WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO / IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)

SHIP OBSERVATIONS TEAM

FIFTH SESSION

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ITEM I-5.3

Original: ENGLISH

WMO INTEGRATED GLOBAL OBSERVING SYSTEMS (WIGOS)

(Submitted by the Secretariat)

Summary and purpose of the document

This document provides information on the WIGOS Pilot Project for JCOMM and the role that the SOT should play in this framework.

ACTION PROPOSED

The Team will review the information contained in this report, and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

Appendices: A. Status of the WIGOS Pilot Project for JCOMM
B. Overarching implementation plan for the ODP and WIGOS Pilot Project for the IODE and JCOMM
C. Pilot Project outline

References: A. Executive Council working Group on the WIGOS and the WIS, First Session, Geneva, Switzerland, 4-7 December 2007[1]
B. Ad hoc planning meeting for the JCOMM Pilot Project for WIGOS, Ostend, Belgium, 29 March 2008[2]
C. Meeting of the joint Steering Group for the IODE Ocean Data Portal (ODP) and the WIGOS Pilot Project for JCOMM, Geneva, Switzerland, 18-19 September 2008[3]
D. Executive Council working Group on the WIGOS and the WIS, Sub-Group on the WIGOS, First Session, Geneva, Switzerland, 10-13 November 2008[4]

[1] http://www.wmo.int/pages/prog/www/WIGOS-WIS/reports/ECWG-WIGOS-WIS-1_Geneva2007.pdf

[2] ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-MR/JCOMM-MR-57-WIGOS1.pdf

[3] ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-MR/JCOMM-MR-59-ODP-WIGOS2.pdf

[4] http://www.wmo.int/pages/prog/www/WIGOS-WIS/reports/SG-WIGOS-1_Geneva_2008.pdf

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

I-5.3 WMO Integrated Global Observing Systems (WIGOS)

I-5.3.1 The WMO Secretariat reported on the development of the WMO Integrated Global Observing Systems (WIGOS) and recalled that the WMO Fifteenth Congress (Cg-XV) agreed on establishing a comprehensive, coordinated, and sustainable system of observing systems with ensured access to its component observing systems' data and products through interoperable arrangements (Res. 30 – Cg-XV). Congress recommended to initiate five Pilot Projects, one of which being the integration of marine and other appropriate oceanographic observations into the Global Observing System (GOS). The Fifty-ninth WMO Executive Council (EC-LIX) (Geneva, Switzerland, 28-30 May 2007), established a Working Group on WIGOS and WIS (EC WG WIGOS-WIS) to follow the development of an over-arching WIGOS Development and Implementation Plan, and also to review the progress in the implementation of WIGOS / WIS "Pilot Projects".

I-5.3.2 The Team noted that WIGOS / WIS will address all WMO Programmes and Co-sponsored programmes requirements, ensure availability of required information, meet data quality standards, and facilitate access in real / quasi-real time as well as to archived information. JCOMM responded quite pro-actively to the challenge proposed by the Congress and Executive Council and drafted an ambitious WIGOS Pilot Project for JCOMM as an important contribution to the development of WIGOS / WIS respecting the ownership of partner organizations regarding their components of the observing system. The Pilot Project is expected to demonstrate the strong and growing level of collaboration and coordination between the WMO and IOC stakeholders both striving to enhance and sustain global ocean observing networks and provide free and unrestricted data access in line with their respective data policies.

I-5.3.3 The Pilot Project for the integration of marine and other appropriate observations into the GOS, also named WIGOS Pilot Project for JCOMM, has been working pro-actively since WMO Cg-XV for developing its Project and Implementation Plans. The deliverables of the WIGOS Pilot Project for JCOMM are: (i) to promote and document instrument best practices and related standards, (ii) build marine data systems that are interoperable with WIS and (ii) promote quality management and standards. The Pilot Project multi-disciplinary approach will permit the provision of consistent, coherent, timelier and better quality data and products, while at the same time minimizing duplication. Status of the Pilot Project is provided on Appendix A, and an outline in Appendix C.

I-5.3.4 The Team noted that the Sixtieth WMO Executive Council (EC-LX) urged Members to participate actively in the Pilot Project and engage in active cooperation with the oceanographic data centres in order to ensure the development or interoperable arrangements between their data systems and the WIS. The Council also recognized the importance of JCOMM's decision as part of its ongoing mandate to produce a catalogue of existing standards and best practices in marine meteorology and oceanography in connection with observing systems and exchange of observations. It urged Members to consider providing assistance to this effort as a contribution to the WMO Quality Management Framework. Given the need for continuous operation of a global ocean observing system in support, inter alia, of coupled ocean-atmosphere climate modelling and operational ocean prediction, as well as the limited lifetime of individual platforms, data buoys, floats, ship-based and bottom-mounted systems, the Council urged Members to establish a system of national ocean centres or services dedicated to the implementation and maintenance of ocean observing systems and to improve cooperative support and coordination through the JCOMM.

I-5.3.5 The Team noted the outcome and recommendations from the ad hoc planning meeting for the JCOMM Pilot Project for WIGOS (Ostend, Belgium, 29 March 2008), and the meeting of the joint Steering Group that followed (Geneva, Switzerland, 18-19 September 2008). The Team noted with appreciation that it had already contributed quite actively to the Pilot Project. For example, the SOT Task Team on Instrument Standards has proposed changes to the WMO Guide to Meteorological Instrument and Methods of Observation (WMO No. 8). These have been reviewed and approved by

the Joint Steering Group, Chung-Chu Teng (NDBC, USA), JCOMM focal point on CIMO matters, and by Peter Dexter (BOM, Australia), JCOMM Co-President. The changes have then been submitted to the sixth Session of the CIMO Management Group (St. Petersburg, 25-26 November 2008). Nicola Scott, United Kingdom GCC, is also a member of the Pilot Project joint Steering Group, assisting in the making of the VOS delayed mode data available via the WIS. The Team is also actively contributing through (i) e-logbook intercomparison, (ii) XBT fall rate evaluation, and (ii) the collection and exchange of ship and instrument metadata through WMO Publication No. 47, JCOMMOPS, the Water Temperature Metadata Pilot Project (META-T), and the ODAS Metadata Service (ODASMS) operated by the National Marine Data and Information Service (NMDIS – China).

I-5.3.6 The Team agreed that additional efforts by Team Members should be made for achieving a better integration of SOT Best Practices and Standards into the WIGOS. This objective can be achieved through:

(i) Contributing to the development of WIGOS Best Practices and Standards, e.g. providing input to WMO Publications No. 544 – Manual on the GOS – , No. 488 – Guide on the GOS – , and No. 8 – WMO Guide on Meteorological Instruments and Methods of Observation –. The Team requested the Task Team on Instrument Standards to keep under review these Publications and make proposals through the WMO Secretariat and the JCOMM Focal Point on CIMO matters if necessary (***action, TT Instrument standards, ongoing***).
(ii) Implementing those WIGOS agreed upon Best Practices and standards, and in particular, to provide the ship platform / instrument metadata to Pub 47, JCOMMOPS, META-T servers, and the ODASMS as appropriate (***action, Team members, ongoing***); and
(iii) Contributing to the development of specialized and / or regional marine Instrument Centres or assist candidate instrument centres as appropriate (***action, Members, mid-2009***).

I-5.3.7 The Team invited its members to check the Pilot Project implementation plan (Appendix B) and identify how they could practically contribute to the Pilot Project (***action, Team members, ongoing***).

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Appendices: 3

APPENDIX A

STATUS OF THE WIGOS PILOT PROJECT JCOMM

(Submitted by the Co-Chairpersons of the Joint Steering Group for the IODE Ocean Data Portal and the WIGOS Pilot Project for JCOMM, Mr Greg Reed, Co-Chairperson, IODE, and Mr Rainer Dombrowsky, former Vice-President, CIMO)

1. Introduction and key deliverables

1.1 The Pilot Project for the integration of marine and other appropriate observations into the GOS, also named WIGOS Pilot Project for WIGOS has been working pro-actively since WMO Cg XV in developing its Project Plan. The deliverables of the WIGOS Pilot Project for JCOMM are (i) developing interoperability arrangements between ocean data systems and the WIS while proving for documented and standardized data, (ii) documenting and integrating best practices and standards, and (iii) Quality Management and implementation of cost effective Quality Management Systems (QMS). The Pilot Project multi-disciplinary approach will permit the provision of consistent, coherent, timelier, and better quality data and products, while at the same time minimizing duplication.

2. Scope

2.1 The cooperation with the ocean community and IOC is the key, in particular with the IOC International Oceanographic Data and Information Exchange (IODE) and its system of National Oceanographic Data Centres (NODC). This will permit the development of appropriate connections between the IODE Ocean Data Portal (ODP) and the WIS for historical and recent data, including new sources of data for their integration into the WIGOS framework (e.g. World Ocean Database, upper ocean thermal data from Argo profiling floats and XBTs, Deep Ocean time-series multi-disciplinary reference stations, high resolution SST from satellites, sea level stations, marine climatological data sets, satellite data, etc.). Access to these ocean data sets will be facilitated through ODP connectivity to the WIS. Due to the diversity of data sets within the marine and ocean communities, they have developed data policies to meet their needs. This being noted WIGOS agreed to respect (i) ownership of IOC for some of the components of the Global Ocean Observing System (GOOS), and (ii) data policies of partner organizations; adhering to the decisions of WMO EC Resolutions 40 and 25 respectively and the IOC Oceanographic Data Exchange Policy.

3. Activities

3.1 The *ad hoc* planning meeting for the JCOMM Pilot Project for WIGOS was held in Ostend, Belgium, 29 March 2008. The recommendations from the Executive Council Working Group on WIGOS-WIS were discussed and the Pilot Project plan updated so that it is in line with the WIGOS Concept of Operations (CONOPS).

3.2 Because of the strong potential synergies between the ODP and the JCOMM Pilot Project for WIGOS, the *ad hoc* planning meeting proposed to establish a joint Steering Group with balanced representation from the IOC and WMO communities. The Steering group includes representatives from CIMO, IODE, JCOMM Observations and Data Management Programme Areas, the IODE/JCOMM Expert Team on Data Management Practices (ETDMP), the WIS, the US Integrated Ocean Observing System (IOOS), IODE NODCs, and the MCSS Global Collecting Centres (GCCs).

3.3 A meeting of the Joint Steering Group for the IODE Ocean Data Portal and the WIGOS Pilot Project for JCOMM was held in Geneva, Switzerland, from 18 to 19 September 2008. The meeting updated the project plan, reviewed and adopted an implementation plan, discussed the business plan, capacity-building issues, and addressed the core deliverables of the WIGOS Pilot Project for JCOMM and the IODE Ocean Data Portal. A strategy was proposed for reviewing progress considering risks,

and trade-offs between time to deliver the project, costs and available resources, and quality of the deliverables.

4. Implementation plan

4.1 The implementation plan addresses the three core deliverables in sub-tasks, and provides detailed information on actions proposed to implement the plan (e.g. feedback with regard to specific implementation of the E2E, requirements for partners to develop interoperability). The responsibilities for undertaking the tasks, and/or following up their implementation, are given to groups or individuals with identified deadlines.

5. Business plan

5.1 Potential benefits that the Meteorological and Oceanographic agencies could gain from developing the Pilot Project have been included in the Project Plan.

5.2 A realistic business plan, focusing initially on the National Oceanographic Data Centres (NODCs), will be produced as a deliverable of the Pilot Project and is intended to be used by the Directors of NODCs to generate national support for the development of interoperable arrangements between NODCs and WIS. A sound business plan could facilitate decision making regarding essential software/hardware developments and national funding. While remaining relatively simple through a qualitative approach, the business plan should include the information necessary for securing the required funding.

5.3 The joint Steering Group came to the realization that it remains difficult during this phase of the Pilot Project to quantify the project's costs and benefits. Partners who volunteered to commit data sets in the Pilot Project have been requested to document functional requirements and conduct assessments nationally.

