WORLD WEATHER WATCH
COMMISSION FOR BASIC SYSTEMS

World Meteorological Organization
Working together in weather, climate and water

ICT-ISS

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REPORT FROM IPET-MDRD TO ICT-ISS

Future work plan for IPET-MDRD provided in document [D04.04(3)].

Issues to raise ICT-ISS

1. Helping Members take advantage of opportunities offered by technological developments (see [D04.04(4)]).
2. Use of wider community to develop technical regulation and guidelines (see [D04.04(5)]); capacity challenges for Expert Teams.
3. Proliferation of code forms in WMO No. 306 Part D.
4. Validation of data exchange specifications must be robust; 'approval' should not be based on their being no objections (e.g. there were no comments raised at Cg against METCE and IWXXM), there needs to be demonstration through implementation that it 'works' (e.g. W3C and IETF require demonstration that two independent implementations have passed a test suite). [ref. WIGOS MD Application Schema development]
5. Insufficient time available for public consultation of WIGOSMD Application Schema; formally, Mr Aubert (EUMETSAT) notes that he is unable to endorse the data model on behalf of the CGMS community without further review on an acceptable timescale.
6. Policy clarification required. In response to TT-GISC's request that WCMP include a mechanism to assert that transmission of [operational] data is ongoing or stopped and the begin/end time of transmission, MDRD notes the current policy to delete metadata records associated with obsolete data exchange. MDRD also notes that the 'archive' dataset is a different resource to the operationally exchanged content - each requiring a different metadata record' e.g. the 'global collection' DCPC for buoy data provides access to archive data as a supplement the operational data streams from NCs.

Requirements for / recommendations for other teams within OPAG-ISS

1. **REQUIREMENT** (ET-WISC): GISCs include style-sheet directive in OAI-PMH response that can be processed by browsers to render a human readable response to OAI-PMH request.
2. **REQUIREMENT** (ET-WISC): GISCs generate a notification / error report if data is received where there is no metadata record; error reports should be sent to the originating centre and be available for the generation of statistics as part of the metadata quality monitoring regime.

3. **RECOMMENDATION** (IPET-DRMM): documentation for future versions of TDCF (GRIB, BUFR, CREX) include the URLs used to identify each term within the WMO Codes Registry.
4. **RECOMMENDATION** (IPET-DRMM): all code lists, including those related to WIGOS MD, should be managed using the same procedures. (see MDR/a/8)

Status of tasks assigned to IPET-MDRD within ISS Work Plan

Please refer to **Annex A** for details of those tasks not discussed during IPET-MDRD-4.

MDR/a/7: Publication of WMO code-table resources as web-accessible registers

The WMO Codes Registry (http://codes.wmo.int) was initially deployed in 2013 to support Aviation XML. It has since been updated, incorporating many functional enhancements within the underlying software. Updates to technical and user documentation are in progress and planned for completion by Met Office in 2016 (see http://test.wmocodes.info/ui/about for current status; all feedback welcome).

IPET-MDRD recommends that WMO Codes Registry is formally adopted as a complement to the WMO Technical Regulation, providing a machine-readable repository for code lists - noting that the Manuals remain the authoritative source of the code lists.

Maintenance of the registry content remains an ongoing task (see **MDR/a/8**).

MDR/a/8: Use of web-accessible registers to support TDCF

ONGOING. Procedure developed to enable robust management of changes and validation of new content prior to publication on WMO Codes Registry.

BUFR Table B, BUFR Code and Flag tables, and GRIB (Ed 2) Code tables 0.0, 4.1, 4.2, 4.5 and 4.10 have been populated within the WMO Codes registry.

In addition, IPET-MDRD have been collaborating with TT-WMD (WIGOS Metadata) and TT-ACV (Atmospheric Chemistry Vocabulary) to publish web-accessible code lists for their needs; currently still in experimental phase.

To encourage standardisation of code list development across all Expert Teams, IPET-MDRD recommend a set of principles for managing code lists and entries (see **Annex B**)

Governance and workflow for maintaining the registry content are under development. New code lists and terms should be added to the codes registry in parallel to their release for publication via other channels.

