

WORLD METEOROLOGICAL ORGANIZATION

SECOND WIGOS WORKSHOP ON QUALITY MONITORING AND INCIDENT MANAGEMENT

Geneva, Switzerland, 15-17 December 2015



FINAL REPORT



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AGENDA

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EXECUTIVE SUMMARY

The second WIGOS Workshop on Quality Monitoring (QM) and Incident Management (IM) was held at the WMO Headquarters in Geneva, Switzerland, from 15 to 17 December 2015.

The Workshop continued progress from the 1st WIGOS Workshop on QM and IM held at Geneva, 10-12 December 2014, and had the primary aim of discussing and refining the development of the Quality Monitoring and Incident Management pilot projects. A significant outcome was the preparation of detailed plans and recommendations for the GOS implementation of the WIGOS Data Quality Monitoring System (WDQMS), which is one of the five priorities for the Pre-operational Phase of WIGOS (2016-19).

The Workshop noted the current monitoring capabilities by the lead centres in various WMO Regions, reported by Kenya, Japan, USA, Indonesia, Germany, Canada and Tanzania and was also informed about the development of NWP based monitoring capabilities, as reported by ECMWF, NCEP and EUMETNET. The Workshop also received reports relating to the monitoring practices of other WIGOS component systems, including GCOS, JCOMMOPS, GAW and AMDAR.

Further to the Quality Monitoring function and the Incident Management function, the additional function of Quality Evaluation was identified as an important component of the WDQMS. This function involves the analysis and assessment of quality monitoring results and other information relevant to the performance of the observing networks and provides key information to the Incident Management system on observing system quality issues. The functional requirements, design and potential resource requirements for each of the three WDQMS components were more fully described and documented.

The Workshop agreed and consolidated the plans for a Demonstration Project to be developed and implemented in WMO Region I to test the end to end functionality and outputs of each of the three components of the WDQMS.

A set of actions and milestones were agreed for the further technical development of the WDQMS, particularly those required for the implementation of the Demonstration and Pilot projects in 2016.

It was agreed that, during 2016 the focus would remain on establishing the WDQMS functionality to support improvements to the land based components of the GOS, noting the need that the design should ensure extensibility to the requirements of other component observing systems of WIGOS in the future.

GENERAL SUMMARY

1. SESSION A - OPENING AND ORGANIZATION OF THE WORKSHOP

The opening session of the 2nd WIGOS Workshop on Quality Monitoring and Incident Management was held at the WMO Headquarters in Geneva, Switzerland, on Tuesday the 15 December 2015.

1.1. Welcome and Opening remarks

Mr Stuart Goldstraw (United Kingdom of Great Britain and Northern Ireland), the Chair of the Workshop, opened the session at 09:30 local time, 15 December 2015 and he invited Dr Wenjian Zhang, the Director of the WMO Observing and Information Systems Department, for the welcome address. Dr Zhang welcomed the participants on behalf of the WMO Secretary General, Dr Michel Jarraud and started by noting the opportunity of the Pre-operational Phase of WIGOS for further development and improvement of WIGOS during the next 4 years. He underlined the importance of the 2nd WIGOS Workshop on Quality Monitoring and Incident Management, as an essential step for the development of the WIGOS Data Quality Monitoring System (WDQMS), which is one of the five priorities of the WIGOS Pre-operational Phase. He recognized that there has been a need for a long time, for tools such as the WDQMS that provide the operational status of WIGOS observing systems at all times. Dr Zhang noted that there are several global centres that undertake monitoring of observations, but these are mostly limited to monitoring of data availability of the meteorological component in non-and are not focused on real-time monitoring. He underlined the need for a new system that provides near real-time monitoring of all atmospheric variables that would allow Members to be informed of their national observing systems status in terms of both quality and availability. Dr Zhang mentioned the need for voluntary contributions from Members to develop and resource the operation of the WDQMS, noting the case of the funding of the development of OSCAR (Observing System Capabilities Analysis and Review tool). He also mentioned the role of the Regional WIGOS Centres (RWC) in the WDQMS and the impacts on improved services that Regional Associations are expecting for their Members from the implementation of monitoring and incident management activities. Dr Zhang underlined the need to expand the monitoring systems to include all WIGOS observing components, such as atmospheric composition and cryospheric observations. Finally, Dr Zhang wished participants a successful outcome and a pleasant stay in Geneva.

1.2. Introductory remarks – goals of the workshop

Mr Goldstraw noted one of the key challenges of the Workshop was to draft a detailed plan for the development of the WDQMS. He mentioned the importance of the links between the WDQMS and related activities under the Global Data Processing and Forecasting System (GDPFS) and the WMO Information System (WIS). Mr Goldstraw also mentioned monitoring results produced every 6 months by the Japan Meteorological Agency (JMA) as providing a good example of best practice in quality monitoring and fault analysis at regional level. It was highlighted the need for the workshop to define the terms of reference and requirements for an entity or centre that could undertake analysis of issues highlighted by monitoring systems and work closely with Members to rectify problems, including long standing quality issues. He noted that we should also learn from the best practices of other related programmes, such as the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology in-situ Observations Programme Support Centre (JCOMMOPS) and the Global Climate Observing System (GCOS). Mr Goldstraw underlined some of the major issues that the WDQMS should be able to address, such as identifying and quickly rectifying silent stations and identifying where data latency is impacting on the usefulness of observations exchanged internationally. He suggested that the two major components of the WDQMS, the Quality Monitoring (QM) component and the Incident Management (IM) component, will have inter-dependencies and interfaces that will need to be considered in planning and development. He also suggested that the scope of the QM and IM pilot projects should be clearly defined by the Workshop. Mr Goldstraw mentioned that the developing WDQMS should make best use of existing functionality so as to minimize the cost impact on Members. Nevertheless the value of the WDQMS will be to make the global observing systems more effective by increasing the availability of data that at least meets minimum quality requirements. Finally, he mentioned the different requirements for functionality of the WDQMS depending on the various roles at different levels, including: Global Monitoring, Regional Evaluation of issues and the ownership and resolution of corrective actions.