5.4 The Joint Steering Group concluded that at this point in the project it was premature to produce a generic business plan for use by the Directors of the NODCs. The September 2008 meeting agreed that the business plan should be produced towards the end of the Pilot Project and it would be based on experience gained with the partners, other WIGOS Pilot and Demonstration Projects. The Steering Group also agreed that potential synergies might exist with the Demonstration Projects and should be investigated and developed. Examples of derived benefits needed to be documented e.g.

- Benefits already stated in the CONOPS and the WIGOS Pilot Project for JCOMM project plan;
- Participation in GEOSS thanks to data made available to a wider community through the WIS (only one interface developed leading to more efficient maintenance);
- Cleaner access to the GTS and push the data to the GTS as with the present situation (e.g. NODCs being able to specify the GTS bulletins they need directly);
- More effective communication;
- Less redundancy;

6. Deliverable 1 - Instrument Best Practices and Standards

6.1 In terms of Instrument Best Practices, the Pilot Project recognizes the need for traceability to agreed standards, and is promoting and developing a strong cooperation between JCOMM, CIMO, and HMEI. The Pilot Project intends to build on CIMO's experience with regard to instrument intercomparison, instrument centres, etc.

6.2 The September 2008 meeting recommended that the JCOMM Observing Panels and associated programmes address the issue of documenting their best practices in light of the WIGOS developments. The various related publications available via WMO and IOC will be reviewed and updated as required. A strategy was proposed for the updating of the WMO Guide on Instruments and

Methods of Observation (WMO No. 8) to better integrate oceanographic issues. The strategy calls for future updates to be submitted through the JCOMM focal point on CIMO matters to the CIMO Focal Point for WMO No. 8.

6.3 The meeting proposed that instrument best practices related to surface meteorological and marine observations be included in the relevant chapter of the CIMO guide while inviting JCOMM to consider developing similar best practices for the sub-surface observations as part of a separate document, perhaps published by IOC. All relevant documentation would avoid duplication, provide for appropriate links, and be referenced in the JCOMM Catalogue of Best Practices and Standards (see below). This work will have to be coordinated between WMO and IOC. **The EC WG WIGOS-WIS was invited to re-address this issue, – taking into account, the IOC ownership, and provide further guidance to the Pilot Project**.

6.4 The Pilot Project is proposing to establish regional marine instrument centres using CIMO's regional instrument and radiation centres as models. The NOAA National Data Buoy Centre (NDBC) has offered to investigate the feasibility of such a marine centre and agreed to act as such centre on a trial basis. The JCOMM Focal Point on CIMO matters was invited to review CIMO Terms of Reference for instrument centres, draft Terms of Reference for marine instrument centres and develop a proposal for a trial period to be circulated to the Joint Steering Group for consideration and approval.

6.5 The Pilot Project reviewed the methodology proposed by CIMO for conducting instrument intercomparison to ensure homogeneity, and compatibility of the observations. The joint Steering Group agreed to explore how JCOMM and ocean instrument comparisons can profit from the CIMO process.

7. Deliverable 2 - Interoperability with WIS

7.1 The Pilot Project in particular is addressing interoperability issues between the Ocean Data Portal (ODP) and WIS, as well as between other ocean data systems and WIS. The Pilot Project proposes to achieve interoperability with WIS mainly through (i) ocean data centres contributing to the ODP, and (ii) ODP becoming fully interoperable with the WIS.

7.2 While recognizing that it was difficult at this point in the pilot project to make precise recommendations regarding the convergence of the WMO Core Metadata Profile, and other metadata profiles used in the marine community (e.g. Marine Community Profile – MCP –, SeaDataNET Common Data Index – CDI), the Joint Steering Group recommended to submit MCP and/or any other relevant metadata profiles through the JCOMM/IODE standards process for review by a wider user community. This process would help MCP to build on WIS specifications and for the development of specific recommendations that will achieve interoperability with WIS.

7.3 Excellent progress has been made with regard to the development of version 1 of the IODE Ocean Data Portal (ODP). Development of version 2 of the ODP has begun, but will continue for up to two years. Understanding this, the Joint Steering Group agreed that the Pilot Project should, as part of the Pilot Project deliverables, target version 1 for connecting specific data sets to ODP and WIS. This strategy will allow for the refinement of version 2 requirements.

7.4 The Joint Steering Group reviewed potential partners and data contributions. Discussions have taken place since the March 2008 meeting to address them, namely the SeaDataNET, the GHRSST-PP, and the Global Collecting Centres (GCCs – delayed mode VOS data as part of the MCSS). The September 2008 meeting noted with appreciation the development of a Virtual constellation for the measurement of Ocean Surface Vector Wind. Thirteen potential partners were finally identified for providing key data sets to the Pilot Projects as key deliverables. The Joint Steering Group has designated individuals to follow up with these potential partners and data contributors acquiring their participation in the WIGOS pilot project and eventually WIGOS. The Joint Steering Group also asked the Secretariat to write to the potential pilot participants seeking their participation.

8. Deliverable 3 - Quality Management

8.1 In terms of Quality Management, Best Practices and Standards, JCOMM has engaged in the following interlinked activities consistent with the WMO Quality Management Framework (QMF):

- the development of a JCOMM Catalogue of Best Practices and Standards compiling appropriate documentation from WMO and IOC. It is planned to recruit a consultant in order to have a draft available by March 2009;
- the establishment, in cooperation with the IOC International Oceanographic Data and Information Exchange (IODE) of a Standards process (http://www.oceandatastandards.org/) to achieve broader agreement and commitment to the adoption of a number of standards related to ocean data management and exchange. In addition promoting a higher level of standards, including common WMO-ISO standards as appropriate, thanks to the recent WMO-ISO agreement.

8.2 The minimum requirements for developing a Quality Management System (QMS) as part of WIGOS, the Pilot Project takes into account the 9 quality principles as stated in the ISO Quality Management documents, ISO 9000:2000 and ISO 9004:2000:- Customer focus, Leadership, Involvement of people, Process approach, System approach to management, Continual improvement, Factual approach to decision making and Mutually beneficial supplier relationships. The Joint Steering Group proposed to include in the Business Plan guidelines for implementing QMS.

8.3 The joint Steering Group also noted that the implementation of the ISO9000 standard would be very resource demanding and thus probably unrealistic for the pilot project. The September 2008 Meeting decided that a more realistic approach would be to invite partners, who agreed to participate in the pilot project as data providers, to carefully document quality management procedures they now utilize. These could include*, inter alia*, quality control practices, monitoring, feedback, response capabilities etc. The combined input received from all partners could then be compared with the goal of identifying common procedures. These could then be submitted to the IODE/JCOMM Ocean Data Standards Pilot Project for adoption as a standard. It was further recommended to add this information to the JCOMM Catalogue of Best Practices.

9. Capacity Building

9.1 In terms of Capacity Building, the Pilot Project is focusing on the cooperation of developing countries in the Ocean Data Portal project, the need for collaboration in the development of training materials between WMO and IOC on topics related to JCOMM, the promotion of WIGOS at the national level, and the organization of training courses in topics relevant to the WIGOS Pilot Project for JCOMM.

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APPENDIX B

OVERARCHING IMPLEMENTATION PLAN FOR THE ODP[5] AND WIGOS[6] PILOT PROJECT FOR THE IODE[7] AND JCOMM[8]

(6 November 2008)

BACKGROUND

Assisted by the WMO fifteenth Congress (Cg-XV), the high-level WIGOS / WIS goal is to establish a comprehensive, coordinated, and sustainable system of observing systems with assured access to data and products from the component observing systems by interoperability arrangements. WIGOS is the system of observing systems and the WMO Information System (WIS) provides access through interoperability arrangements. The WIGOS / WIS will address all WMO Programme requirements through its Rolling Review of Requirements (RRR) to ensure availability of required information9, meet data quality standards, and facilitate access to real-time data as well as to archived information.

Cooperation between the IODE and JCOMM, through its joint Expert Team on Data Management Practices (ETDMP), has resulted in the development of the End-to-End data management (E2EDM) technology that provides functionality for building the distributed data system known as the Ocean Data Portal (ODP).

The objective of the ODP is to facilitate and promote the exchange and dissemination of marine data and services. The ODP provides a full range of processes including data discovery, access, visualization, and delivers a standards-based infrastructure that provides the integration of marine data and information from a network of distributed IODE NODCs, data centres of JCOMM and other participating systems.

The development of the ODP and its linking to the WIGOS objectives furthers the objectives of both JCOMM and IODE. The ODP-WIGOS Pilot Project for IODE and JCOMM will provide WIGOS with links to oceanography and marine meteorology data and products.

A project plan was prepared, which listed three deliverables. They were:

- Document and integrate instrument best practices and related standards;
- Build marine data systems that are interoperable with the WIS; and
- Promote quality management and standards.

Details of the work expected to be carried out to meet these deliverables can be found in the project plan.

A proposed schedule and actions also appear in the project plan:

a. Sixth session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) Management Committee (JCOMM MAN-VI), (Paris, France, 3-6 December 2007). Draft proposal presented for discussion;

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5 ODP: Ocean Data Portal
6 WIGOS: WMO Integrated Global Observing Systems
7 IODE: IOC's International Oceanographic Data and Information Exchange
8 JCOMM: Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
9 Unless specified otherwise, the use of the word information in this document refers to the WMO definition of it (such as in WMO Information System) and relates to data and metadata in general which exchange is required to meet the requirements of WMO Programmes and Co-sponsored Programmes.

b. International Oceanographic Data and Information Exchange (IODE) / JCOMM Forum on Oceanographic Data Management and Exchange Standards (Ostend, Belgium, 21-25 January 2008). Draft proposal presented for discussion;

c. Third session of the JCOMM Data Management Coordination Group (DMCG-III), (Ostend, Belgium, 26-28 March 2008). Draft proposal presented for discussion;

d. Pilot Project initial Steering Group ad hoc meeting to finalize project plan and membership (Ostend, Belgium, 29 March 2008). Meeting held;

e. Representation of the Pilot Project at the annual plenary meeting of the Pan-European infrastructure for Ocean and Marine data Management (SeaDataNet), (Athens, Greece, 3-4 April 2008). Presentation made;

f. March / April 2008. Consultations with the Steering Group and reports on progress and proposed strategy by the Pilot Project. Consolidated report by the WMO Secretariat for review by the WMO Executive Council Working Group on WIGOS-WIS (EC WG WIGOS-WIS) and guidance by the sixtieth session of the WMO Executive Council (EC-LX - June 2008). Reports delivered;

g. July 2008: Consultation with the Management Committee and the Pilot Project Steering Group to incorporate EC-LX guidance and decisions into their final plans. Consultation held;

h. September 2008: Pilot Project Steering Group meeting to report on progress of planning activities, adjust the draft Implementation Plan and refine targets for the next year. Meeting held;

i. October / November 2008: discussion with the Data Buoy Co-operation Panel (DBCP) at its twenty-fourth session (Cape Town, South Africa). Expected outcome: progress regarding integration of best practices and standards regarding buoy observations. Discussion held;

j. April 2009: discussion with the JCOMM Ship Observations Team (SOT) at its fifth Session. Expected outcome: progress regarding integration of best practices and standards regarding ship observations;

k. Twentieth session of the IODE, May 2009. Expected outcome: formal endorsement from IODE and Resolution;

l. Third session of JCOMM, fall 2009. Expected outcome: formal endorsement from JCOMM and Resolution; and

m. Implementation of the project by November 2010 reporting to the JCOMM Management Committee, EC WG WIGOS-WIS and finally Cg-XVI (May 2011).

Finally, the project plan estimated costs for coordination of the project to be as follows.

OVERALL BUDGET AND CONTRIBUTIONS BY EACH PROJECT PARTNER (CHF)

Item:	2008		2009		2010		Total
	IOC	WMO	IOC	WMO	IOC	WMO	
Meetings of the Steering Group	7.500	30.000		20.000	20.000		77.500
Experts attending specific meetings or visiting data centres on behalf of the Pilot Project	0	0		15.000		15.000	30.000
Consultant	0	0		15.000		15.000	30.000
JCOMM Best Practices and Standards Catalogue	0	0	30.000				30.000
Total	7.500	30.000	30.000	50.000	20.000	30.000	167.500

It was, especially noted that the actual cost of implementation will be higher and these will be borne by the participants in the project.

