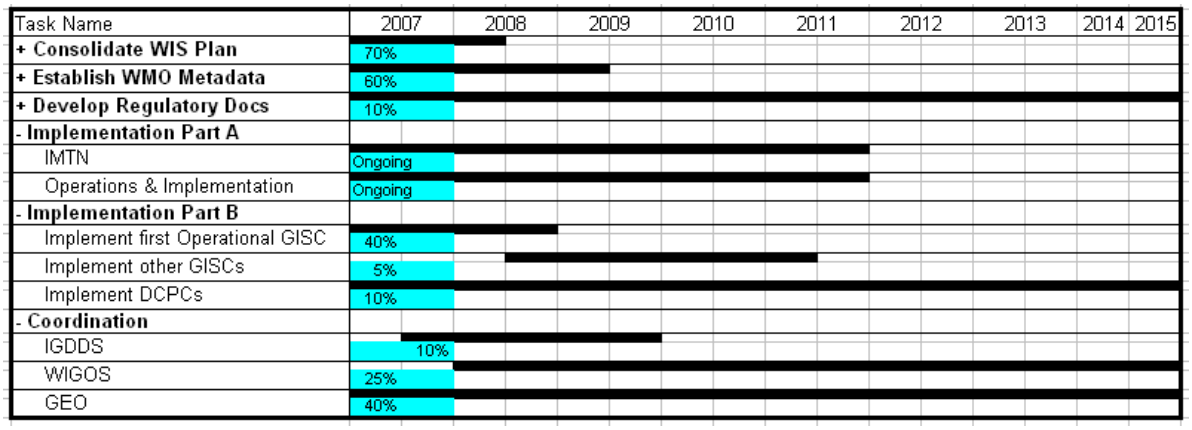


Figure 3 Milestone Activities

Progress and Pilot Projects

Professor Geerd-Rüdiger Hoffman describes in 'An Implementation Timetable for the WMO Information System' (Hoffman, 2005) that progress within WIS has been largely through several pilot projects exploring data management issues, new technologies and systems for WIS. These projects and activities, some of which have become operational, are described in appendix A. In order to understand the relationships and contributions of these projects, it is necessary to understand the jigsaw puzzle of WIS, which can be viewed from two key perspectives, namely data management and connectivity. As noted in figure 2, WIS also has three key component centres that are the GISC, DCPC and NC.

Data management is the heart of WIS and impacts on the efficiency and value of the systems, as well as the discovery and access to information and services across WMO. A core data management requirement is to have a standard way of describing data, products and services so that systems can work together to manage this information and so that users can search for, subscribe to, or request ad hoc access to these information and services. This requirement is being addressed by the development of a WMO Core Metadata Profile, based on ISO 19115 and the accompanying ISO 191xx series. Exercising and testing the data management components is a key deliverable of the Region VI VGISC project which addresses many issues from all three of the GISC, DCPC and NC roles. In addition to the data descriptions, there is the need to explore and test data models for making various data models interoperable. The VGISC project is addressing these issues along with virtual organisation frameworks, as is the UNIDART pilot project.

Also involved in the data management development, but with a focus on the DCPC role are NCAR DCPC, TIGGE, GAWSYS, WAMIS, CLIWARE and the E2EDM. Each pilot project explores components of the DCPC from different WMO Programmes' perspectives.

Pilot projects addressing the NC role in WIS include the Region VI VGISC, CLIWARE and, presently under development, the Region I WIS Team. The Region I team also hopes to address the other components of WIS and is a key pilot in outreach and ensuring WIS is connected to and owned by all WMO Member countries.

In conjunction with data management at the heart of WIS, is the connectivity that enables the systems to work together. This has been driven by the continued development of the GTS Main Telecommunication Network under IMTN, but has to include alternative communication mechanisms including the Internet. The VPN pilot project addresses many of these issues.