One particular concern is the need to support the WIGOS implementation. IPET-MDRD noted the need to avoid the duplication of content within WMO Codes Registry; recommending that terms from WIGOS Table (1-01) “parameters” be added to Common Table D2 “quantity-kind”.

IPET-MDRD also noted that navigation within the WMO Codes Registry is confusing. To improve the user experience, the top-level navigation needs to be improved. In support of

this, IPET-MDRD recommended that new root-level categories within WMO Codes Registry would use human-readable short names for register names rather than the WMO No. of the manual/regulation associated with the code list(s); e.g. code tables for WIS would be registered under /wis rather than /1060, and code tables for WIGOS MD registered under /wigosmd rather than /1160.

IPET-MDRD identified a number of enhancements for the WMO Codes Registry. These are identified in the Work Plan [D04.04(03)].

MDR/a/14: Provision of WIS DAR metadata guidance & examples

Metadata guidance will be published in two parts:

I. Part 1: providing a template-driven approach aimed at helping authors of metadata include the appropriate content in their metadata records. This is based on work developed for by Coordination Group for Meteorological Satellites (CGMS).
II. Part 2: providing details of XML encoding and aimed at a technical audience such as developers of metadata management tools.

Part 1 will form part of WMO No. 1061 Guide to WIS; Part 2 will be published only via the WIS wiki (see http://wis.wmo.int/page=MDG_Guide) in English only.

IPET-MDRD anticipates metadata authors being abstracted away from the XML encoding through the use of software tools provided by their affiliated GISCs. Several examples of such tools were demonstrated during IPET-MDRD-4.

Part 1 of the metadata guidance is intended to provide authors with insight into the common elements required to make WIS work (e.g. title, abstract, fileIdentifier, data license and granularity) using a “generic template”. Part 1 will also include a set of specialised templates for routinely exchanged data types (e.g. SYNOP; surface, upper air land, ship, buoy, etc.). The aim is to help metadata authors identify what information content is required when creating good metadata and where they might find that information.

Part 1 (draft) will be complete by 31 August 2016. Part 2 (draft) will be complete by 17 October 2016 for expert review prior to CBS16.

MDR/a/15: Evolution of WMO Core Metadata Profile specification

ONGOING. Changes proposed by the National Focal Points for WIS Metadata are managed ex-committee by IPET-MDRD subject to the documented process. See http://wis.wmo.int/page=DM-Changes for details of current change proposals.

MDR/a/16: Develop WMO Discovery Metadata Core Profile v2

The current version of WMO Core Metadata Profile is based on ISO 19115:2003 and ISO/TS 19139:2007; the former was has been superseded by ISO 19115-1:2014 and the latter is expected to be replaced by ISO/TS 19115-3:2016(e) during 2016; as of June 2016, release is still pending.

IPET-MDRD note that ISO 19115-1:2014 provides incremental improvement but there are currently few signs of the standard being adopted by the geospatial information community.

In contrast, there remain strong requirements for additional guidance on preparing & managing metadata and for structuring metadata catalogues to improve search. IPET-MDRD

concluded more benefit would be provided to WIS through improving metadata quality in general (through development of further guidance etc., see **MDR/a/14**) rather than developing a new version of the WMO Core Metadata Profile.

Adoption of ISO 19115-1:2014 and ISO 19115-3:2016(e) within the WMO Metadata Core Profile will be deferred until CBS-Ext(2018) at the earliest. In the interim, IPET-MDRD (or its successor) should to continue to assess the value to be realised from adoption of ISO 19115-1:2014 within the meteorological community; validating national / organisational implementation experience to determine and collate best practice. Members are encouraged to assess the value of ISO 19115-1:2014 and ISO/TS 19115-3:2016(e) for use in their local operations, and to share their experiences with IPET-MDRD through their National Focal Point on WIS Metadata.

IPET-MDRD noted that adoption of ISO/TS 19115-3:2016(e) will also enable the inclusion of ISO 19115-2:2009 (Metadata -- Part 2: Extensions for imagery and gridded data) which is already in widespread usage. Currently organisations that use ISO 19115-2, such as EUMETSAT and NOAA, are required to 'downgrade' their metadata from ISO 19139-2:2012 to publish metadata to WIS.