The ODP-WIGOS Pilot Project for IODE and JCOMM was initiated in 2008 and has two years to complete. This Implementation Plan provides details of the project. It does so by: first addressing each of the three deliverables separately, identifying specific tasks to each deliverable, and projecting a time line for each. A section addresses the requirement for overall project management tying together all activities needed to accomplish ODP-WIGOS Pilot Project for IODE and JCOMM deliverables. A final section constructs a timeline of actions for the entire project.

ODP-WIGOS PILOT PROJECT FOR IODE AND JCOMM CONCEPT OF OPERATIONS

This Pilot Project is the contribution of JCOMM to the WIGOS / WIS developments of WMO. Because it is being developed in conjunction with the IOC / IODE Ocean Data Portal, it also contributes to that project. The WIGOS has developed a Concept of Operations (CONOPS) document that provides the umbrella principles and objectives of WIGOS / WIS. The description here borrows heavily from that document but provides a focus on marine observations, information, and specifics of importance to the marine community.

(i) There is a broadly recognized need for a comprehensive, coordinated and sustainable global observing system. The WIGOS is the organizational response of WMO to this need, and therefore is committed to the very strong cooperation that is needed among all partners to accomplish the broad objectives. The WIGOS is a comprehensive, coordinated and sustainable system of observing systems based on all WMO Programmes' observational requirements. It ensures availability of required data, information and facilitates access through the WMO Information System (WIS) according to identified temporal, geographical and organizational requirements, including those for real-time, near-real time and delayed-modes to all required information and in doing so it respects data sharing policies. Additionally, it helps ensure high data quality standards and benefits from archival and technological innovations.

(ii) WIGOS development and implementation proceeds in parallel with the planning and implementation of the WMO Information System. The combination of both efforts allows for an integrated WMO end-to-end system of systems designed to improve Member's capability to effectively, provide a wide range of services and to better, serve research programme requirements.

The WIS is used in the collection and sharing of information for all WMO and related

international programmes. It provides a flexible and extensible structure to allow participating centres to enhance their capabilities as their national and international responsibilities grow. Its implementation builds upon the successful components of existing WMO information systems in an evolutionary process. Its communication network is based on links used within the World Weather Watch (WWW) for distribution of high priority real-time data. It utilizes international agreed-upon standards for protocols, hardware and software.

The WIGOS objectives for integration encompass:

a. Improving WMO management and governance (use of resources, planning, institutional and programme structures, and monitoring);

b. Increasing interoperability between systems with particular attention given to space-based and in situ components of the systems;

c. Addressing the needs of the atmospheric, hydrologic, oceanographic, cryospheric domains within the operational scope of a comprehensive integrated system; and

d. Ensuring that broader governance frameworks (e.g. inter-agency co-sponsorship of systems) and relationships with other international entities are sustained and strengthened.

The WIGOS objectives:

a. Ensure the availability of all required information produced within JCOMM, with particular emphasis on information generated by satellites, RADAR, airborne systems, in situ ocean platforms, and other next generation observing systems;

b. Facilitate the access in real / near-real time and delayed-mode of observations required for WMO and WMO co-sponsored programmes as well as relevant international conventions which are generated by systems implemented and managed by cooperating agencies, organizations and programmes;

c. Ensure required data quality standards are met and sustained for all programme requirements;

d. Facilitate improved data management including archival and data retrieval capabilities;

e. Facilitate technological innovation opportunities;

f. Continue on-going coordination with instrument manufacturers and scientific institutes in the development and testing of next generation observation instruments;

g. Develop appropriate regulatory documentation including organization and recommended practices and procedures; and

h. Link existing technologies in an integrated manner to provide societal benefits.

JCOMM, through WIGOS:

- contributes to strategies to satisfy observational requirements from WMO Programmes and international partners through the WMO Rolling Review of Requirements (RRR) Process;

- contributes to strategies to guarantee system interoperability, including data quality of observing systems and instruments;

- evaluates existing WIGOS capabilities before developing, acquiring, and or deploying new observing systems or sensors;

- exploits existing platforms and employs multi-sensor platform concepts to the maximum possible extent;

- coordinates requirements, plans and activities with all appropriate Technical Commissions, Regional Associations and Programmes; and

- builds upon existing observing systems/networks as a global system of observing systems.

The WIGOS integration objective will be, accomplished at three levels:

- Standardization of instruments and methods of observations (instruments and methods of observation level);

- Common information infrastructure, (WIS data level); and

- End-product (e.g., observations, analyzed fields, model output), quality assurance (QM / QA / QC product level), and standards needed to ensure data quality to project defined minimal requirements.

Standardization and interoperability, including data compatibility, are primary factors for enabling integration. JCOMM will meet several WIGOS sub-goals as follows:

- Improve the production, use and application of data and information from across all observing systems sponsored and co-sponsored by WMO, in a seamless way, to satisfy user requirements;

- Be designed to accommodate the diversity among Members with respect to their capabilities and needs;

- Through capacity-building, improve capabilities of Members to access and utilize observations and analysis products from all WMO and sponsored observing systems;

- Ensure compatibility, connectivity and interoperability including interface arrangements within and among all WMO and sponsored observing systems components and externally with other users;

- Allow for the continuous review of the requirements placed on the integrated system and have the capability to effectively adjust and respond to changing requirements;

- Ensure the continuing sense of ownership by the various groups that have initiated and developed the individual observing system components through directly involving these groups in the planning and implementation of the WIGOS;

- Promote the development, testing and comparison of new observing capabilities and provide mechanisms to easily integrate them into WMO and sponsored operational observing systems;

- Ensure the optimum integration of the various components of all observing programmes;

- Increase efficiencies by reducing as far as possible redundancies and overlaps of systems and the management activities supporting them;

- Facilitate more rapid and efficient assimilation of technological advances and apply them as far as possible across all observing programmes;

- Foster co-location of observing sites of complementary systems as far as practical thereby reducing redundancies; and

- Ensure the involvement of the various scientific and user communities in the activities of setting requirements, and the monitoring and assessing system performance.

The ODP-WIGOS Pilot Project for IODE and JCOMM will respect the data policies of partner organizations, including those of both the WMO and IOC. The IODE and JCOMM will strive to ensure that the conditions placed by the originator on the additional data and products are respected and made known to initial and subsequent recipients for the exchange of data and products including guidelines on relationships in commercial activities.

DELIVERABLE 1: DOCUMENT AND INTEGRATE INSTRUMENT BEST PRACTICES AND RELATED STANDARDS

The two domains of marine meteorology and oceanography have different histories that have resulted in different practices. For marine meteorology, there is a long history of working within the framework of the WMO and the various regulations and observing practices that have been established. In contrast, oceanographic observations are more recent and most originate from a research environment. As a result, new methods and procedures are frequently being tested and this results in less standardization of practice, though best practices are evolving.

This Pilot Project is focused on the practices that impact data collection, processing, archiving and dissemination. The standards and practices used in observing the atmosphere and ocean need to be well documented and ensure that sufficient detail accompanies observations so that a user can interpret the measurements correctly.

Information on Meteorological Parameters:

The practices used for making meteorological observations have been standardized by WMO through its Commission for Instruments and Methods of Observation (CIMO). CIMO is responsible for the *WMO Guide to Meteorological Instruments and Methods of Observations* (WMO Publication No. 8 - *CIMO Guide*), which includes a marine chapter that describes these practices and standards. This material needs to be reviewed during the course of this Pilot Project to update and / or add content that reflects present operations of marine meteorological practices.
[Action 1.1]

Information from the JCOMM Observations Programme Area (OPA) Panels:

Instrument best practices, calibration procedures, operating / implementation / deployment procedures and guides, quality control procedures and / or guidelines (delayed-mode, real-time, automatic, or manual), data processing techniques, and formats (e.g., data collection formats) have been developed over the years by the different marine observing systems whose implementation is coordinated through the JCOMM Observations Programme Area (OPA) and the predecessors of JCOMM, i.e., the WMO Commission for Marine Meteorology (CMM), and the WMO-IOC Integrated Global Ocean Services System (IGOSS). The OPA includes the Data Buoy Co-operation Panel (DBCP), the Global Sea Level Observing System (GLOSS), the Ship Observations Team (SOT), and associated groups such as the Ocean Sustained Interdisciplinary Timeseries Environment observation System (OceanSITES), the Argo Steering Group (AST), and the IOC International Ocean Carbon Coordination Project (IOCCP).

The documentation produced is being maintained by these Panels and there is benefit in reviewing the relevant information on instrumentation best practices and standards, addressing

integration issues, i.e. identifying compatibilities, avoiding duplication of information, proposing higher levels of standards, including joint WMO-ISO standards. Documentation should be updated accordingly, higher-level standards proposed and integrated into relevant parts of the appropriate WMO and / or IOC Manuals and Guides, or at least a cross-reference between documentation should be included as appropriate. The review of such documentation should begin as part of the development of the *JCOMM Catalogue of Best Practices and Standards*.
[Action 1.2]

Documenting Instrument Best Practices:

As standards for instruments and methods of observation are adopted, they will be submitted for inclusion in the marine chapter of the *CIMO Guide* (surface marine meteorological measurements) and other appropriate IOC Manuals and guides (sub-surface oceanographic measurements). An editor from the Pilot Project will work in collaboration with the Rapporteur on the *CIMO Guide* to preparing material for inclusion.
[Action 1.3]

Instrumentation Centres:

The WIGOS Concept of Operations (CONOPS) recommended that all WIGOS observational data and metadata and processed observational products should adhere to WIGOS standards for instruments and methods of observation. To achieve this, a key element is the promotion of instrument centres dedicated to marine and other appropriate oceanographic instruments. Such Centres would be essential for monitoring instrument performance, calibration procedures, providing assistance with regard to intercomparison, as well as providing for appropriate training facilities that would complement what the manufacturers are already providing. In addition to instrument centre staff, invited ocean experts and instrument manufacturers would be invited to participate in such instrument training.

Currently there is only limited experience in oceanography for conducting formal regional or global instrument intercomparison. Indeed, the recent revisiting of the XBT fall rate question underlines the importance of a formal mechanism to carry out these studies. So, too, is the experience in the deployment of Argo floats where it is now encouraged to carry out an initial test dive and surfacing coincident with a CTD cast to provide an initial intercomparison.

It is generally accepted that systematic intercomparison of new with legacy instruments is needed. However, operating such intercomparison at sea and in a variety of ocean areas and conditions would seem to be a greater challenge than normally associated with land-based meteorological instrumentation centres. CIMO has experience with meteorological instrument centres and climate instrument centres and collaboration with such experts to translate the more usual, land-based testing to ocean-based work would be valuable. The ad-hoc planning meeting (Ostend, 29 March 2008) recommended that the OPA nominate someone to liaise with CIMO on instrument and best practices matters. Since the meeting, Dr Chung-Chu Teng, NOAA National Data Buoy Centre (NDBC) has been nominated by the JCOMM OPA Coordinator. Dr Teng will be invited to begin this dialogue with CIMO, and liaise with appropriate OPA experts, such as the Chairperson of the Ship of Opportunity Programme Implementation Panel (SOOPIP) and the DBCP.

Depending on the outcome of the discussions with CIMO, the Pilot Project may have to develop and propose Terms of Reference (ToR) for JCOMM Instrument Centres, as well as provide guidelines regarding exactly what would be involved in the operations of these instrument centres, e.g. providing facilities for training and organizing training events, providing facilities for the calibration and maintenance of marine instruments, holding high level equipment for the calibration of instruments, seeking ISO standards - through the IODE / JCOMM standards process - for such high-level calibration equipment, etc.