1.3. The WDQMS in the context of the WPP

Dr Lars Peter Riishojgaard, WIGOS Project Manager, WMO Secretariat, briefly explained the role and the functionality of the WDQMS in terms of the implementation of WIGOS and its importance within the key activity areas number 4 (Observing System Operation and Maintenance) and number 5 (Quality Management) of the WIGOS Implementation Plan (WIP). Dr Riishojgaard outlined the key WIGOS deliverables approved by the 17th session of the World Meteorological Congress (Cg-17), including the WIGOS Technical Regulations (WMO-No. 49, Volume I, Part I) and the Manual on WIGOS. He mentioned that in order for WIGOS to become fully operational by 2020, as expected, further development and implementation was required in the following five priority areas defined for the Pre-operational Phase of WIGOS: (i) WIGOS Regulatory Material; (ii) WIGOS Information Resource, including OSCAR; (iii) WIGOS Data Quality Monitoring System (WDQMS); (iv) Regional WIGOS Centers; (v) National WIGOS Implementation, coordination and governance mechanisms. Dr Riishojgaard underlined the relation between priorities (ii) and (iii), and their relevance to enabling WMO and Members to assess the performance and capabilities of observing systems. He explained that OSCAR comprises three components (OSCAR/Requirements, OSCAR/Space and OSCAR/Surface) and would facilitate the practical implementation of the WIGOS Metadata Standard (endorsed by Cg-17, as part of the Manual on WIGOS), an outcome which would result from one of the first successful joint efforts by different communities (Weather Watch, Global Atmosphere Watch, Hydrology, Global Cryosphere Watch, Climate, Marine Meteorology, Aeronautical Meteorology) to define and use common terminology supporting interoperability under the WIGOS framework. Finally, Dr Riishojgaard explained the fundamental roles of OSCAR and the WDQMS in that OSCAR defines “what WIGOS is” and the WDQMS assesses “how well WIGOS works” and suggested that the Workshop should discuss and deliberate on the possible inter-relation and integration of these two systems.

1.4. Review of the outcomes from the 1st workshop

Mr Goldstraw summarized the proceedings and outcomes of the 1st WIGOS Workshop on Quality Monitoring and Incident Management held in Geneva, Switzerland, 10-12 December 2014, aimed at reviewing the current international quality monitoring systems of the Global Observing System (GOS) and actions required to enable its modernization and the establishment of practices associated with incident management. The 1st workshop focused on the land surface component of the GOS and drafted a Roadmap and timeline for agreed actions including plans for the establishment of pilot projects on monitoring and incident management. Since the workshop, considerable progress had been made by the European Centre for Medium-Range Weather Forecasts (ECMWF), National Centers for Environmental Prediction (NCEP) (National Weather Service (NWS)/National Oceanic and Atmospheric Administration (NOAA), (USA)), the WIGOS Project Office (WMO) and other experts, in developing the global monitoring function, which highlighted the challenges of integrating products from different Numerical Weather Prediction (NWP) Centres into common formats. The detailed planning of Incident Management Pilot Project had not yet been completed but the first pilot would be based in Regional Specialized Meteorological Centre (RSMC) Nairobi (Kenya). He briefly described the various aspects of the WDQMS at global, regional and national levels, noting particularly the critical role of national focal points in addressing issues identified by the monitoring system and suggested that the Workshop should work on producing more detailed descriptions of the structure and functionalities of the WDQMS. Finally, Mr Goldstraw noted the milestones that were adopted by the 2nd session of the Task Team on the Plan for the WIGOS Pre-operational Phase (TT-PWPP-2, 15-17 September 2015) that suggest that the prototype for land surface monitoring system should be available in early 2016, and the RA I field pilot should commence in mid-2016.

Discussions following the presentations raised the issue of how to monitor the availability and quality of other observation types that are not assimilated by the NWP Centres. It was mentioned that the quality monitoring of such observations, including those made by from non-NMHS (non-National Meteorological and Hydrological Services) organizations would be beneficial and serve as an incentive for the sharing of more data. It was agreed that the development of the WDQMS, whilst focusing initially on the traditional Regional Basic Synoptic Networks (RBSN), should be designed so as to allow extensibility to a broader implementation of the concept across all WIGOS component observing systems. Furthermore, while NMHSs were currently the major source of observational data there were already many examples of non-NMHSs data being used by NWP and there was an expectation of considerable growth in the volume of such data in the future.

2. SESSION B1 – CURRENT (RA) LEAD CENTRE MONITORING CAPABILITIES

The representatives from each of the following Member countries delivered a presentation reporting on the status of the regional monitoring activities:

Mr Henry Karanja from Kenya, briefly described the RA I monitoring of surface pressure performed by the RSMC of Nairobi, which is based on the differences “Observed-First Guess” using the UK MetOffice Global model (25 Km output). He explained they look at long period data for persistent errors, using the GDPFS criteria for bias RMS and gross error. The monthly monitoring results are sent to WMO Secretariat by the Permanent Representative (PR) of Kenya, in order to be distributed to Members for actions on the identified issues.

Discussions following this presentation concluded that there is no structured feedback loop regarding the monitoring results, these are processed in an ad hoc approach.

Mr Ota Yukinari from Japan briefly described the RA II monitoring of land surface observations performed by the RSMC of Tokyo, which results are published online every six-months. He showed several examples of manual analysis of monitoring results and he mentioned that most of the errors are related to wrong elevation data of the stations.

Discussions following this presentation concluded that the importance of the analysis function has to be taken into account in the development of the WDAQMS. The relevance of knowing the environment surrounding the stations, i.e. metadata, was also clear. The importance of working closely with the NWP community has been mentioned as beneficial also for the improvement of NWP systems.

Mr Robert Grumbine from USA mentioned the multiple data users with subtly different requirements and the wide range of observations types currently used and the wide range of sources. He also mentioned that observing sites can be set up anywhere which leads to different input weights, with associated errors as a function of location, e.g. MESONET stations may be given input weight lower or better than METAR and RBSN stations. Mr Grumbine underlined that data latency is an issue for real time forecasting challenges and that quality control structure at NCEP includes a human assessment of in/out decisions that can override the auto selectors. He suggests the interaction of data / people and technology is too complex to provide a simple linear data Quality Control (QC) process, instead the “fabric” concept could be used, where there are strengths and weaknesses across all aspects of the process – sometimes people, sometimes systems and sometimes observations. He briefly described the monitoring of land surface observations performed by NCEP, and noted the importance of data evaluation by weather forecasters. Mr Grumbine finally mentioned that MESONET data are not exchanged internationally, but are received, monitored and even used by the mesoscale model, not by the NCEP global model, where they need to ensure data of sufficient quality.