In addition to the pilot projects under way, and following on from EC-LVIII (Geneva, June 2006) a full time WIS project manager was seconded for twelve months in March 2007 for coordinating the implementation of the WIS, in close cooperation with the ICG/WIS. This plan is one outcome from having a project manager available. Furthermore, a WIS Trust Fund was created in December 2006 and at the time of writing has contributions totalling around CHF 200,000 (Switzerland, Japan, UK, Germany, and Australia).

Other achievements include the endorsement by Congress XV of the governance processes for the addition of GISCs and DCPCs into WIS.

Project Environment and Considerations

WIS is built on Members' Systems

Information systems across WMO such as the GTS are developed, operated and maintained by WMO members. While the Secretariat provides support in terms of coordination and facilitation between Members, the bulk of funding and resources required for the development and implementation of WIS is from the WMO members.

National and regional initiatives based on non-WMO projects

As is evident in the WIS pilot projects of UNIDART, the Region VI VGISC and the NCAR DCPC, WIS is being built by members on members systems and has some dependency on regional projects or activities that may be initiated outside of the WMO community. Fortunately regional projects and developments have taken into account modern day best practices which include utilising international standards and designing around scalable, services oriented architecture rather than building stand alone solutions. Thus, Members are able to incorporate WIS requirements into their national and regional activities. The dependencies on regional projects is particularly so in Region VI where the European Union has many overlapping activities that impact on WIS. This includes the SIMDAT project that is a key contributor to the development of the Region VI VGISC. Similarly, as part of Region IV, the USA has several initiatives such as the Community Data Portal and the Earth System Grid that can be utilised to create the required capabilities of the NCAR DCPC. However, such dependencies are normal modis operandi for WMO and are proving to be a major strength rather than inhibitor.

Global Spatial Data Infrastructure (GSDI) and regional components

Many WMO members participate in spatial data infrastructure initiatives that are building on the ISO 191xx series of standards relating to spatial data and metadata. As the WMO metadata is a profile of this series, the work of the Inter-programme Expert Team on Metadata Implementation (IPET-MI) is ensuring Member countries' work towards WIS is synonymous with their national initiatives. Major programs the IPET-MI are aware of and working with include INSPIRE (Europe), NSDI (USA) and ANZLIC (Australia and New Zealand).

Closely related to the GSDI is the Open Geospatial Consortium (OGC) initiative to standardise the way spatial data is shared across systems. Although not a standards setting organisation like ISO, OGC has developed a series of standard recommendations which have been adapted by ISO. These include the Geographic Mark-up Language (GML), Web Mapping Services (WMS), Web Feature Services (WFS) and Web Coverage Services (WCS). Many of WMO's members are utilising these standards to break down barriers to interoperability and the sharing of spatial information from different data sources. This technology is being used as a part of the IPCCC data sharing practices at the British Atmospheric Data Centre, and in various ocean data centres. An example of this technology is shown at the Australian national bushfire monitoring service at http://sentinel2.ga.gov.au/acres/sentinel/ and on the European Geo-Portal http://eu-geoportal.jrc.it/. One of the goals of WIS is to enable all WMO members to be able to serve their data through such national initiatives utilising the same infrastructure as for their international collaboration.

Other project initiatives impacting on WIS

The concept of a Grid[6] joining together computing and data sources has been growing rapidly in the last few years driven by researchers wanting access to the wealth of high quality data from measurements and computer simulations. Initiatives such as the Earth System Grid (ESG) in the USA, the Solid Earth and Environment Grid (SeeGRID) in Australia, SIMDAT in Europe and the Australia-UK collaboration for the Exploitation of Grid and Geospatial Standards (AUKEGGS) are just a few initiatives that, like WIS are attempting to improve the sharing of resources using international standards and developing best practice. Although WIS is not necessarily utilising Grid computing to the same extent as many of these projects, the ability to bring together different datasets, manipulate the data and then visualise the data is something that could be in scope for WIS but is not at this time. The Earth System Grid and associated activity could become a key aspect to delivering these components should the scope be extended.