The Pilot Project would also propose strategies for addressing the costs for establishing and operating JCOMM Instrument Centres. This will require developing a proposal for an agreed upon

host supported operation based on in kind contributions and the proposal of accepted mechanisms for funding additional activities going beyond a typical operating budget.
[Action 1.4]

Platform / Instrument Metadata:

The WIGOS CONOPS recommends that all WIGOS observational data and metadata (including platform / instrument metadata and discovery metadata) should be exchanged via WIS using agreed upon data and metadata representation forms and formats. Within JCOMM DMPA, there is the Water Temperature platform / instrument Metadata (META-T) Project. One of the META-T's objectives is the consolidation of instrument and other metadata to describe sea temperature measurements. There are two centres contributing infrastructure to this project, one in the United States and the other in China. The ODP-WIGOS Pilot Project for IODE and JCOMM should consider how to include this work, as well as propose a strategy for including variables other than Sea Surface Temperature and water temperature profiles in the platform / instrument metadata collection, distribution, and archiving system being developed.

Within the Voluntary Observing Ship (VOS) scheme and the VOS Climate Project (VOSClim) there are also platform / instrument metadata being assembled concerning, among other information, the siting of meteorological instruments on voluntary observing ships as well as information on airflow patterns around ship's superstructures. Such valuable information can assist in the interpretation of measurements. Just as for the META-T, these metadata should be considered for inclusion in the ODP-WIGOS Pilot Project for IODE and JCOMM.
[Action 1.5, 1.6]

Cooperation with the manufacturers

The Ostend Meeting noted the co-operation established by CIMO with the Association of Hydro-Meteorological Equipment Industry (HMEI) in terms of evaluating instrument performance and their documentation, as well as their assistance in capacity building activities. In this regard, the WMO Secretariat was asked to approach HMEI to seek their participation in the ODP-WIGOS Pilot Project for IODE and JCOMM. Early dialogue with the HMEI concluded that it has been demonstrated that HMEI could efficiently act as a relay between the meteorological instrument manufacturers and the meteorological observing community. However, with respect to marine instrument manufacturers and the marine observing community, beneficial links have already been, established between them through direct contact, including manufacturers being invited to JCOMM meetings, as appropriate. Therefore, the marine instrument manufacturers do not necessarily feel the need for their participation in HMEI. At the same time, not all manufacturers attend the JCOMM meetings when invited, and when they do, they naturally tend to represent the interests of their particular company rather than those of the manufacturers as a whole. To address this issue several strategies are possible:

(i) formally recognizing the role that HMEI could play in representing the marine instrument manufacturers with the WMO and IOC through JCOMM;

(ii) WMO and IOC informing by means of a formal letter to the manufacturers of the role they will be invited to play with both Organizations, including JCOMM Expert Teams and Panels;

(iii) discouraging direct participation of manufactures at JCOMM meetings except when formally representing HMEI; and

(iv) encouraging participation of HMEI member manufacturers for specific activities such as pilot projects, technology development, instrument evaluation, and intercomparison.

In terms of capacity-building activities, HMEI members could provide assistance to developing countries by participating and collaborating with the WMO and IOC in conducting training workshops

on instrument use, instrumental calibration and testing, communication and coding training. The HMEI encourages the development and possible fabrication of instruments in developing countries. The worldwide traceability of measurements to SI and development of instrument standards are also aided by HMEI involvement and participation within ISO standard setting teams.
[Action 1.7]

Actions:

1.1 Review the marine chapter of the CIMO Guide. Provide updates and additions on meteorological instruments and methods of observation as necessary.

1.2 Assemble reference material on instrument best practices and standards available from the JCOMM OPA Panels and associated observing programmes for inclusion in the JCOMM catalogue of best practices and standards.

1.3 As standards are adopted, editors from the Pilot Project and CIMO will need to work together to prepare the material for inclusion in the marine chapter of the *CIMO Guide*.

1.4 Dr Teng will discuss with CIMO about ocean instrument centres, and liaise with appropriate OPA experts, such as the Chairperson of the SOOPIP, the DBCP and other appropriate Panels. The Project may need to propose and agree on Terms of Reference (ToR) for the JCOMM Instrument Centres, and develop guidelines for running them. It should propose guidelines regarding the costs involved for setting up and running such centres.

1.5 The Pilot Project should determine if and how the information assembled by the JCOMM META-T Project can be included, as well as propose a strategy for including other variables than SST and water temperature profiles in the platform / instrument metadata collection, distribution, and archiving system being developed.

1.6 The Pilot Project should determine if and how the information assembled by the VOS and VOSClim Projects can be included.

1.7 The WMO and IOC Secretariats to write to the marine instrument manufacturers and invite them to be represented through the Association of Hydro-Meteorological Equipment Industry (HMEI), to consider organizing training workshops and developing cooperation with the Pilot Project.

DELIVERABLE 2: BUILD MARINE DATA SYSTEMS THAT ARE INTEROPERABLE WITH THE WIS

Access objectives of this Pilot Project will be achieved through improved interoperability between oceanographic and meteorological communities. The Ostend Meeting itemized a number of potential organizations that could be approached to contribute data sets they support to the Pilot Project. The lists were qualified by potential, meaning those that appeared to be available, and tentatively committed, meaning those that were prepared to initiate discussions to assess the resource implications of their participation. These were:

Potential:

- In situ data sets from the JCOMM Observations Programme Area such as:
    - Profiling floats (Argo);
    - Deep ocean time-series reference stations (OceanSITES);

  - Tropical moorings (TAO);
  - Drifters (DBCP);
  - Ship-based observations in the SOT (ASAP, VOS, XBTs);
  - Tide gauges (GLOSS);
  - Water temperature and salinity profiles (GTSPP);
  - Surface underway data (GOSUD); and
  - Ocean carbon (IOCCP), etc.
- Satellite products and analysis, and merged in situ / satellite products (e.g., GHRSST);
- Model output fields (e.g., GODAE);
- Metadata about the platforms / instruments (e.g., META-T);
- Integrated data systems (e.g., SeaDataNet, DMAC);
- ODINs (Demonstration projects, because some of them had E2E training course already they could provide data sets and get access to the WIS);
- Fast delivery sea level data (University of Hawaii Sea Level Center);
- Instrument Centres; and
- Ocean current data from VOS.

<u>Tentatively committed:</u>

- US NODC (Mr Terry Tielking):
  - World Ocean Atlas;
  - World Ocean Database; and
  - US NODC GTSPP (Mr Charles Sun)
- Surface currents from HF radar (Dr Jack Harlan);
- Russian Federation NODC (Mr Nikolay Mikhaylov):
  - End-To-End prototype technology (Russian Federation);
- GTS operational database, marine-surface climatology (air T, SST, sub-sal, oxygen);
- Canada, ISDM (Mr Robert Keeley):
  - Upper-ocean T & S gridded in situ fields; and
  - Ocean currents derived from surface drifters

Permanent Service for Mean Sea Level (PSMSL) (Mrs Lesley Rickards);

- Marine Climatological Summaries and Global Collecting Centres (GCCs) (UK Met Office or DWD via Virtual GISC) (Ms Nicola Scott); and

- Blended quality climatology products (e.g., ICOADS) (Mr Scott Woodruff).

Since the Ostend meeting, strong interest has been expressed by the GHRSST-PP (Global High Resolution Sea Surface Temperature Pilot Project) to be included in this Pilot Project. The GHRSST (recently renamed the Group for High Resolution SST) agreed that its participation in this Pilot Project would be an effective mechanism for the GHRSST to deliver its information to users. New GHRSST sub-groups (on "metadata requirements" and on "buoy quality") will provide information to this Pilot Project. GHRSST is using ISO 19115 compliant GHRSST Master Metadata Repository (MMR) that should connect relatively easily to the WIS. One or more GHRSST data centres could eventually be acting as WIS Data Collection and Production Centres (DCPCs).

Mr David Thomas (WIS Programme Manager, WMO Secretariat) attended a SeaDataNet meeting in April 2008, and presented the Pilot Project. SeaDataNet was very interested in WIS, especially the linking of search capabilities through the search standard ISO 23950 and the metadata standard ISO 19115. With SeaDataNet's close link to INSPIRE and focus on interoperability, there are many similarities between the objectives of WIS and those of the SeaDataNet. There are also strong opportunities for technical discussions with SeaDataNet developers, including ideas on security and metadata.

Infrastructure:

a) End-to-End technology

The Russian NODC has been leading the way in the development of a prototype linking the WIS with their End-to-End system (E2E). They have constructed software that allows their centre to operate as a DCPC. This requires the installation of certain software on a server that is exposed to the Internet. Any other centre taking part in the Pilot Project that wants to function as a DCPC will need to do the same installation.

A contributor can play the role of a data provider to the E2E system. This requires the installation of a smaller set of software than for a DCPC. Flexibility built into the operating software provides access to flat files, relational databases and data within the netCDF structure.

To provide access to data, it is necessary to provide discovery metadata in the WMO core profile of the ISO 19115 standard. Metadata in another form may be transformed into this structure, or if the metadata do not exist, they will need to be created. Tools within the E2E software can facilitate this process.

Extensive documentation has been prepared to describe the operation of the software both at a high-level and at a more detailed level. The documentation is currently under review and should be available in the near future. Once completed it will be made widely available to help potential data and information contributors understand what they must do to be contributors to the Pilot Project.

b) Specific developments by candidate National Centres (NC) or DCPCs

The use of the E2E technology is not the only option. A candidate partner in the Pilot Project may wish to develop or use specific infrastructure, tools and software (Opensource, self-developed or developed in a wider cooperation context, or even purchased) to provide for WIS connectivity. A centre can act as a WIS NC or DCPC. Requirements are detailed in WIS documentation and available at http://www.wmo.int/pages/prog/www/WIS-Web/RefDocuments.html and particularly in the WIS compliance specifications of Global Information System Centre (GISC), Data Collection and

Production Centre (DCPC), and National Centre (NC) document (draft version 1.0, December 2007).

Access to data and information:

There is a wide variety of types of data and information represented in the list of data sets of the potential and tentatively committed organizations. This translates to a wide variety of hardware platforms, computer security environments and software environments. Though each is different, there are common steps that will be required in order for those data sets to become available through this Pilot Project. These steps are as follows:

a. Each contributor needs to examine the state of the data collections they are considering and to identify which ones they will offer to the Pilot Project;

b. Those contributors wishing to use the E2E technology need to have a discussion with technical experts from the Russian Data Centre to identify exactly what they must do in order for their data sets to become available via ODP. This includes what software must be installed, what information files must be created and where data collections must be placed to be visible;

c. Those contributors wishing to develop or use specific infrastructure, tools and software need to consult with WIS experts to identify exactly what they must do in order for their data sets to become available via WIS. This includes what software must be installed, what information files must be created and where data collections must be placed to be visible;

d. Each contributor needs to commit to devoting resources to make their data collections available. They will also need to identify a local contact for the project and the time frame for completion that is no later than December 2010 (the end of this Pilot Project);

e. Each contributor will work with Russian or WIS experts, as appropriate, to install the necessary software, create any necessary information files and whatever other technical tasks are needed to expose the data collections to the Pilot Project;

f. Each contributor will work with Russian or WIS experts, as appropriate, to verify that their data collections are visible to WIS and ODP; and

g. The Pilot Project will have to define a work plan for making the ODP and WIS interoperable, and ODP acting as a WIS DCPC.

Actions:

2.1 Complete the editorial review of ODP software documentation and make this widely available.

2.2 Each contributor is to carry out the necessary steps (as listed above) to provide access to their data or information.

2.3 Define a work plan for making the ODP and WIS interoperable, and ODP acting as a WIS DCPC.

DELIVERABLE 3: PROMOTE QUALITY MANAGEMENT AND STANDARDS

The ad-hoc meeting in Ostend noted that one of the core goals of the Pilot Project would be to coordinate the development of cost-effective end product Quality Management Systems by Members and to propose practical solutions or examples. As stated in the WIGOS Concept of Operations (CONOPS), many of the WIGOS aims relate to Quality Management, and in particular the following:

***Access*:** Facilitate the access, in real/near-real time and delayed-mode, of observations

required for WMO and WMO co-sponsored programmes as well as relevant international conventions which are generated by systems implemented and managed by cooperating agencies, organizations and programmes;

Standards: Ensure required data quality standards are met and sustained for all programme requirements;

Quality Management Systems: Facilitate improved data management including data processing, archival and data retrieval capabilities; and

Documentation: Develop appropriate regulatory documentation including organization and recommended practices and procedures.