Mr Riris Adriyanto from Indonesia briefly described the status of the national stations networks and noted the significant number of new upper-air sites in the country not yet reporting on GTS. He mentioned that the monitoring results of availability are distributed to regional centres, the overall average is very high (~98.4%), which is a consequence of WMO reports highlighting some data with poor quality that had triggered actions to improve the observations. Mr Adriyanto also mentioned the Southeast Asia Climate Assessment and Dataset (SACAD) project as a source and archive of high-resolution data, which includes hourly quality controlled data and he also mentioned the reporting and extraction functions of the Indonesian Climate Data Management System. Mr Adriyanto finally mentioned the capabilities for recording metadata and monitoring and control, e.g. the graphical tools to check availability of Automatic Weather Stations (AWS) data.

From the presentation the following question remained to be solved: what issues are preventing 9 radiosonde Indonesian stations to report onto the GTS and how to solve them?

Mr Tom Robinson from Canada briefly described the monthly global data monitoring, which includes land, marine surface and upper-air stations. He mentioned they just started to re-activate the six-monthly report in a more efficient way, but not being sure about feedback from Members. Mr Robinson noted most errors are related to station heights and mentioned that quarterly monitoring of data availability is currently made by their IT department. He also mentioned the mandate at Canadian meteorological Centre (CMC) to review the requirements and the end to end QC/QA process, the results expected to be reported end of March 2016, so the changes could be implemented in 2016/17. Mr Robinson finally also mentioned they are looking into the outputs of NWP and also working on improving information in Volume A.

Mr Stefan Klink from Germany mentioned that Deutscher Wetterdienst (DWD, the German Weather Service) has stopped, several years ago, the monitoring activities as lead centre for surface stations of RA VI. He briefly demonstrated the alternative monitoring portal for RA VI stations developed by DWD, using the EUMETNET (grouping of 31 European NMHSs) web system for the EUMETNET composite observing system (EUCOS) network.

3. SESSION B2 – NATIONAL MONITORING REPORTS

Mr Hamza Kabelwa from Tanzania informed that their national monitoring is linked to the Nairobi monitoring and noted that the results may be different if data does not make it out of the country to the regional hub in Nairobi. He mentioned the high performance of Tanzanian stations and the increasing number of AWS in the country. Mr Kabelwa briefly described the Digital Meteorological Observatory software developed at the Tanzania Meteorological Agency (TMA), with interfaces for collection and analysis of reports, including the control, the dissemination and coding into BUFR, which allows improved comparison of data to identify faults, as well as the move away from manually intensive analysis and requires less – or maybe no paper.

From discussion following this presentation it was mentioned that the eastern Africa countries share information on an annual basis. It was also mentioned that the monitoring is mostly looking at availability rather than quality of observational data. Finally, Mr Kabelwa noted that TMA is in discussion with partners about the sharing / data policy, e.g. from organizations operating AWS.

4. SESSION C1 – NWP BASED MONITORING CAPABILITIES

Dr Cristina Prates from ECMWF briefly introduced the data assimilation (DA) system of the NWP model at ECMWF and noted that data availability and quality impact on the model results. She mentioned the automated checking developed because of the volumes of observations, which include “soft limits” (based on recent statistics ~20 days), necessary for detecting sudden changes, and broader “hard limits” important to pick up slow drifts on the statistics (which would not be picked up by soft limits), the alert categories defined at 4 severity levels (slightly, considerable, severe and severely persistent) depending on how far statistics are from the limits. Dr Prates noted that ECMWF produces global statistics for satellites, and station statistics for in-situ observations. She mentioned the assimilated variables that are checked (temperature, pressure, humidity and wind) and alerts produced by geographic area and by WMO block checks against the limits, which are published online for the 4 defined levels. She also noted that the default approach is to exclude data until it is proven to be acceptable. Dr Prates mentioned the “traffic light system” of alerts developed and available internally at ECMWF and the tools for the visualization of monitoring results, including time series. She also mentioned that ECMWF is still producing monthly monitoring reports for upper-air data and she noted they undertake quality control of metadata. Dr Prates briefly described the quality flags used by the DA system and noted these may not be sufficient for the WDAQMS.

Discussions during this presentation raised the question about the needs of NWP for atmospheric composition observations into the DA system. Following another question whether the blacklists would trigger any actions by ECMWF, it was mentioned that only personal/national contacts, if any, would be used to talk to the station operator.

Mr Robert Grumbine from NCEP/NWS/NOAA informed that, for the QM pilot project they are focusing on SYNOP reports and surface pressure although wind, temperature and humidity are other potential variables. He mentioned the data flow from the BUFR messages to the forecasting system including the QC procedures. Mr Grumbine underlined the challenges of defining what “bad data” is, since it depends on which application area looks at it, and noted that NCEP sometimes over removes data that does not fit the model. He finally noted the different needs of different models for different observation limits.

Mrs Tanja Kleinert from DWD/EUMETNET briefly described the EUMETNET Monitoring portal, which covers ‘all’ EUCOS, GCOS and RA VI RBSN networks. She noted that all stations are listed in the portal, which enables the capture of silent stations, and underlined the need for performance standards clearly agreed to allow for regular assessment reports. Mrs Kleinert mentioned the statistical results produced separately for availability (counts), for latency and for quality, and

available as tables as well as time-series. She noted the QM and the Fault Reporting are undertaken in the same (EUCOS) team and that the BUFR migration is seen as a QM task, where the embedded metadata was seen to be a source of error. She suggested that the experiences of transition from Traditional Alphanumeric Codes (TAC) to Binary Codes (BUFR) should be communicated with those about to switch and also suggested WMO to provide central access to commonly BUFR templates. Mrs Kleinert noted that involvement of EUCOS and GTS related focal points are essential, but mentioned that not all Members reply to the incidents raised. Finally, she mentioned that monitoring results are available on the portal for 12 months, but all the historical reports are kept.

5. SESSION C2 – OTHER WIGOS COMPONENT MONITORING REPORTS

Mr Tim Oakley from UK/GCOS mentioned that GCOS has a wide range of information available, but for this Workshop he would focus on the GCOS Reference Upper-Air Network (GRUAN) and on the GCOS Surface Network (GSN). He noted the value of a Network Manager, and suggested that access to common monitoring links would be extremely helpful. He also noted the limited guidance on how to interpret the monitoring statistic results, suggesting the need to identify the minimum expected level of technical knowledge (competences) for people involved in the WDQMS. Finally, Mr Oakley mentioned the value of the tiered networks approach (Reference / Baseline / Comprehensive) for the classification of the outputs of the quality monitoring function.