IPET-MDRD recommend that WCMP should adopt code tables from ISO 19115-1:2014 on a case-by-case basis as deemed necessary.

The delayed to adoption of ISO 19115-1, and consequential opportunity for harmonisation with Marine Metadata Profile, to be communicated by Secretariat to JCOMM

MDR/a/17: Provision of "metadata quality assessment techniques" and of analysis/validation tools

Monitoring the quality of metadata in the WIS DAR Catalogue has not been progressed beyond the validation of WIS DAR metadata analysis tooling (see **MDR/a/12**). This topic was not included in the scope of the WIS monitoring pilot.

IPET-MDRD recommends that a periodical (e.g. monthly) monitoring regime of metadata records within the WIS DAR catalogue be established to assess the quality of metadata-including tracking of 'missing' metadata.

Such assessment would need to be supported by software tooling. IPET-MDRD recommend that NOAA's rubric be considered as the primary option, and note that plans are in place to enhance the rubric to support catalogue-wide assessment of metadata quality.

In addition, working procedures for engagement with GISCs must be defined to enable metadata quality issues identified though assessment to be effectively resolved.

MDR/a/18: IWXXM incremental changes to support ICAO Annex 3 Amd 77 (Aviation XML)

Delivery of IWXXM 2.0 in response to ICAO Annex 3 Amd 77 will be submitted to CBS16 as "pre-operational" following 2-month pubic consultation through June and July 2016.

In addition to meeting new requirements from Amd 77, IWXXM 2.0 deprecates use of the Simple Aeronautical Features (SAF) package in favour of referencing the Aeronautical Information Exchange Model (AIXM) industry standard.

Dr Fucile, chair of TT-AvXML noted the lack of resources available to contribute to this work item, and the consequent challenges in delivering to agreed timescales.

MDR/a/19: OGC TimeseriesML and OGC WaterML2 Part 1 Timeseries incorporated within WMO technical regulation

The development of TimeseriesML was successfully undertaken within the Open Geospatial Consortium (OGC). *Timeseries profile of Observations and Measurements* (OGC #15-043r3) and *TimeseriesML 1.0 - XML Encoding* (OGC #15-042r3) are approved by the OGC Technical Committee and are pending publication.

To minimise overhead, the regulatory material for inclusion in WMO No. 306 Part D ("FM 221 TimeSeriesML") normatively references the OGC TimeseriesML standard.

This is a significant occurrence: it is the first time that WMO will adopt another organisation's [technical] standards. Not only does this help address concerns regarding capacity within Expert Teams, it should also significantly help interoperability with the wider [open data] community.

When the work item for TimeseriesML was established in OGC, IPET-MDRD anticipated that the OGC hydrology domain working group would seek to amend WaterML2 Part 1 Timeseries (OGC #10-126r4) to derive from TimeseriesML. However, there appears little appetite within OGC to undertake this change. Consequently, the only feasible solution that meets the needs of CHy to include WaterML 2.0 - Part 1 Timeseries in WMO technical regulation.

As for TimeseriesML, the regulatory material proposed for inclusion in WMO No. 306 Part D normatively references the OGC WaterML 2.0 - Part 1 Timeseries standard.

METCE, the conceptual model underpinning the model-driven data exchange standards, has undergone minor amendments in order to support a wider range of meteorological data exchange scenarios and to improve alignment with other profiles of ISO 19156 Observations and Measurements (such as TimeseriesML). This is released as METCE 1.2.

Updates to regulatory material are ready for translation.

MDR/a/20: Represent WIGOS metadata

A formal XML data format is required to support roll-out and adoption of the WIGOS Metadata Specification.

The 'WIGOS MD Application Schema' formalises the requirements specific in WMO No. 1160 WIGOS Metadata Specification in a manner consistent with WMO METCE and the ISO 19100-series of geographic information standards and provides the basis from which an XML encoding can be derived.