This Implementation Plan has addressed the issues related to instrument best practices and standards in a previous deliverable. This deliverable covers all of the other practices and standards related to data processing and access.

As the state of standards in oceanography is relatively immature, there will be a significant amount of organizational work required. It will be advantageous for this Pilot Project to designate someone, possibly a contractor, to take on this work, to consult with the appropriate observing panels to assemble existing materials, identify differences to be resolved, encourage submission of documentation and standards and work with CIMO to determine what material is appropriate for WMO and what lies outside.
[Action 3.1]

JCOMM Catalogue of Best Practices and Standards:

WMO has engaged in the Quality Management Framework (QMF) where one of the goals is to produce a catalogue of technical publications related to quality management and their review to ensure adherence to quality management principles. In December 2007, the JCOMM Management Committee recommended producing a catalogue on JCOMM best practices and standards to be published as a JCOMM Technical Document as a high priority need. The Meeting agreed that the ODP-WIGOS Pilot Project for IODE and JCOMM should assist in its development and production. The Meeting also agreed that both the IODE OceanTeacher training facility and the new WIGOS website should be used by the Pilot Project to share appropriate documentation.
[Action 3.2]

JCOMM/IODE Standards process

Assembly of the documentation material from contributors is only the beginning. In January 2008, the IODE and JCOMM held a Standards Forum (see http://www.oceandatastandards.org/) with the objective of agreeing on international standards for managing the data and information10 collected on and in the ocean. The expectation is that this will create a focus for groups to suggest community standards, to have these evaluated, to get agreement from the broad community to accept the agreed upon standards, and their adoption. The authors of the documented practices of contributors to this Pilot Project will be encouraged to submit these to this Standards Process. In some cases, there will be overlaps in material and differing procedures for the collection, processing or dissemination of data or information about the same parameter. The committee that oversees the standards process, the IODE-JCOMM Expert Team on Data Management Practices (ETDMP), will encourage authors to resolve these differences so that a single practice can move forward.

As standards are recommended, documentation of these should be included in the appropriate IOC and WMO publications. Use of the IODE OceanTeacher and a new WIGOS website for sharing this documentation is something to be considered. In particular, the division of material between these two sites, and the marine chapter of the *CIMO Guide* needs to be resolved.

10 The word information in this paragraph is used in both WMO and IODE contexts, i.e. it relates to both data and metadata, and to bibliographic information

This has strong overlaps with actions identified in deliverable 1.
[Action 3.3]

Marine Climatology Information

Meteorological data are collected routinely from ships, buoys, or other platforms and often reported within hours. The data circulate on the GTS and are used in Member and partner operated Numerical Weather Prediction (NWP) systems. There are also systems operated to assemble these data for climatological purposes. These are all managed within the Marine Climatological Summaries Scheme (MCSS) of two Global Collection Centres assembling the various data. These Centres check the data and build a composite data set for distribution to Members and partners. These data also contribute to the International Comprehensive Ocean and Atmosphere Data Set (ICOADS), a collection of all available surface marine observations dating from the late 1700s to present.

Documentation of the procedures that are followed in processing and archiving the marine meteorological data should be included in appropriate WMO or IOC publications.
[Action 3.4]

Data from NODCs:

In oceanography, there is a well-established system of National Oceanographic Data Centres (NODCs), which was established by the IOC's IODE Programme in 1960 to share data and resources. At the global level, the NODCs collaborate with the International Council for Science (ICSU) World Data Centres (WDCs) for oceanography. Each of these NODCs manages the data collected by their own country. Some Centres also manage global data sets. Each of these NODCs operates separately, but meets regularly as the Members of the IODE Committee to discuss issues of international exchange of ocean data. Through some of the international activities between NODCs, some common practices are beginning to emerge. For those NODCs that contribute to this Pilot Project, it will be necessary to assemble the documentation that describes their procedures.
[Action 3.4]

IOC / IODE Information:

There are a number of guides, manuals and technical material within the IOC community, which describe various aspects of managing oceanographic data. Some of these have been recently updated, whereas some need updating and some are obsolete. A list of these documents and an initial assessment of what needs to be done with each has been compiled, and was made available at the recent Data Management Coordination Group meeting (Ostend, Belgium, March 2008). Some of this material will be superseded as standards are generated through the IODE / JCOMM process, but the timing and strategy for conducting this activity has yet to be determined. One approach to be considered is to focus on documents describing practices that are likely to be updated by standards submitted by contributors to the Pilot Project. It is envisaged that, for these documents, minimal updates would be undertaken simply to ensure that present status is represented. Whatever approach is applied to this task, an editor and expert reviewers will be required to bring this documentation up to date and to coordinate with WMO / CIMO on how this material should be referenced.
[Action 3.4]

Information from Oceanographic Observing Projects:

It has become common for international projects in oceanography to establish a Global Data Assembly Centre (GDAC), which is responsible for data assembly and distribution of the data for the project. These GDACs perform a centralized function not only for data, but also for information about the project and the project operations and procedures. Some projects are open-ended in time, and once a GDAC is established, it is expected to continue providing this function on a continuing basis.

Each Project and GDAC operates autonomously to set up data management procedures. However, because of overlaps in personnel between projects, there are strong similarities between the

GDACs due to the adoption of a few common practices rather than a concerted effort at standardization. For those GDACs that become part of the Pilot Project, it will be necessary to assemble and compare the material they have describing their operations, then to include them in the JCOMM catalogue of Best Practices and Standards, and make reference to relevant parts in the WMO and / or IOC Manuals and Guides. Appropriate material will be encouraged to be submitted to the IODE/JCOMM Standards Process.
[Action 3.5]

Information about Data Management Projects:

In the past few years, individual countries (e.g., Australia, United States) and consortia of countries (such as the European Union's SeaDataNet Project) have started to build comprehensive data management systems for marine data. Each of these projects has had the need to address standards and they are producing national or project documentation that describes what has been decided. Contributions to the Pilot Project are going to come from individual countries, and to the extent that they have standards, they will be encouraged to submit them to the IODE / JCOMM Standards Process for broader review, possible modification and adoption. The ET-DMP will need to play the same coordination role here as for documentation from GDACs.
[Action 3.6]

Actions:

3.1 An editor and reviewers are needed to assemble the documentation on standards and best practices of contributors to this project. Their task is also to recommend where such material should be stored and how it can be made available.

3.2 The organizational task identified in action 3.1 should also assume the task of providing appropriate references to the *JCOMM Catalogue of Best Practices and Standards*.

3.3 The person responsible for organizing documentation as referenced in action 3.1 should also determine the most appropriate location for documentation to be held, between the IODE OceanTeacher, WIGOS website and the *CIMO Guide*.

3.4 Assemble the documentation or references that describe data management procedures carried out at MCSS centres and at NODCs that contribute to this Pilot Project. There is also material in IOC Manuals and Guides and other such publications that are relevant and should be considered.

3.5 Assemble material or references that describe operations of the various GDACs contributing to the Pilot Project, include them in the *JCOMM Catalogue of Best Practices and Standards*, and refer to relevant parts in the appropriate WMO and / or IOC manuals and guides.

3.6 Assemble material or references that describe operations of national or multi-national data management projects particularly as they develop standards. Encourage the authors of the documented practices of contributors to this Pilot Project to submit these to the joint IODE / JCOMM Standards Process.

PROJECT MANAGEMENT

This ODP-WIGOS Pilot Project for IODE and JCOMM is funded by the WMO until the end of 2010. By this date, participants will need to show that a significant number of marine data collections are available to the WIGOS/WIS, or that developments have started and plans and commitments are being made by Members to realize it. The precise timing of what data collections become available is difficult to identify at this point. This will become clearer as discussions are held between the individual data holders and Russian experts in the E2E technology or WIS experts, as appropriate. For this reason, the timetable listed in the Annexes is less precise than it should be. However, it includes all of the actions listed in this implementation plan, and the order in which they should be completed and

suggested due dates for completion.

The Pilot Project should refine its Business Plan and particularly develop a cost / benefit analysis. It would be a useful tool to convince the WMO and IOC Members to commit resources in the Pilot Project if they had information on the improvements in the final products – serving end user needs - gained from additional observing stations, better quality data, more timely data, or the integration of additional data sets in the WIS. Those improvements should be quantified, the costs involved in making those improvements estimated, and then compared with the estimated benefits for each targeted end user (e.g., insurance companies, transportation industry, energy industry, safety authorities, etc.).
[Action 4.1]

The Pilot Project should designate members of the Steering Group to be responsible to follow up and remain pro-active with regard to the integration of specific datasets and the development of synergies with specific demonstration projects and reporting.
[Actions 4.2, 4.3]

Actions:

4.1 Refine the business plan and initiate a cost / benefits analysis.

4.2 Nomination of Pilot Project Steering Group members to follow up integration of specific data sets and the development of synergies with specific demonstration projects.

4.3 Provide reports as required to parent bodies of WMO and IOC.

DEMONSTRATION PROJECTS AND CAPACITY-BUILDING

The ad-hoc planning meeting (Ostend, Belgium, 29 March) agreed that one or more of the WIGOS Demonstration Projects should be associated with the WIGOS Pilot Project for JCOMM. The Meeting identified Morocco (RA I), USA (RA IV), Australia (RA V), and the Russian Federation (RA VI) as potential candidates. Meanwhile, Brazil has refined its Pilot Project, which also shows some interesting potential synergies with the ODP-WIGOS Pilot Project for IODE and JCOMM. The Pilot Project will approach those Pilot Projects, explore the synergies, and make recommendations for establishing collaborations, as appropriate.

In terms of capacity building, the Pilot Project has already identified the following possible actions:

- Producing appropriate training materials, updating the E2E documentation, and reviewing the marine chapter of the WMO Publication No. 8 (*CIMO Guide*);
- Organize training courses at the IOC Project Office for IODE, in Ostend, Belgium. Themes for the training courses can include E2E technology, WIS interoperability, best practices and standards, instrument evaluation and intercomparison;
- Asking participants of the 2007 E2E training courses to participate in the Pilot Project;
- The WMO Education and Training Programme (ETRP) would be an effective mechanism for promoting WIGOS and the JCOMM Pilot Project in developing countries by providing training materials and training courses to them;
- The IODE Ocean Data and Information Networks (ODINs) could substantially help developing countries to benefit from the Pilot Project by engaging in it as partners; and
- Provide experts to visit centres willing to join the Pilot Project.

Action:

5.1 Address capacity-building issues according to the guidelines mentioned-above.

LEGACY

The Pilot Project is aiming at rationalizing documentation on instrument best practices and standards, promoting the establishment of regional or specialized marine instrument centres, integrating several marine data sets in the WIGOS framework through interoperability arrangements with the WIS, and addressing quality management issues and how, specific centres could implement Quality Management Systems (QMS). Much work will remain after the end of the Pilot Project in order to achieve the vision expressed in the WIGOS CONOPS. The Pilot Project will have to propose the governance through which the principles developed under WIGOS will permit continued progress and managing the sustainability of the integrated observing system.

Action:

6.1 Address legacy issues in the view to make proposals for the WMO Cg-XVI through the WMO EC WG on WIGOS-WIS and its sub-group, as appropriate.