Mr Etienne Charpentier from WMO Secretariat briefly reported on JCOMMOPS real-time monitoring activities, performed by UK-MetOffice, Meteo-France, USA-NCEP and ECMWF for drifting buoys and ships, a real time mechanism as well as a delayed mode quality monitoring. He explained that the principal role of JCOMMOPS is to provide technical support to the platform operators, which improves their observing performance and noted the existing feedback mechanism for all Members, which is key to improving the links to user communities. Mr Charpentier suggested that providing quality monitoring to platform operators can encourage more data to be made available. Finally, he mentioned that JCOMMOPS is moving from the classical Marine Climatological Summaries Scheme (MCSS) to the new Marine Climate Data System (MCDS) which has a higher level of quality control.

During discussion following this presentation Mr Charpentier explained that JCOMMOPS is funded via contributions from Members.

Mrs Oksana Tarasova from WMO Secretariat briefly reported on the Global Atmosphere Watch (GAW) Programme quality monitoring activities. She noted that the GAW Programme, which comprises six focal areas, is not uniform in terms of understanding of needs for all variables, some parameters should be considered to be added to RBSN sites. She mentioned the GAW Station Information System (GAWSIS), which includes quality information linked to the Primary Standard Instrument, and it is now part of the OSCAR. Mrs Tarasova informed that they are working on the harmonization of the quality flagging across the 6 Data Centres, where data are submitted to within a year (delayed mode linked to traceability to reference standard), metadata updates being required on a regular manner. She also mentioned the tiered structure of the GAW networks, and the QM procedures across different levels of networks may not be the same (similar to 3rd party networks). Mrs Tarasova noted that GAW Data Centres check the data submitted but the responsibility on quality is on Members and stations operators. She also noted that there is a clear framework describing the links between Data Centres, Advisory Groups and Members.

Following a question if GAW removes stations from their networks Mrs Tarasova explained the cascading reporting for non-compliant stations as: intermittent, silent, then closed.

Mr Dean Lockett from WMO Secretariat briefly reported on the current system of Aircraft Meteorological Data Relay (AMDAR), noting that the expansion of volumes of data were mostly due to increasing number of fleets and aircrafts joining the programme. He noted that the possible future availability of high volume of high resolution data from the “ADS-B/Mode-S” system. Mr Lockett mentioned some typical issues with the quality of AMDAR data and that focal points have been established so that NWP issues can be fed back to somebody. He also mentioned that NCEP does the AMDAR monthly monitoring on behalf of the Washington World Meteorological Center (WMC), but there is no log of incidents in a systematic manner, since there is no real incident system in place.

During discussions following this presentation some aspects for the Incident Management System (IMS) were considered, such as the links to OSCAR, the false reporting of incidents, the scale of the issues in driving the level of communication with the user community - the levels of warning are deemed vital to the IMS.

Mr Stephan Bojinski, from WMO briefly talked about quality monitoring of space-based observations, noting that there is no systematic monitoring of satellite data availability on the GTS. He mentioned that the Coordination Group on Meteorological Satellites (CGMS) includes 13 meteorological satellite operators. Mr Bojinski also mentioned that some satellite data monitoring is being performed at NWP Centres, even of data that is of interest, but not used in the assimilation scheme. He noted the benefits if Global NWP monitoring reports would be regularly provided to WMO Members; the goal should be to have high-level weekly/monthly reports. The CBS Inter-Programme Expert Team on Satellite Utilization and Products (IPET-SUP) is currently looking into options for developing such monitoring results.

Discussions following the presentation mentioned the need to build relationship between the data users and the operators. It was noted that ECMWF only have limited resources to monitor satellite data volumes but they are willing to develop very simple checks such as on satellite instrumentation performance. It was also mentioned that an IMS for satellites needs good communication procedures to allow a broad range of users to be informed.

6. SESSION D – PILOT PROJECTS

6.1. Quality Monitoring tools

Mr Timo Proescholdt, from the WMO Secretariat, informed the participants about the status of development of the monitoring tools for the Quality Monitoring pilot project. He noted that files with monitoring results are being produced in near real-time by ECMWF and NCEP, using common format for SYNOP reports, although a few issues still need to be addressed to ensure full compatibility between ECMWF and NCEP results, for instance the start time for the 6 hours intervals between two successive files. Mr Proescholdt mentioned that the WIKI made available by ECMWF for the monitoring project should be used to capture the technical specifications of the pilot project. He noted the relation between this project and the OSCAR project, and mentioned the interest in exploring common developments for the interoperability of both systems and the integration of relevant data.

During discussions, Mr Klink underlined the need to have gridded maps of the composite/density results from the monitoring function, e.g. showing the number of received report per grid-cell by each NWP Centre. This provides a very useful and easy to review summary that would be beneficial for NWP Centres and all other contributors.

6.2. Incident Management

Mr Dean Lockett, from the WMO Secretariat briefed the participants about the Incident Management pilot project, and explained the concept of a regional centre receiving, analyzing and acting on QM information in cooperation with several national centres. He noted that, for the purposes of the pilot project, the IMS might be a relatively simple system and not require the development of a technical fully-functioned system. It was possible that IMS pilots might be run in cooperation with two sub-regions in WMO Region I, allowing the demonstration and testing of the IMS concept and the requirements for its effective operation in developing countries. The CBS ET-SBO (Expert Team on Surface Based Observations) had proposed terms of reference for the IMS, which highlighted the need for multiple teams across different Commissions and Programmes to potentially be engaged in the development, testing and implementation of the WDAQMS. While the Secretariat would support and coordinate this engagement, the IMS operation would rely on the drive of Members to work together for the common good of improving the operation of observing systems and the quality of observations in the region for the benefit of all application areas and data users.

It was agreed by the Workshop that the plans to involve the RSMC/Nairobi in the IMS pilot should be consolidated in terms of resources needed, dates/milestones and participating countries (RA I Members).