As well as Grid computing, there are key initiatives in countries or regions aiming to facilitate the provision and use of operational information for the global monitoring of the environment. One such project, which is a joint initiative of the European Commission and European Space Agency, is called the 'Global Monitoring for Environment and Security' (GMES). Within GMES there are three themes that relate closely to WMO's activity in Europe. These are:

- MERSEA - the integrated project of the GMES Ocean theme;
- GEOLAND - the integrated project of the GMES Land Cover & Vegetation theme;

6 "A computational grid is a hardware and software infrastructure that provides dependable, consistent, pervasive, and inexpensive access to high-end computational capabilities."
This definition was coined in a 1998 article by Ian Foster and Carl Kesselman, according to a 2002 "GridToday" article at http://www.gridtoday.com/02/0722/100136.html

- GEMS - the integrated project of the GMES Atmosphere theme.

Under the GMES project they have Specific Support Actions (SSA). The SSA for the above three themes is HALO which stands for 'Harmonised coordination of Atmosphere, Land and Ocean integrated projects'. Like SIMDAT, many of these projects have funding which may be utilised by member countries to develop their components of WIS where such components lead towards these projects objectives. The use of international standards and design principles increase the ability of members to be able to create synergy with these local and regional opportunities.

Major Outcomes of the Sixty Session of the WMO Executive Council on WIS (WMO Expected Result 5)

WIS Implementation Plan, including support to WIGOS

The Council agreed that considerable progress had occurred in the development and implementation of WIS when taking into consideration the many activities and demanding time frame approved by Cg-XV. In particular, the Council was encouraged with the major steps taken towards the implementation of the first operational Global Information System Centre (GISC) by early 2009. It expressed its deep appreciation to the group of Europe's largest centres, with the participation of ECMWF and EUMETSAT, for the joint development effort and investment towards the procurement and implementation of GISC/DCPC hardware and software facilities. It also expressed great appreciation for the development efforts made by other Members through participation in national and/or international pilot projects. It fully agreed that all these experiences should be shared among other Members planning GISCs and/or DCPCs. It urged Members to focus special efforts and resources on the further development of the following key projects:

(a) Implementation of other operational GISCs: 2009–2011;

(b) Implementation of DCPCs, i.e. WIS interfaces at centres with agreed international responsibilities within WMO Programmes for collecting and/or generating related data and products: 2008-2011.

The Council also reaffirmed the crucial importance for the success of the WIS project through effective communication and outreach efforts to ensure NMHSs understanding of WIS and its benefits to all potential user groups and entities.

The Council agreed that considerable progress had been made in the development of the comprehensive WIS Project Plan, including an Implementation Plan, as supervised by the ICG-WIS with strengthened support from the Secretariat and coordination with the EC Working Group on WIGOS-WIS. The Council urged NMHSs and technical commissions to provide early interaction and contribution to the development and consolidation of the WIS Project Plan and WIS Implementation Plan.

The Council emphasized that, despite the considerable efforts made by a few NMHSs and organizations in the development of WIS, additional financial and human resources were needed for ensuring the proper development of WIS pilot projects and prototypes. It urged that further efforts be made in promoting the value and benefits that are expected from the WIS, in order to better inform all potential users as well as NMHSs and to trigger Members to begin implementation. The Council invited Members and organizations to contribute to the WIS Trust Fund and expressed its satisfaction and appreciation to those that had already provided

donations in kind and/or in funds, which were instrumental in boosting the support to WIS development. In this regard, the Council expressed deep appreciation to Australia and the USA for the contributed staff resources. In noting the major contributions made by seconded staff resources, even for a limited duration, for the WMO as a whole as well as for the Member itself in planning its own WIS-related implementation, the Council encouraged Members to provide suitable staff to the Secretariat through secondments.

The Council stressed that WIGOS was crucially dependant upon effective WIS support and services, e.g. the specialized data collection means, the generation, collection, management and handling of related metadata and the distribution of and access to the data. It therefore requested the ICG-WIS, in collaboration with the EC WG on WIGOS-WIS and in coordination with relevant technical commissions, to ensure that the WIS elements and components required respectively for the implementation of the five WIGOS Pilot projects were developed and coordinated to meet the respective projects' aims and requirements.