ANNEX I

ACTION ITEMS AND RELATED SUB-TASKS OF THE ODP-WIGOS PILOT PROJECT FOR IODE AND JCOMM

Deliverable 1: Documenting and integrating instrument best practices and related standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
PP Steering Group Representative to coordinate with the ETMC, SOT, DBCP, GLOSS and Argo.	**Action 1.1:** Review the marine chapter of the *CIMO Guide*. Provide updates and additions on meteorological instruments and methods of observation, as necessary.	Pending. Agreement is being secured for some changes. Sub-surface component of the instrument best practices should go in appropriate IOC M & G. *CIMO Guide* will refer to IOC material. JCOMM MAN and OPA to address the issue.	4Q 2009	for coordination
	Sub-tasks:			
PP Steering Group	**1.1.1** Monitor progress, make adjustments and refine targets of action.	Ongoing / Some adjustments have been made already. Establish links to *JCOMM Catalogue*.		
Chairperson OCG to liaise with OPA Panels and address additions to *Guide* at OCG-III.	**1.1.2** Secure agreement on proposed changes from within the marine community, including WMO Members, regarding the operation, of marine instruments and methods of observation.	Pending / Identify additions needed in the *CIMO Guide* and *JCOMM Catalogue* while avoiding duplication. Standards level can be raised to ISO via WMO-ISO agreement. Possibility to add a new chapter in *CIMO Guide* for sub-surface observations.	1Q 2009	
Chairperson OCG	**1.1.3** Conduct discussions with the Data Buoy Co-operation Panel at its twenty-fourth session (Cape Town, South Africa). Expected outcome is progress regarding integration of best practices and standards for buoy observations and a submission to the IODE / JCOMM Standards Process.	Pending.	4Q 2008	
Co-chairpersons PP	**1.1.4** Co-chairpersons will participate in discussions with the JCOMM Ship Observations Team at its fifth Session.	Pending.	Apr 2009	
R. Dombrowsky to identify ongoing CIMO representative to the PP	**1.1.5** Coordinate changes with the Rapporteur on the *CIMO Guide*.	Pending. - Initial is R. Dombrowsky, later on Dr Teng.	3Q 2009	

Deliverable 1: Documenting and integrating instrument best practices and related standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
PP Steering Group, Secretariats, contractor, CIMO Guide Rapporteur, Chairperson OCG	**Action 1.2:** Assemble reference material on instrument best practices and standards available from the JCOMM OPA Panels and associated observing programmes for inclusion in the JCOMM catalogue of best practices and standards.	Pending. (a) Contractor (to be identified by PP Steering Group and Secretariats) to coordinate production of the *JCOMM Catalogue* (3-4 months total for the *Catalogue*). Table of content to be presented to JCOMM-III.(b) Draft catalogue available at JCOMM-III	(a) Draft TOC: 1Q 2009 (b) Draft *Catalogue*: 4Q 2009	
	Sub-tasks:			
Chairperson OCG	**1.2.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
Chairperson OCG	**1.2.2** Begin assembly of relevant documentation and / or references.	Pending.	4Q 2008	
Chairperson OCG	**1.2.3** Work with CIMO, WMO and IOC Representatives to determine what material is appropriate for CIMO, for WMO or IOC *Manuals* and *Guides.*	Pending.	First draft: 1Q 2009	

Deliverable 1: Documenting and integrating instrument best practices and related standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Dr Chung-Chu Teng, ET-DMP, Chairperson OCG, CIMO Guide Rapporteur	**Action 1.3:** As standards are adopted, editors from the Pilot Project and CIMO will need to work together to prepare the material for inclusion in the marine chapter of the *CIMO Guide.*	Pending. OCG Chairperson to Coordinate in liaison with Dr Teng of NOAA's National Data Buoy Center.	Initial standards: 3Q 2009. Continuing to 4Q 2010	
	Sub-tasks:			
Chair ET-DMP, Chairperson OCG, CIMO Guide Rapporteur	**1.3.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
Chair ET-DMP, Chairperson OCG	**1.3.2** Collect standards.	Pending.	Start: 4Q 2008	
Chairperson ET-DMP, Chairperson OCG	**1.3.3** Reconcile differences in standards.	Pending.	As required	
Dr Chung-Chu Teng, ET-DMP, Chairperson OCG, CIMO Guide Rapporteur	**1.3.4** Prepare agreed upon standards for inclusion into *CIMO Guide.*	Pending.	Initial standards: 3Q 2009	

Deliverable 1: Documenting and integrating instrument best practices and related standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Dr Teng, OPA Panel Chairpersons, Chairperson OCG, CIMO Guide Rapporteur	**Action 1.4:** Dr Teng will discuss with CIMO about ocean instrument centres, and liaise with appropriate OPA experts, such as the Chairperson of the SOOPIP, the DBCP and other appropriate Panels. The Project may need to propose and agree on Terms of Reference (ToR) for the JCOMM Instrument Centres, and develop guidelines for running them. It should propose guidelines regarding the costs involved for setting up and running such centres.	Pending.	Begin: 4Q 2008. Report: 1Q 2010	
	Sub-tasks:			
Dr Teng	**1.4.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
PP Steering Group	**1.4.2** Begin collaboration with CIMO, the WIGOS / WIS Development Team, and other program representatives involved in WIGOS and preparing for the potential future development of ocean instrument centres.	Pending.	4Q 2008	
Dr Teng, R. Dombrowsky, J. Gorman	**1.4.3** Investigate the need for and if required develop a proposal for the creation of regional ocean instrument centres (and address the level of operations of instrument centres to include Terms of Reference to be presented at the next OCG meeting.	Pending.	Jan 2009	
Dr Teng, R. Dombrowsky, J. Gorman	**1.4.4** Following OCG agreement to the proposal, identify potential Ocean Instrument Centres and select one of the candidate centres as the initial demonstration prototype.	TBD.	2Q 2009	
Dr Teng, R. Dombrowsky, John Gorman	**1.4.5** Prepare and present a report on the project.	TBD.	1Q 2010	

Deliverable 1: Documenting and integrating instrument best practices and related standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Co-chairperson PP, Chairperson Meta-T, S. Belov and E. Christian	**Action 1.5:** The Pilot Project should determine if and how the information assembled by the JCOMM META-T Project can be included, as well as propose a strategy for including other variables than SST and water temperature profiles in the platform / instrument metadata collection, distribution, and archiving system being developed.	Pending. Asking META-T to develop a proposal for the IODE / JCOMM Standards process.	Initial response: 4Q 2008, Demonstrate: 2010	
	Sub-tasks:			
D. Snowden	**1.5.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
S. Belov, D. Snowden, J. Chen, B. Burnett	**1.5.2** Begin collaboration with the Chairperson of the META-T, Russian experts, ET-AWS, ET-DRC, and the WIS IPET-MI Expert Teams on how information should be assembled within WIGOS / WIS.	Pending.	Sep 2008	
D. Snowden, J. Chen, B. Burnett	**1.5.3** Develop a proposal for meeting the requirements for such data collection, distribution and archival.	Pending.	End 2008	
J. Chen, B. Burnett	**1.5.4** Following acceptance of the proposal, begin the implementation of the proposed strategy.	Pending.	End 2008	
D. Snowden	**1.5.5** Prepare a report on the status of the implementation.	Pending.	End 1Q 2009	
J. Chen, B. Burnett	**1.5.6** Demonstration by JCOMM-III.	Pending.	4Q 2009	
S. Belov	**1.5.7** Demonstrate ODP connectivity.	Pending.	2010	

Deliverable 1: Documenting and integrating instrument best practices and related standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Co-chairperson PP, Chairperson VOS / VOSClim , S. Belov, WIS Support Team	**Action 1.6:** The Pilot Project should determine if and how the information assembled by the VOS and VOSClim Projects can be included.	Pending.	2Q 2009	
	Sub-tasks:			
S. Woodruff, J. Fletcher, N. Scott	**1.6.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
S. Woodruff, J. Fletcher, N. Scott, N. Mikhaylov, S. Belov	**1.6.2** Begin collaboration with the VOS / VOSClim and Russian experts and WIS Support Team.	Pending.	4Q 2008	
S. Woodruff, J. Fletcher, N. Scott, N. Mikhaylov, S. Belov	**1.6.3** If determined to be feasible, prepare a proposal for inclusion of VOS and VOSClim projects.	TBD	2Q 2009	
S. Woodruff, J. Fletcher, N. Scott, N. Mikhaylov, S. Belov	**1.6.4** Begin implementation.	TBD	2Q 2009	

Deliverable 1: Documenting and integrating instrument best practices and related standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
WMO and IOC Secretariats	**Action 1.7:** WMO and IOC Secretariats to write to the marine instrument manufacturers and invite them to be represented through the Association of Hydro-Meteorological Equipment Industry (HMEI), to consider organizing training workshops and developing cooperation with the Pilot Project.	Pending.	First contact: 3Q 2008. Complete: January 2009	
	Sub-tasks:			
WMO Secretariat	**1.7.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
WMO and IOC Secretariats	**1.7.2** Initiate correspondence with HMEI and resolve any concerns HMEI and non-HMEI may have with establishing a process by which manufacturers become more actively involved with WIGOS activities.	Pending.	End 2008	
WMO Secretariat	**1.7.3** Invite HMEI representative(s) within the WMO to future Steering Group session.	Pending.	End 2008	
WMO and IOC Secretariats	**1.7.4** Secure agreements similar to those that CIMO has with HMEI, through which HMEI assists, in conducting instrument-training workshops.	Pending.	January 2009	

Deliverable 2: Build marine data systems that are interoperable with the WIS

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Review Group (G. Reed, R. Keeley, S. Belov), WIS Support Team	**Action 2.1:** Complete the editorial review of software documentation and make this widely available.	Pending.	4Q 2008	
	Sub-tasks:			
Review Group, WIS-PO	**2.1.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
Review group, DMCG, PP Steering Group, WIS-PO	**2.1.2** Review software documentation.	Pending. Review has completed 4 documents.	4Q 2008	
WIS-PO, E. Christian	**2.1.3** Organize E2E Workshop with WIS PO to address E2E and WIS technologies and interoperability issues in order to refine ODP v1, and produce plan for ODP v2. In collaboration with the WIS Project Office, prepare a summary of the results and making them widely available.	Pending.	1Q 2009	CHF 5000 (from WIS-PO)

Deliverable 2: Build marine data systems that are interoperable with the WIS

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Candidate centre representatives, WIS Support Team, PP Support Team	**Action 2.2:** Each contributing centre to carry out the necessary steps (as listed in deliverable 2 of the document) to provide access to their data or information.	Pending. Visits to be conducted by PP Support Team (S. Belov, N. Mikhaylov) as required.	December 2010	
	Sub-tasks:			
PP Steering Group	**2.2.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
Candidate centre representatives, PP Support Team	**2.2.2** Coordinate with contributors to identify which data sets they will offer to the Pilot Project. Consider developing virtual infrastructure for connecting specific data sets.	Pending.	End 1Q 2009	
WMO and IOC Secretariats, S Belov	**2.2.3** Determine which contributors will be utilizing the E2E technology and direct them to technical experts from the Russian Data Centre to identify exactly what they must do in order for their data sets to become available via ODP. This includes software to be, installed, the creation of information files and where data collections must be placed for visibility and user access.	Pending. (a) Secretariats to write to Members (WMO PRs, IOC action addressees, cc to Directors of the agency proving data sets) asking what they could contribute. (b) Develop questionnaire (S. Belov). (c) Send second letter with questionnaires to those who responded (Secretariat).	(a) 31 October 2008 (b)15 October 2008 (c) End 2008	
WMO and IOC Secretariats, PP Support Team	**2.2.4** Identify local contacts for the project.	Pending.	1Q 2009	
PP Support Team	**2.2.5** Discuss with each contributor what commitment is needed to WIS, as well as the level of resources required, to make their data collections available.	Pending.	1Q 2009	
PP Support Team	**2.2.6** As needed, visit candidate centres for completion of implementation that, is no later than end of 2Q 2009.	Pending.	End 2Q 2009	PP Budget
PP Steering Group	**2.2.6** Ensure that implementation is completed by December 2010, the end of this Pilot Project.	Pending.	December 2010	

Deliverable 2: Build marine data systems that are interoperable with the WIS

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Candidate centre representatives, WIS Support Team, PP Support Team, ODP	**Action 2.3:** Define a work plan for making the ODP and WIS interoperable, and ODP (v1) acting as a WIS DCPC.	Pending.	End 2009	
	Sub-tasks:			
PP Steering Group	**2.3.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
B. Burnett, E. Christian, S. Belov	**2.3.2** Contributors who wish to develop or use specific infrastructure, tools and software to consult with WIS experts to identify exactly what they must do in order for their data sets to become available via WIS.	Pending.	End 2009	