6.3. Wrap-up and organize break-out groups

Mr Goldstraw conducted a wrap-up session where the main discussion was around the “decision making function” (analysis), which should be somewhere in between the functions of QM (data gathering) and IM (actions). Then, it was agreed that the Regions, either as single entities or as sub-Regional groupings, would play a critical role in the assessment/judgment of the QM results in order to decide on the issuing of incident tickets. Therefore there was a need to ensure the WDAQMS decision reflected an overarching global design but with a strong element of regional shaping to ensure it best met the needs of the locale in which it was operating.

From discussions it became clear that there is a need to evaluate the impact/scale of the issues raised by the QM results prior to informing data users and data providers; The analysis function should use a set of different levels of severity/impact of issues, from “catastrophic” to “minor”.

Mr Goldstraw concluded that there is a need to define the generic features of the pilot projects, putting into context the Demonstration Project to be developed in RA I. Then, the session split into two breakout groups, one dedicated to the QM functions (BG-1) and the other dedicated to the IM functions (BG-2) with the following objectives and membership:

- BG-1= How to produce standard global monitoring results with visualization tools? (Cristina Prates, Ota Yukinari, Henry Karanja, Robert Grumbine, Stuart Goldstraw, Luis Nunes, Timo Proescholdt);
- BG-2 = what is the minimum monitoring information needed to run the IMS? (Stefan Klink, Riris Adriyanto, Tim Oakley, Tanja Kleinert, Hamza Kabelwa, Dean Lockett, Tom Robinson, Yves Pelletier)

6.4. Quality Monitoring pilot project design (BG-1)

Building on the work already undertaken by NCEP and ECMWF in the preceding year Breakout Group 1 focused on addressing the outstanding questions that had not easily been solved to date:

- a) Quality flagging system – the decision tree for the flags to be used in the files with the monitoring results was discussed and a draft structure was prepared. The details of this structure can be found at Appendix III. It was highlighted that the flagging system would evolve as a richer information content became possible to articulate. Therefore the proposed flagging system should be viewed as the agreed starting point. It was agreed that as changes to the system are proposed they should be complementary to the existing flags, added to rather than changing the basic definitions. However freedom to evolve the system was deemed important as the value of the information would grow as other components of the WDAQMS found ways to exploit the information produced. It was also agreed the NWP Centres should carefully document the methodologies they used to determine the flag. This would enable users to identify any subtle differences that may occur in the flagging due to the functional differences between NWP systems. It was noted that although the flagging structure had been developed with an NWP focus other application areas should be able to use the basic principles of a tiered approach to data quality flagging;
- b) Baselines assessment – by understanding what the NWP system is expecting one can highlight the anomalies where quality expectations have not been met. This point had been discussed prior to the meeting as well as during the breakout. The nature of data utilization by an NWP can sometimes make this expectation of assessing quality against a baseline sometimes difficult to assess – if data is not received no judgment as to the quality of the data can be made. It was felt one of the goals of the emerging requirements for the Collection and Evaluation Centre would be a comparison against the expected result. In terms of expected baseline this should be the detailed record of an observing platform/system/network observing schedule as defined in OSCAR Surface. In addition NWP Centres could provide valuable advice about the long term trends of performance within a particular network or programme. The period of one month was considered sufficient to assess statistically significant variations for the majority of observing programmes (noting where seasonal variations give rise to changes in performance);

- c) The minimum expectations of inputs to NWP were discussed but these were broadly expected to be in line with the standard operating procedures defined in the WIGOS Manual. However it was noted that special conditions could be established to monitor new observing systems if agreement could be reached between the network operators and the NWP Quality Monitoring Centres. The details of these agreements would be addressed as the needs arose. Beneficial feedback to NWP centres – routine reports about actions taken/issues solved should be made available from the IMS to the NWP Centres, every month or so (minimum quarterly);
- d) Minimum visualization capability for QM outputs – the ECMWF six-hourly maps with the global coverage of observations should be used as the basis for developing the visual interfaces, of monitoring results for the WDQMS;
- e) Apart from the 6 hourly flagged products what else should the NWP Centres provide?
The following were agreed: the departures (O-B) for surface pressure, the stations blacklists and the working practices, including the business rules used to place a station on, or remove it from, a black list. For upper-air reports it was agreed, at this stage, to focus only on the availability (silent/not silent stations) of observations. Further capability would be decided upon as the pilot projects develop;
- f) What is the target for updating/making available the QM output files? Answer: daily.
It was recognized that monitoring of aircraft observations should have special targets, such as outputs available every 6 hours, and visualization tools able to show availability maps for vertical profiles separately from the flight level data. It was noted that making the data available on a daily basis then allowed flexibility in the other components of the WDQMS. Sometimes the analysis and incident management tasks may be undertaken on a daily basis or every other day or weekly depending upon the performance of the networks being monitored.
- g) The requirements for the (prototype) Evaluation Centre were discussed. It was deemed important that the Centre should be the archiving point for the outputs from the NWP Quality Monitoring Centres. This would reduce the burden on the NWP Centres (although they could hold the outputs if they wished). In addition the need for technically competent staff was deemed important. The NWP Centre representatives were happy to build the knowledge of the staff but did not want to have to repeatedly answer basic questions about NWP performance characteristic. Therefore it was determined the Collection and Evaluation Centre staff should have a blend of skill: a knowledge of typical NWP performance features; an understanding of common observing system issues and the ability to engage with all communities in a constructive manner to ensure issues were quickly identified and actions taken to overcome the issues. Therefore a level of scientific, technical and stakeholder management skills were expected.

6.5. Incident Management pilot project design (BG-2)

BG-2 reviewed the output of, and subsequent progress made, since the 1st Workshop. It discussed the principles of incident management, highlighting the differences between issues and incidents. It made recommendations for the incident management system in terms of functions and procedures to be followed. The Breakout Group identified these functions and procedures could be tested during the Demonstration Project for RA I but this would require the development of the IMS tools and it recommended these tools were kept as simple as possible for the period of the Demonstration Project. It also highlighted that the importance of technically competent staff in the decision making process was key. The Breakout Group drew extensively on the operational experiences gained from the EUCOS Quality Monitoring practices and the wealth of knowledge from other Members' implementation of Incident Management procedures. The majority of the terminology and approach had been obtained from the practices established within the IT Service Management environment but were equally applicable in the effective management of operational observing systems.

The functional characteristics of an incident management system and the flow diagram for the tracking of, the generation, management and resolution of operational incidents can be found at Appendix IV.