Regulatory and guidance documentation

The Council reaffirmed the need for appropriate regulatory and guidance documentation on the WIS, including organization and recommended practices and procedures (i.e. a Manual on WIS). It agreed that a significant step forward had been made in the development of WIS technical documentation, i.e. the WIS GISC and DCPC interoperability Technical Specifications, and soon the WIS Functional Architecture, with strengthened support from the Secretariat, and asked CBS and the ICG-WIS to build upon these contributions towards regulatory documentation, as a matter of priority and based on the experience gained through early WIS implementation.

Requirements on WIS

The Council supported the ICG-WIS' view that significant progress had been made in WIS requirements from WMO Programmes, as reviewed in the 'Report on the WIS Rolling Review of Requirements', but that they were still not in a form to allow accurate sizing of WIS. It urged technical commissions to actively pursue their contributions to the refinement of WIS Rolling Review of Requirements to ensure that their programme(s) requirements on WIS, at global and regional levels, are taken into account.

Involvements of Technical Commissions (TCs), Regional Associations (RAs) and NMHSs (including Developing Countries, and the Less Developed Countries)

The Council stressed that the support and involvement of regional associations and technical commissions in the WIS development was a crucial factor for ensuring a successful implementation and a shared ownership of the system. The Council urged Members to pursue and strengthen the proactive promotion of the WIS in these bodies and requested them and the ICG-WIS to attach greater importance to their participation in WIS development and participation. It reaffirmed the need for building capacity in developing countries to enable them to participate in WIS, and the importance of involving developing countries' experts in the development work of WIS to take into account the realistic capabilities, opportunities and constraints for the participation of the NMHSs of the developing countries in the WIS. Noting WIS pilot projects already implemented, and those that were identified for Region I in this respect, the Council stressed the high value of these pilot projects and urged Regional Associations, through the relevant working groups and with the support and coordination of the ICG-WIS, to develop and promote pilot projects that facilitate the introduction of WIS

functions and services. It invited NMHSs from developed countries to support and assist in these initiatives.

GISC and DCPC designation process

The Council stressed the crucial importance of an early identification of GISCs and DCPCs for the actual planning and implementation of WIS. It emphasized that Cg-XV endorsed in principle WIS procedures for the designation of GISCs and DCPCs and encouraged Members to adhere to them. It therefore urged technical commissions to establish a process for identifying their programmes' candidate DCPCs and to follow the WIS procedures for the designation of DCPCs, including early submission of candidate DCPCs to the ICG-WIS and CBS. The Council supported the early review, made by the ICG-WIS, of the development and planning of several potential GISCs and DCPCs, including the European VGISC (Virtual GISC) and associated DCPCs (EUMETSAT & ECMWF), RTHs Tokyo and Beijing, WMCs Moscow, Washington and Melbourne. It requested the ICG-WIS and CBS, with the support of the Secretariat, to take the necessary action with a view to the preliminary identification, including some designations if possible, of potential GISCs and DCPCs, at its sixty-first session (2009).

Coordination with related international projects (GEOSS, GMES/INSPIRE)

The Council re-emphasized the important role WMO has to play in contributing the essential WIS data exchange and data management services to the GEOSS, and it requested the ICG-WIS and CBS to actively support coordination activities ensuring that WIS be a core contribution and an interoperable information system within the GEOSS, as regards weather, water and climate data. The Council emphasized the mutual benefits made available by the interoperability arrangements between WIS and GEOSS, enabling WMO Members to have access to other GEO data and products.

With respect to the initiatives and projects being developed at national or multi-national level aiming at promoting and standardizing the presentation of and access to environment-related information, such as INSPIRE and GMES of the European Union, the Council noted the advantages of WIS being interoperable with these systems, and possibly be a contribution to them, to the benefit of the NMHSs and all parties concerned. It invited the NMHSs concerned, with the support and coordination as required of CBS, ICG-WIS, RAs and the Secretariat, to ensure the proper technical coordination with the relevant initiatives and projects.

Appendix 3

Chapter 1 - GMDSS SERVICES

METAREA V

Brazil
Forecast Areas - Zones de prévisions