The WIGOS MD Application Schema has been developed over the last 12-months, suffering the acute lack of technical resource as did IWXXM development. The data model (and related XML encoding) has been "90% stable" for the last six months. The data model builds on both METCE and TimeseriesML.

Alignment with INSPIRE Environmental Monitoring Facility has been evaluated; the experts believe that the concepts underpinning the WIGOS MD and the INSPIRE Environ-

mental Monitoring Facility schemas are sufficiently aligned, albeit as partially overlapping sets of concepts) that a single repository/database would be able to hold the information required to support both WIGOS and INSPIRE requirements. A Guidance note will be provided explaining the alignment of the WIGOS MD and INSPIRE Environmental Monitoring Facility schemas.

Public review has been limited to desk-study assessment; concerns remain whether the majority of reviewers have sufficient skills to assess the Application Schema. As of discussion during IPET-MDRD-4 (May 2016) there had been no software based testing of the proposed model (e.g. defining a simple API and building a client / server pair to see how the data model supports management of observing system capability). Such testing requires volunteers to invest resources- which few are willing to do prior to approval of the data exchange specification as Technical Regulation.

The candidate WIGOS MD Application Schema has been released for a 2-month public consultation through June and July 2016, emphasising the need to focus on elements that relate to Phase 1 of WIGOS Metadata implementation.

Assessment of alignment with OGC SensorML is anticipated within the consultation period.

IPET-MDRD anticipate creation of the regulatory material for inclusion in WMO No. 306 Part D (“FM 241 WMDR-XML - WIGOS Metadata Record”) to be largely automated through derivation from the UML model.

Regulatory material presented to CBS16 will address only the elements required for WIGOS phases 1 and 2.

MDR/a/22: Establish mappings from WMO codes to CF-Standard names under shared governance with CF community

IPET-MDRD are collaborating with the British Oceanographic Data Centre (BODC), who publish the CF-Standard names on behalf of the CF community (http://vocab.nerc.ac.uk/collection/P07/current/), to establish a community process for capturing and maintaining the mappings between terms from WMO No. 306 Manual on Codes and CF-Standard names. Under the leadership of a member of IPET-MDRD, the Metarelate project (see http://www.metarelate.net and http://www.metarelate.net/metOcean) is developing services and tools to make mappings between GRIB and CF-netCDF available within decoder software. Speed of progress is limited by the capacity of the collaborating organisations.

IPET-MDRD recommends that this activity continue ouring the next CBS Session.

ANNEX A: STATUS OF REMAINING WORK ITEMS

MDR/a/1: Delivery of Aviation XML Standard

COMPLETED. Regulatory material for first version of Aviation XML and underpinning METCE components approved by CBS-Ext(2014) and endorsed by Cg-17 / EC (2015). New volume of WMO No. 306 Manual on Codes established for this purpose: Volume I.3, Part D – Representations derived from data models.

MDR/a/2: WaterML2 standardisation

REPLACED. See **MDR/a/19**.

MDR/a/3: Further development of WMO METCE (logical data model) - surface-based climate observations

REPLACED. See **MDR/a/20**.

MDR/a/4: Standard for serialisation of WMO METCE using Common Alerting Protocol (CAP)

REMOVED. ICT-ISS (2014) concluded that there was no requirement for a WMO CAP profile. Responsibility driving a consistent approach amongst Members and reporting on usage of CAP was identified by ICT-ISS as a Public Weather Service function and outside the scope of OPAG-ISS.

MDR/a/5: Automated transformation of WMO METCE Application Schema to TDCF-templates

DEFERRED. Best practice approaches for development of Application Schema are yet to emerge within the WMO community. Should there be a requirement, IPET-MDRD recommend that this should be addressed within the next CBS session.

MDR/a/6: Further development of WMO METCE (logical data model) - upper-air climate observing networks

REPLACED. Description of upper-air climate observing networks should be within the scope of the WIGOS Metadata. See **MDR/a/20**.