6.6. Conclusions in plenary

As identified in the Breakout Groups the Analysis function needs further elaboration and this was undertaken in plenary, and recognizing the need to use vocabulary that doesn't mislead its purpose, the name "Evaluation Centre" was suggested. It was underlined that minimum standards are needed for the decision process to take place effectively. As an example the EUCOS tables with detailed monitoring information (bias, RMSE, count, timeliness), which are automatically colored if the standards are not met, was mentioned as being essential for the human evaluation and decision to trigger or not an action for the IMS.

The plenary agreed on the functionality of the Evaluation Centres as described in Appendix V. This helped clarify the links between the Quality Monitoring Function and the Evaluation Function and also the links between the Evaluation Function and the Incident Management Function.

The Workshop also developed the following list of principles to be followed by the WQMS:

- 1- Not all issues are necessarily incidents as local or other factors may result in an issue not being escalated to an incident;
- 2- The impact of the issue determines the priority and/or urgency of incident;
- 3- Both the duration of issue and value of observation can independently or in combination affect the impact of the incident;
- 4- The departure of the output from a published or normal observing programme implies an issue;
- 5- When considering the impact of an issue all user needs should be considered, not just those of NWP;
- 6- Deviation from typical performance is an important factor to consider, so the importance of maintaining a historical record of performance is highlighted;
- 7- Timing of issue being raised is important to ensure an effective response;
- 8- The priority for the focus of issue and incident management in the light of multiple problems with observing systems is: total loss of observation, then latency of observation, then quality of observation;
- 9- Lessons learnt from the Demonstration Project would greatly assist the revision of the principles being applied to effective quality monitoring, evaluation and incident management.

6.7. Demonstration Project for RA I

Following the outputs and conclusions of the two Breakout Groups the framing of the Demonstration Project in RA I was more clear. The following requirements and actions/milestones were agreed for the development of the Demonstration Project:

- a) The project will start with land surface stations of RBSN and GSN of RA I in the countries engaged in the demonstration; Actions: send a letter to the PR of Kenya with the final report of the workshop to confirm involvement (January 2016), Henry Karanja will pre-brief to ensure the requirements are understood; Send letters to the PRs of other potential participating Member countries from RA I (January/February 2016);
- b) List the RA I Member countries that will agree to participate, including the WIGOS national focal points who will either be the first points of contact or delegate the responsibility to an appropriate member of the observing department (February 2016);
- c) NWP Quality Monitoring Centres to be involved in providing monitoring files (flags and supporting information): ECMWF and NCEP; Other NWP Quality Monitoring Centres may join the demonstration if they have the resources and approval to do so: DWD, JMA, Environment Canada.
- d) Prototype tool for the visualization of monitoring results made available by the WIGOS PO (January 2016);
- e) The number of, and skills of, staff from Kenya Meteorological Department (KMD) required to be involved in the Collection & Analysis and Incident Management procedures to be defined by the Project Team (March 2016) (March 2016). This may result in the need for training of the KMD staff by suitably qualified members of the Project Team (April/May 2016);
- f) The IT resources required by KMD to operate the Collection & Analysis and the Incident

Management procedures, such as bandwidth and HW/SW, to be defined by the Project Team (March 2016);

- g) OSCAR populated with metadata from stations to be included in the Demonstration Project; Participating Members will have to update OSCAR with their national stations metadata and it is expected some support from the WIGOS PO will be required for this task (April 2016);
- h) Incident management
 - i- Process diagram, as output from the Workshop Report (January 2016);
 - ii- Spreadsheet form available for testing (February 2016);
- i) The agreed duration for the Demonstration Project is to be 8 months elapsed time with 6 months operational time. This will allow time an evolutionary improvement in the monitoring toolset and procedures based on practical experience at KMD (May to December 2016);
- j) A mechanism to capture project experiences and issues will be developed by the Project Team and used by the KMD and other staff to enable lessons learnt from the Demonstration Project to be recounted to other regions considering establishing similar systems.
- k) A Project Governance Board shall be established to oversee the Demonstration Project; this should include KMD senior staff, WMO RA I regional office representative, WIGOS PO representative, NWP representative and Participating Members representatives)
- l) Communication channels for project results shall be established by the WIGOS PO.

In addition to the newly established Demonstration Project, the monitoring of GCOS Surface stations (GSN) will also be made through the EUCOS monitoring portal by Tim Oakley, GCOS Implementation Manager and Tanja Kleinert, EUCOS Quality Management Expert. This will enable two different quality monitoring systems to be compared.

7. SESSION E – ACTION PLAN AND RECOMMENDATIONS

The following actions and deadlines were agreed by the Workshop participants:

General Actions:

The EUCOS Quality Monitoring Portal link should be circulated to all interested parties (Tanja Kleinert). In addition the action from the second session of CBS ET-SBO in Tokyo, Japan, should ensure the EUCOS Portal link is included in the new monitoring links page being established by Dean Lockett and Tim Oakley.

Regular WebEx sessions should be established to maintain the momentum obtained from the second workshop – WMO Secretariat.

Actions associated with the Quality Monitoring Function:

The Quality Monitoring Flagging Structure to be reviewed by NWP centres and, if necessary, further revised as practical experience of its use becomes available. The leads for this are Robert Grumbine of NCEP and Cristina Prates of ECMWF although all participating NWP Centres have an interest in its evolution.

The readiness of NWP Centres to use OSCAR as the operational source of operational station information should be confirmed – especially in the context of the Demonstration Project – WMO Secretariat.

Actions associated with the newly defined Evaluation Function:

Identify the sources of WIS information that can be used to assist in building of an understanding of the root cause of missing observations. WMO Secretariat to lead. Once identified the method by which this information is to be passed to the Demonstration Project team, needs to be considered.

Actions associated with the Incident Management Function:

Incident Management flow diagram, at appendix IV, to be reviewed by Stefan Klink and Stuart Goldstraw to ensure it can be used in the Demonstration Project.

Build a spreadsheet based incident ticketing system for use in the Demonstration Project – ET-SBO (Stuart) to lead this task.

Examples of issues, their escalation and their raising as incidents to be developed as training material, in time for the Demonstration Project.

Examples of operational practices relating to the existing escalation procedures for issues to incidents to be provided. EUCOS Team to provide their current guidelines for raising operational incidents.