Deliverable 3: Promote Quality Management standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
PP Steering Group, IODE Officers, CIMO Representative	**Action 3.1:** An editor and reviewers are needed to assemble the documentation on standards and best practices of contributors to this project. Their task is also to recommend where such material should be stored and how it can be made available.	Pending. PP Steering Group will work with the Secretariat in securing a contractor.	1Q 2010	
	Sub-tasks:			
IODE Officers	**3.1.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
R. Dombrowsky, IODE Officers	**3.1,2** Identify the ad hoc working group of editors and reviewers of IOC / IODE materials.	**Done – IODE Officers and R. Dombrowsky for CIMO**	4Q 2008	
IODE Officers	**3.1.3** Identify IOC /I ODE material requiring an update.	Pending. Some initial work has been completed.	4Q 2008	
IODE Officers	**3.1.4** Discuss and prepare materials for publication.	Pending.	1Q 2009	
IODE Officers	**3.1.5** Publish material.	Pending.	Start: 3Q 2009	

Deliverable 3: Promote Quality Management standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Contractor, Chairperson OCG, Chairperson DMCG	**Action 3.2:** The organizational task identified in action 3.1 should also assume the task of providing appropriate references to the *JCOMM Catalogue of Best Practices and Standards*.	Pending. Suggest JCOMM representatives by chairs of DMCG and OCG.	3Q 2009	
	Sub-tasks:			
IODE-PO, Chairperson OCG	**3.2.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
Contractor	**3.2.2** Assemble existing materials.	Pending.	4Q 2008	
Contractor	**3.2.3** Identify and resolve differences in the materials assembled.	Pending.	1Q 2009	
ET-DMP	**3.2.4** Submission of new standards or updates to existing standards for review and approval.	Pending.	2Q 2009	
Chairperson DMCG	**3.2.5** Collaborate with WMO and IODE to determine the appropriate disposition of all submitted materials.	Pending.	3Q 2009	

Deliverable 3: Promote Quality Management standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Contractor, CIMO, IODE-PO and ETRP.	**Action 3.3:** The person responsible for organizing documentation as referenced in action 3.1 should also resolve the most appropriate location for documentation to be held, between the IODE OceanTeacher, WIGOS website and *CIMO Guide*.	Pending. See action 3.1.	3Q 2009	
	Sub-tasks:			
IODE-PO, Chairperson OCG	**3.3.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
IODE-PO, R. Dombrowsky	**3.3.2** Begin collaboration with the IODE OceanTeacher, WIGOS development team and CIMO on the development of a strategy for organizing documentation on ocean monitoring instruments, methods of observation, data and products.	Pending.	4Q 2008	
Contractor	**3.3.3** Develop a proposal for the cross-referencing ocean related information on monitoring instruments, methods of observation, data and products.	Pending.	End 1Q 2009	
PP Steering Group	**3.3.4** Acquire approval of proposal.	Pending.	2Q 2009	
PP Steering Group	**3.3.5** Begin Proposal Implementation process.	Pending.	3Q 2009	

Deliverable 3: Promote Quality Management standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
PP Steering Group, Chairperson OCG, Chairperson DMCG	**Action 3.4:** Assemble the documentation or references that describe data management procedures carried out at MCSS centres and at NODCs that contribute to this Pilot Project. There is also material in IOC Manuals and Guides and other such publications that are relevant and should be considered.	Pending. ODP procedures (E2E docs) need to be made available to the NODCs and / or other JCOMM Agencies contributing data sets. For those committing data sets, documentation describing the datasets must be made available to the Pilot Project Steering Group.	First draft: 2Q 2009, Final 3Q 2009	
	Sub-tasks:			
PP Steering Group	**3.4.1** Monitor progress, make adjustments and refine targets of action	Ongoing.		
PP Steering Group , S. Belov	**3.4.2** Begin assembly of relevant documentation and / or references	Pending. Make information available on ODP website.	4Q 2008	
Chairperson DMCG	**3.4.3** Consult with the appropriate groups to assemble existing materials, identify differences to be resolved, encourage submission of documentation and standards.	Pending.	2Q 2009	
Dr Teng, CIMO Guide Rapporteur	**3.4.4** Work with CIMO to determine what material is appropriate for the WMO *CIMO Guide* and what lies outside.	Pending.	2Q 2009	

Deliverable 3: Promote Quality Management standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
PP Steering Group, Secretariats, Contractor	**Action 3.5:** Assemble material or references that describe operations of the various GDACs contributing to the Pilot Project, include them in the *JCOMM Catalogue of Best Practices and Standards*, and make reference to relevant parts as appropriate to WMO and / or IOC *Manuals* and *Guides*	Pending. (a) Contractor (to be identified by PP Steering Group and Secretariats) to coordinate production of the *JCOMM Catalogue* (3-4 months total for the catalogue). Table of content to be presented to JCOMM-III. (b) Draft catalogue available at JCOMM-III.	(a) Draft TOC: 1Q 2009 (b) Draft *Catalogue*: 4Q 2009	
	Sub-tasks:			
Chairperson OCG	**3.5.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
Chairperson OCG	**3.5.2** Begin assembly of relevant documentation and / or references.	Pending.	4Q 2008	
Chairperson OCG	**3.5.3** Work with WMO and IOC Representatives to determine what material is appropriate for WMO or IOC *Manuals* and *Guides.*	Pending.	First draft: 1Q 2009	

Deliverable 3: Promote Quality Management standards

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
DMPA, ET-DMP, Contractor	**Action 3.6:** Assemble material or references that describe operations of national or multi-national data management projects particularly as they develop standards. Encourage the authors of the documented practices of contributors to this Pilot Project to submit these to the joint IODE / JCOMM Standards Process.	Pending.	Initial documents: 2Q 2009	
	Sub-tasks:			
Chairperson DMCG, Chairperson ET-DMP	**3.6.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
ET-DMP	**3.6.2** Secure and compare inputs provided by contributors to the Pilot Project.	Pending.	4Q 2008	
ET-DMP	**3.6.3** Mediate differences for resolution.	Pending.	1Q 2009	
IODE-PO	**3.6.4** Post an updated document stating the IODE / JCOMM Standards Process.	Pending.	2Q 2009	

Deliverable 4: Project Management

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
PP Steering Group	**Action 4.1:** Refine the business plan and initiate a cost / benefits analysis.	Pending.	End 2010	
	Sub-tasks:			
PP Steering Group	**4.1.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
PP Steering Group	**4.1.2** As an element of the Business Plan, prepare a cost/benefit analysis.	Pending.	End 2010	

Deliverable 4: Project Management

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Secretariat, contributing centre representatives, WIS Support Team	**Action 4.2:** Nominate Pilot Project Steering Group members to follow up integration of specific data sets and the development of synergies with specific demonstration projects.	Pending. Done for some specific data sets: 1) WOA - Kenneth Casey. 2) WOD - Kenneth Casey. 3) SeaDataNet - Nikolay Mikhaylov, in liaison with Robert Keeley. 4) Argo - Candyce Clark. 5) RNODC/DB - Robert Keeley, in liaison with Nikolay Mikhailov. 6) GHRSST- Kenneth Casey. 7) XBTs - Greg Reed. 8) ICOADS - Robert Keeley to consult with Scott Woodruff. 9) GCCs - Nicola Scott. 10) META-T, ODASMS - Bill Burnett, and Robert Keeley. 11) GTSPP - Kenneth Casey. 12) Virtual const SVW - Kenneth Casey in liaison with Paul Cheng and Stan Wilson. 13) HF Radars - Jack Harlan	Initial: September 2008 Begin: implementation of others: 2Q 2009	
	Sub-tasks:			
PP Steering Group	**4.2.1** Monitor progress, make adjustments and refine targets of action.	Ongoing		
PP Steering Group	**4.2.2** Nomination of Steering Group Members.	**Done** IODE - Mr Greg Reed. CIMO - Mr Rainer Dombrowsky. JCOMM DMPA - Mr Robert Keeley. JCOMM OPA - Ms Candyce Clark. JCOMM ETDMP - Mr Nikolay Mikhaylov. WIS - Mr Eliot Christian. US-IOOS - Dr Jack Harlan. US NODC – Dr Kenneth Casey. MCSS and GCC - Ms Nicola Scott.		

PP Steering Group	**4.2.3** Identify specific data sets, which have the greatest potential for developing synergies with WIGOS pilot and demonstration projects.	Pending.	September 2008	
PP Steering Group	**4.2.4** Approach these projects to see how the ODP-WIGOS Pilot Project for IODE and JCOMM could assist / collaborate through the integration of data sets.	Pending. Solicit responses from agencies whether or not they will contribute.	4Q 2008	
Individual contributors, N. Mikhaylov	**4.2.5** Prepare a strategy for data collaboration with the identified projects.	Pending. R. Dombrowsky to contact NOSA Council (NOAA Observing System Assessment) and see what overall role NOAA could play in WIGOS.	May 2009	
Individual contributors, N. Mikhaylov	**4.2.6** Implement the agreed upon strategy.	Pending.	2Q 2009	

Deliverable 4: Project Management

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
Chairperson PP Steering Group	**Action 4.3** Steering Group Reports, Presentations and Meetings	Pending.	As required	
	Sub-tasks:			
Chairperson of PP Steering Group, R. Dombrowsky	**4.3.1** Prepare and provide periodic status reports on the progress of the PP to the Sub-Group WIGOS-WIS per EC-WIGOS WIS Working Group requirements.	Pending.	Initial report 10-13 November 2008 and as required	
R. Keeley or G. Reed	**4.3.2** Report pilot project progress to JCOMM Management Committee.	Pending	December 2008	
R. Dombrowsky	**4.3.3** Attend Working-Group WIGOS-WIS planning and reporting sessions.	Pending.	16-18 December 2008 and as required	
G. Reed	**4.3.4** Presentation to IODE-XX: Expected outcome: formal endorsement and Resolution from IODE on participation of ODP in this Pilot Project.	Pending.	May 2009	
PP Steering Group	**4.3.5** Meeting to assess progress and address (Action 6.1) Steering Group to address legacy of WIGOS PP.	Pending.	Sep 2009	
R. Keeley	**4.3.6** Presentation to JCOMM-III. Expected outcome: formal endorsement and Resolution calling the WMO and IOC Members to participate and contribute to the Pilot Project.	Pending. Keeley or alternate.	Nov 2009	
PP Steering Group	**4.3.7** Meeting to assess progress and address (Action 6.1) Steering Group to address legacy of PP.	Pending.	September 2010	
	4.3.8 Presentation to JCOMM Management Committee meeting (after JCOMM-III) reporting PP progress.	Pending.	End 2010	
Chairperson of PP Steering Group	**4.3.9** Draft report for WMO Cg-XVI. Legacy of WIGOS proposed by the Pilot Project.	Pending.	End 2009	
	4.3.10 Report to WMO Cg-XVI on legacy of		Early 2011	

	WIGOS proposed by the Pilot Project.			