MDR/a/9: Recommendation of keyword thesauri for WIS DAR metadata

COMPLETE. Publication of code tables from WMO No. 306 Manual on codes within the WMO Codes Registry (see **MDR/a/7**) enables those code tables to be used as keyword thesauri within WIS DAR metadata. Guidance on how to cite the thesaurus within which a given keyword is published (see **MDR/a/14**). Furthermore, given the use of code lists in WIGOS and METCE, IPET-MDRD recommend that IPET-DRMM (or its successor) should produce and maintain a consolidated set of code lists for use within WIS.

MDR/a/10: Use of XLINKs within WIS DAR metadata

COMPLETE. The use of XLinks within WIS DAR metadata is not recommended. WIS DAR catalogue implementations will not attempt to resolve Xlinks. Therefore WIS centres are encouraged to resolve any Xlinks in their metadata records prior to publishing their metadata records to the WIS Discovery Metadata Catalogue.

MDR/a/11: WIS DAR metadata education programme

COMPLETE. Contributions provided to the WIS Competency Framework and WIS Training Guide - particularly relating to **Competency 4: Manage the data discovery**. IPET-MDRD decided to focus on providing improved guidance and validation / quality assessment tools for metadata authors (see **MDR/a/12** and **MDR/a/14**) rather than establish a formal program of training workshops, noting that it is the responsibility of GISCs to provide training for their affiliated WIS centres. IPET-MDRD will maintain an FAQ for metadata issues. [plus secretariat training workshops; DThomas: "metadata training is the most critical aspect of the WIS training; would like metadata experts to participate in these training activities"]

MDR/a/12: WIS DAR metadata analysis tooling

COMPLETE. Pilot of metadata analysis tool completed based on NOAA's 'rubric' implementation. The Bureau of Meteorology have developed a component for GeoNetwork that validates software against the WMO Core Metadata Profile. See also **MDR/a/17**.

MDR/a/13: Change / defect management tooling for WMO Core Metadata Profile

COMPLETE. Issue tracker implemented within WIS wiki (see http://wis.wmo.int/page=DM-Changes) and associated procedures documented (see http://wis.wmo.int/file=1295).

MDR/a/21: Registration of WMO Application Schemas with ISO/TC 211 (as profiles of ISO 19156:2011 O&M)

REMOVED. Secretariat (Data Management branch) have been exploring options with the ISO/TC 211 secretariat to enable WMO Application Schema to be registered as profiles of ISO 19156:2011 Observation and Measurements. However, at present, there appears little value in exploring these options further.

ANNEX B: PRINCIPLES FOR GOVERNING CODE LISTS

These principles are intended to encourage consistency between code lists (also known as controlled vocabularies) used in WMO data representations. The should be applied to all new code lists.

1. Do not create a new term if there is an existing term with the same definition. Terms in a code list should be drawn from existing code lists, provided the term being defined is the same in both lists. The URI of the term in the new list must be the same as in the original list (or if the data representation does not permit URIs, the definition must refer to the URI). The definition must be the same as in the original list. *This allows applications to extend or restrict the values permitted for a particular application while retaining a clear link between the meaning of terms in different code lists.*

2. Do not create a new code list if there is an existing code list that meets the requirement. *Though it may be necessary to create a synonym for the list to conform with the naming conventions used in that context.*

3. Each term in a code list must have a URI that permanently identifies it. .

4. Each code list must have a URI that permanently identifies it.

5. When introducing a new term that is related to an existing term, use SKOS to link the two terms to indicate whether the new term is broader or narrower than the existing one. SKOS should also be used to note that two terms are synonyms when updating existing code lists.

6. Once approved for inclusion in a code list, a term must never be removed from that list, though it may be marked as not permitted for use in that list. *This is to ensure that information records created before the term was taken out of use remain meaningful, and that the term definition remains available for any code lists that re-use it.*

7. The meaning of terms must not be changed to be more restrictive. If a term has to be made more restrictive (for example because a single category had to be divided into several sub-categories), then new terms should be defined that have new URIs. *Making a term more restrictive could lead to inappropriate interpretation of pre-existing information records. Broadening the definition of a term may in some cases be permissible, but could cause difficulties in code lists other than the one that proposed the change.*

8. WMO terms may use URIs provided by other organizations (such as ISO) provided that organization uses the principles 1, 6 and 7.