Actions associated with the WDQMS Demonstration Project for RA I:

- To support the establishment of RSMC Nairobi as the WDQMS Demonstration Project Evaluation and Incident Management a review of the technical competencies required to undertake effective evaluation and incident management to be considered. The skills of Tanja Kleinert as defined with the DWD Competencies framework are to be described in the context of the WMO competency framework for meteorologists.
- Letters to PRs of Kenya and countries likely to be involved in first Demonstration Project to be generated and sent to Members.
- A project plan for the Demonstration Project should be developed as soon as possible after approval is obtained from ICG-WIGOS to progress the task.

It should be noted that item 6.7 above also includes some agreed actions, those specifically related to the Demonstration Project for RA I.

The participants at the Workshop also agreed with the following conclusions and the remaining open questions:

Conclusions:

- A) It was agreed that the WDQMS should consist of three basic functional components: the WIGOS Quality Monitoring Function, the WIGOS Evaluation (and reporting) Function and the WIGOS Incident Management Function. These functions have inputs, undertake processing tasks and generate outputs and are further described below.

WIGOS Quality Monitoring Function:

For the practical implementation of WDQMS for GOS improvements in the near term the monitoring function is essentially undertaken by Global NWP Centres. The work on defining the 'easy to generate' monitoring reports, as a by-product of undertaking the data assimilation process has been led to date by ECMWF and NCEP, however during the Workshop three other Centres expressed an interest in supporting this work: (CMC-Canada), DWD (Germany) and JMA (Japan). The content and the format of the global NWP generated quality monitoring reports are nearing finalization, and it was agreed that these technical details should be made available at the ECMWF WIKI dedicated to the project.

WIGOS Evaluation (and reporting) Function:

This function ensures that a more universally model can be applied to the WDQMS. It takes the Quality Monitoring outputs from all the contributing centres, extracts the relevant information from OSCAR, and generates routine performance reports based on at least two performance indicators: comparison with the status of WIGOS described in OSCAR; trends in network performance over a subtle period (for GOS elements monthly rolling averages are proposed). Additionally the Evaluation Function will take Quality Monitoring Reports, that include issues identified with the base observational data, OSCAR status information, Quality Monitoring Contributing Centre features and other contextual information (such as geo-political, environmental, expectation of typical performance & exceptional circumstance) to determine if the observational issues raised justify the issue being formally raised as an Incident with the observational data provider, usually but not exclusively a NMHS. It is envisaged there is a semi-automated Global Centre providing routine reports and making available regional and thematic specific information to Regional Centres or WIGOS Component or sub-component Centres (Regional WIGOS Centres).

WIGOS Incident Management Function:

If the issues considered by the Evaluation function merit being raised as Incidents, this will be undertaken by the Incident Management Function. The detailed description of this function can be seen as Appendix IV. Key to the success of the Incident Management Function will be the clear communication of the Incident with the supplier, but also the users of the data to ensure they take suitable precautions with the source.

- B) The structure and process map for the whole WDQMS, comprising the three basic functions and the relevant systems and related stakeholders was agreed, as presented by a diagram in appendix VI.
- C) The daily availability of monitoring files from the NWP Centres should be made at 6:00 AM UTC.
- D) The issue of different monitoring results coming from SYNOP reports exchanged as BUFR and as TAC was recognized but a decision was made not to differentiate them for the moment;

Open questions:

- E) How to integrate the NWP monitoring flags into WMDS/OSCAR?
- F) How to engage the WMO IT department for the pilot projects?

8. SESSION F – ANY OTHER BUSINESS

Following a question raised by David Richardson (ECMWF) on the current revision of the Manual on the GDPFS, regarding the requirements for the existing monitoring centres, the Workshop agreed that the related provisions could be retired for the next edition of the Manual on GDFS. Whilst complimentary detailed provisions were not in existence in the WIGOS Manual or it's soon to be developed Guide, the meeting felt the evolutionary nature of the WDQMS was such that the next generation Global Quality Monitoring System would be described within WIGOS by the end of the 2016-2019 phase.

9. SESSION G – CLOSURE

Dr Riishojgaard thanked the Chair of the Workshop and all the participants, mentioning this activity is producing tangible results that will impact significantly in the improvement of observing systems for the benefit of all WMO Members.

Mr Goldstraw, the Chair of Workshop expressed his appreciation to the participating experts who contributed significantly to the discussions and the conclusions. He then closed the Workshop at 16:00 PM Thursday 17 December 2016.

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FINAL PROGRAMME
15-17 December, Geneva, Switzerland

Tuesday AM, 15 December 2015

TIMING	SPEAKER	SESSION / PRESENTATION TITLE
Session A – Opening and Organization of the Workshop		
09:30	Stuart Goldstraw, Met Office UK, Chair of the Workshop	Introductory remarks – goals of the workshop
09:45	Director OBS Department, WMO Secretariat	Welcome and opening remarks
10:00	Lars Peter Riishojgaard, WIGOS Project Manager	The WDAQMS in the context of the WPP
10:15	Stuart Goldstraw, Met Office UK, Chair of the Workshop	Review of the outcomes from the 1st workshop
10:30	... Coffee-Break ...	
Session B1 – Current (RA) Lead Centre Monitoring Capabilities		
11:00	Henry Karanja	Kenya/RA I
11:15	Ota Yukinari	Japan/RA II
11:30	Robert Grumbine	USA/RA IV
11:45	Riris Adriyanto	Indonesia/RA V
12:00	Stefan Klink	Germany/RA VI
Session B2 – National Monitoring Reports		
12:15	Hamza Kabelva	Tanzania
12:30	... Lunch-Break ...	



FINAL PROGRAMME
15-17 December, Geneva, Switzerland

Tuesday PM, 15 December 2015

SCHEDULE	SPEAKER	PRESENTATION/SUBJECT
Session B1 – Lead Centre Monitoring (RA)		
14:00	Tom Robinson	Canada – Via Webex
Session C1 – NWP Based Monitoring Capabilities		
14:15	Cristina Prates	ECMWF
14:30	Robert Grumbine	NCEP
14:45	Tanja Kleinert	EUMETNET
Session C2 – Other WIGOS Component Monitoring Reports		
15:00	Tim Oakley	GCOS
15:15	Etienne Charpentier	JCOMMOPS
15:30	Dean Lockett	AMDAR
15:45	... Coffee-Break ...	
Session D – Pilot Projects		
16:15	Timo Proescholdt	Quality Monitoring tools
16:30	Dean Lockett	Incident Management
16:45	Stuart Goldstraw	Wrap-up and organize break-out groups
17:00	... End of Day 1 ...	