Deliverable 5: Demonstration projects and capacity building

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
JCOMM, ODP representatives in collaboration with ETRP	**Action 5.1:** Address capacity-building Issues according to the guidelines provided within the document.	Pending. ODP to identify representatives.	3Q 2009	
	Sub-tasks:			
JCOMM, ODP representatives in collaboration with ETRP	**5.1.1** Monitor progress, make adjustments and refine targets of action	Ongoing. Education of staff at RIC. Production of training material.		
S. Belov, CIMO Representative	**5.1.2** Review existing training materials, updating the E2E documentation, and reviewing the marine chapter of the WMO Publication No. 8 (*CIMO Guide*) and update, as appropriate.	Pending.	2Q 2009	
IODE-PO, PP Support Team	**5.1.3** Organize training courses at the IODE Project Office. Suggested themes for training courses to include such topics as E2E technology, WIS interoperability, best practices and standards, instrument evaluation and intercomparison.	Pending. For ODINAfrica and other regions, using OceanTeacher facilities.	Progress report: 3Q 2009	
IODE-PO	**5.1.4** Approach the WMO Education and Training Programme (ETRP) for promoting WIGOS and the JCOMM Pilot Project in developing countries by providing training materials and training courses for their delivery.	Pending. COMET is another resource to consider.	3Q 2009	

Deliverable 6: Legacy

Responsibility:	Actions and related Sub-Tasks:	Status / Comments:	Due Date:	Cost :
PP Steering Group	**Action 6.1:** Address legacy issues in the view to make proposals for the WMO Cg-XVI through the WMO EC WG on WIGOS-WIS and its sub-group, as appropriate.	Pending.	End 2010	
	Sub-tasks:			
PP Steering Group	**6.1.1** Monitor progress, make adjustments and refine targets of action.	Ongoing.		
PP Steering Group	**6.1.2** Prepare its final report for WMO Cg-XVI through the WMO EC WG on WIGOS-WIS and its Sub-group.	Pending.	End 2010	
PP Steering Group	**6.1.3** Conduct meeting to assess pilot progress, address legacy of ODP-WIGOS Pilot Project for IODE and JCOMM, and prepare presentation.	Pending.	End 2010	
Chairperson of PP Steering Group	**6.1.4** Provide presentation of progress to JCOMM Management Committee.	Pending.	End 2010	

ANNEX II

ACRONYMS

Argo	Profiling float programme (not an acronym)
ASAP	Automated Shipboard Aerological Programme
AST	Argo Steering Group (AST)
CB	Capacity-Building
Cg	WMO Congress
CIMO	WMO Commission for Instruments and Methods of Observation
CMM	Former WMO Commission for Marine Meteorology (now JCOMM)
CONOPS	WIGOS Concept of Operations
CTD	Conductivity / Temperature / Depth
DBCP	WMO-IOC Data Buoy Co-operation Panel
DCPC	WIS Data Collection and Production Centre
DMAC	IOOS Data Management and Communications (USA)
DMCG	JCOMM Data Management Coordination Group
DMPA	JCOMM Data Management Programme Area
E2E	End-to-End data management
EC	Executive Council
EC-LX	Sixtieth WMO Executive Council
EC WG WIGOS-WIS	WMO Executive Council Working Group on WIGOS-WIS
ET	Expert Team
ETDMP	IODE-JCOMM Expert Team Data Management Practices
ETRP	WMO Education and Training Programme
GCC	Global Collecting Centres
GDAC	Global Data Assembly Centre
GHRSST	GODAE High-Resolution SST Pilot Project
GISC	WIS Global Information System Centres
GLOSS	Global Sea Level Observing System
GLOSS	Global Sea Level Observing System
GODAE	Global Ocean Data Assimilation Experiment
GOSUD	Global Ocean Surface Underway Data Pilot Project
GTSPP	Global Temperature and Salinity Profile Programme
HMEI	Association of Hydro-Meteorological Equipment Industry
ICOADS	International Comprehensive Ocean and Atmosphere Data Set
ICSU	International Council for Science
IGOSS	Former WMO-IOC Integrated Global Ocean Services System (now JCOMM)
INSPIRE	Infrastructure for Spatial Information in Europe
IOC	Intergovernmental Oceanographic Commission
IOCCP	IOC International Ocean Carbon Coordination Project (IOCCP)
IODE	International Oceanographic Data and Information Exchange (of IOC)
IOOS	Integrated Ocean Observing System (USA)
ISDM	Integrated Science Data Management (Canada)
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
MCSS	WMO Marine Climatological Summaries Scheme
META-T	Water Temperature platform/instrument Metadata
MMR	Master Metadata Repository
NC	WIS National Centre
NDBC	NOAA National Data Buoy Centre (USA)
NODC	IODE National Oceanographic Data Centre
OceanSITES	Ocean Sustained Interdisciplinary Timeseries Environment observation System
OCG	JCOMM Observations Coordination Group
ODIN	Ocean Data and Information Network (of IOC)

ODP	IOC / IODE Ocean Data Portal
ODP-WIGOS PP	Joint ODP and WIGOS Pilot Project for IODE and JCOMM
OPA	JCOMM Observations Programme Area
PSMSL	Permanent Service for Mean Sea Level
QA	Quality Assurance
QC	Quality Control
QM	Quality Management
QMF	WMO Quality Management Framework
QMS	Quality Management System
RA	WMO Regional Association
RRR	Rolling Review of Requirements
SeaDataNet	Pan-European infrastructure for Ocean & Marine data Management
SOOPIP	Ship Of Opportunity Programme Implementation Panel
SOT	JCOMM Ship Observations Team
SST	Sea Surface Temperature
TAO	Array of Tropical moorings
VOS	Voluntary Observing Ship
VOSClim	VOS Climate Project
WDC	ICSU World Data Centre
WIGOS	WMO Integrated Global Observing Systems
WIS	WMO Information System
WMO	World Meteorological Organization
WWW	World Weather Watch
XBT	Expendable Bathythermograph

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APPENDIX C

THE WIGOS PILOT PROJECT FOR JCOMM (OUTLINE)

(6 November 2008)

"Integration of marine meteorological and other appropriate oceanographic observations into the WMO Integrated Global Observing Systems"

Project Name	**WIGOS Pilot Project for JCOMM**
Acronym	N/A
Project Type	Pilot
Project Status	The pilot has defined a detailed implementation plan at the meeting of the joint Steering group for the IODE Ocean Data Portal (ODP) and the WIGOS Pilot Project for JCOMM (Geneva, 18-19 September 2008). The Project plan was defined at the *ad hoc* planning meeting for the JCOMM Pilot Project for WIGOS (Ostend, Belgium, 29 March 2008). Mechanisms have been defined for providing input to the CIMO Guide (WMO No. 8) and other appropriate JCOMM documentation. A standards process for developing ocean data standards is being established in cooperation with IOC. The development of a JCOMM Catalogue of Best Practices and Standards is planned. Thirteen key potential partners have been identified (see below) for providing data through WIS. The Pilot Project is considering establishing regional marine instrument centres. It is engaging in a stronger cooperation with HMEI.
Project Overview	Development of the Pilot Project is coordinated by a Steering Group, providing liaison with appropriate WMO Programmes and Technical Commissions, the WMO EC-WG on WIGOS-WIS (and its sub group), and the International Oceanographic Data and Information Exchange (IODE) of IOC. The Steering Group is responsible for producing the Pilot Project Plan and promoting the continued development and implementation of a system of interoperable systems that provides consistent, documented data and information of known quality from a sustained and coordinated global ocean observing system. Three components are proposed in the development of the Pilot Project: (i) promote and document instrument best practices and related standards, (ii) build marine data systems that are interoperable with WIS and (ii) promote quality management and standards. The Project will recognize and respect the ownership of all partner organizations as well as the WMO and IOC data policies.
Project Aims	Enable the integration of marine and other appropriate oceanographic observations (in situ, surface marine and satellite), real time and delayed mode data and products (e.g. models) within the oceanographic marine community. The Pilot Project will also consider assembled in situ fields, biochemistry, model outputs, surface and underwater marine climatologies and measurements. The Pilot Project will aim at making the appropriate identified data sets interoperable with the wider WMO and IOC communities. It will develop and agree on consistent standards to be used across the community. It will increase accessibility of data; ensure standards and best practices; as well as set guidelines regarding Capacity Building and training programme.

Partners/Participants	• International organizations co-sponsoring GOOS: WMO, IOC, UNEPand ICSU • WMO and IOC Technical Commissions and Programmes (e.g. CIMO, CBS, GOOS and IODE) • WMO Information Systems and its Expert Teams, ICT-WIS • Ocean Data Portal and ETDMP Task Team on ODP/JCOMM Pilot Project WIGOS • ETDMP Task Team on standards process • IODE Ocean Data and Information Networks (ODINs) • JCOMM E2E prototype (Russian Federation NODC, Obninsk) • Instrument centres • Observing Panels • Association of Hydro-Meteorological Equipment Industry (HMEI) • Partners hosting relevant data sets (*in situ*, space based ocean observations data sets, as well as products) o Integrated data sets ▪ The World Ocean Database (WOD); ▪ SeaDataNet; ▪ The Global Temperature and Salinity Profile Programme (GTSPP); o Data from specific networks ▪ Argo profiling float data; ▪ RNODC/DB (drifter data); ▪ XBT data; ▪ Instrument / platform metadata (META-T, ODASMS); o Remote sensing ▪ The Virtual constellation for Ocean Surface Vector winds; ▪ The GODAE High-Resolution SST (GHRSST) Pilot Project; ▪ Surface based remote sensing (e.g. HR Radar); o Climatologies ▪ World Ocean Atlas (WOA) ▪ Marine Climatological Summaries, e.g. Delayed-mode VOS data collected by the Global Collecting Centres (GCCs) ▪ Blended quality climatology products such as the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) o Metadata about the platforms/instruments (e.g. META-T) • Additional participants and partners to be discussed and defined
Funding Source(s)	The project, to the maximum extent, will, make use of the expertise to be provided through the working structure of JCOMM, IOC IODE, and its WIGOS partners. Additional support will be required through the WMO budget and/or WIGOS-WIS Trust Fund. The Members will meet implementation costs.

Project Timescale	2007 – Mid-2008: Establishment of the Pilot Project and proposal for its Steering Group Terms of Reference and Membership; Sept 2008: First meeting of the Pilot Project Steering Group; Adoption of the project implementation plan Nov/Dec 2008: Reporting to the WMO EC WG WIGOS-WIS; End 2008 – 2009: discussions with partner observing programmes (DBCP, SOT, GLOSS, Argo, etc.) and organizations (IOC and IODE); November 2009: Third Session of JCOMM; 2010-2011: Implement the projects; End 2010: Report to Congress XVI finalized; Implementation schedule will depend upon how well WIS is progressing.
Expected Key Deliverables	The Pilot Project will address Result Based Management of WMO and IOC (i.e. it will link its deliverables to the Expected Results). The Pilot Project will have the following deliverables: (i) Business plan to be used by the directors of NMHS and Oceanographic institutes to make the case at the national level for engaging in the necessary developments, funded nationally, to meet the requirements for the Pilot Project; (ii) Project Plan; (iii) Implementation Plan; (iii) Documenting and integrating instrument best practices and related standards among the marine meteorological and oceanographic communities; (iv) Build marine and oceanographic data systems that are interoperable with the WMO Information System (WIS) in close cooperation with the IOC ocean community; (v) Promote quality management and standards and establishing compliance with the WMO Quality Management Framework (QMF); (vi) Participation in the CBS Rolling Review of Requirements (RRR) process and provide input to the WMO Database (instrument performances and requirements).
Project Links	http://www.wmo.int/pages/prog/www/wigos/index_en.html http://www.oceandataportal.net http://www.oceandatastandards.org

Project Summary	The Pilot Project is an interdisciplinary exercise seeking the integration of *in situ* and space based observing systems. These will be implemented and sustained by the WMO and IOC Members through JCOMM in order to make appropriate data sets available in real-time and delayed mode to WMO and IOC applications through interoperability arrangements with the WIS and ODP. The data sets will be produced according to agreed upon standards and the quality control procedures documented according to QMS principles. This integration will enhance the coherence and consistency of the data sets and the availability of relevant instrument/platform metadata. More timely and better quality data will be expected while duplicates will be minimized. **-1- Documenting and integrating best practices and standards**. The goal is to define and agree on common standards between the meteorological (WMO) and oceanographic (IOC) communities for instruments and methods of observation as well as subsequent organization and handling of the data and information to serve consistent and better quality data to both the broad user and modelling communities. **-2- Making marine data systems and WIS interoperable**. The goal is to provide access to marine meteorological and oceanographic data and information to serve a number of applications, including climate. This shall be done in an integrated way via the WIS and thereby facilitating access to well documented and standardized data. Much work remains to develop interoperability between the WMO and IOC communities at both the data discovery (metadata) and data level (compatible formats). The Pilot Project will address these two aspects. **-3- Quality Management**. The goal is to coordinate the development of cost-effective Quality Management Systems by Members and to propose practical solutions or examples. At different steps of the data production line, it is expected that improved quality management will result in better, timelier data, minimized duplication, and an operational data delivery system. This will be achieved through the compilation of regulatory documentation in a way consistent with the eight Quality Management Principles developed under ISO/TC176/SC2/WG15 (User/customers focus, Leadership, Involvement of people, Process approach, System approach to management, Continual improvements, Factual approach for decision making and, Mutually beneficial supplier relationships).
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