FINAL PROGRAMME
15-17 December, Geneva, Switzerland

Wednesday AM, 16 December 2015

SCHEDULE	SPEAKER/LEAD	PRESENTATION/SUBJECT
Session D – Pilot Projects – BREAK-OUT GROPUS		
09:00-12:00	Stuart Goldstraw	Quality Monitoring pilot project design
	Stefan Klink	Incident Management pilot project design
(10:30)	... Coffee-Break ...	
Session D – Pilot Projects – PLENARY		
12:00	Stuart Goldstraw	Quality Monitoring pilot project design
12:15	Stefan Klink	Incident Management pilot project design
12:30	... Lunch-Break ...	

Wednesday PM, 16 December 2015

SCHEDULE	SPEAKER/LEAD	PRESENTATION/SUBJECT
Session D – Pilot Projects – BREAK-OUT GROPUS (Cont.)		
14:00	Stuart Goldstraw	Quality Monitoring pilot project design
	Stefan Klink	Incident Management pilot project design
15:30	... Coffee-Break ...	
Session D – Pilot Projects – PLENARY (Cont.)		
16:00	Stuart Goldstraw	Quality Monitoring pilot project design update
16:30	Stefan Klink	Incident Management pilot project design update
17:00	... End of Day 2 ...	



FINAL PROGRAMME
15-17 December, Geneva, Switzerland

Thursday AM, 17 December 2015

SCHEDULE	SPEAKER/LEAD	PRESENTATION/SUBJECT
Session D – Pilot Projects – BREAK-OUT GROPUS (Cont.)		
09:00-12:00	Stuart Goldstraw	Quality Monitoring pilot project design finalise
	Stefan Klink	Incident Management pilot project finalise
(10:30)	... Coffee-Break ...	
Session D – Pilot Projects – PLENARY (CONCLUSIONS)		
12:00	Stuart Goldstraw	Quality Monitoring pilot project
12:15	Stefan Klink	Incident Management pilot project
12:30	... Lunch-Break ...	

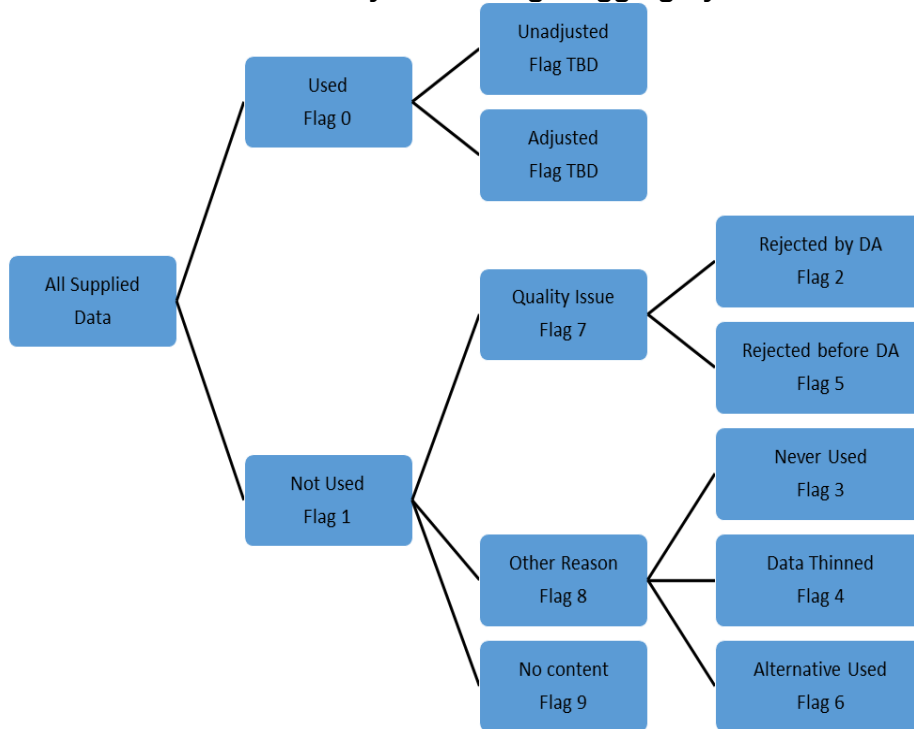
Thursday PM, 17 December 2015

SCHEDULE	SPEAKER/LEAD	PRESENTATION/SUBJECT
Session E – Action Plan and Recommendations		
14:00	Stuart Goldstraw	Action Plan and Recommendations
15:30	... Coffee-Break ...	
Session F – Any Other Business		
16:00	Stuart Goldstraw	AOB
Session G – Closure		
16:15	Stuart Goldstraw	Closure
16:30	... End of Day 3 ...	

WIGOS NWP Quality Monitoring Flagging System

The following flag hierarchy was developed by the NWP experts at WQMS-2 with additional input from other colleagues within the NWP community. It is designed to be an evolutionary structure but with the condition the flag numbering for existing flags remains constant as they are already in use in some prototype WQMS pilot activities.

Figure 1: WIGOS DQMS NWP Quality Monitoring Flagging System



Flag levels are designed to allow NWP centres to provide as much quality information as they are able. Level 0 is mandatory for a NWP Centre to be part of the WIGOS DQMS, level 1 is highly desirable and level 2 is desirable. In future level 1 may be a mandatory condition for an NWP centre to be part of the WIGOS DQMS.

Table 1: Flag Descriptions

Flag No.	Title	Description
0 (level 0)	Used	The data has been used by the NWP system, further information about the use may be available in the future
1 (level 0)	Not Used	The data has not been used by the NWP system, further information should be available to clarify the reason
2 (level 2)	Rejected by DA	The quality of the observational data was such that the DA system deemed it unusable in the DA process
3 (level 2)	Never Used by DA	This data has never been used by this particular NWP system
4 (level 2)	Data thinned	The volume of data, in terms of spatial and/or temporal is such that this source was removed from the DA process
5 (level 2)	Rejected before DA	Data was removed from the processing chain before reaching DA – usually as part of a blacklisting process
6 (level 2)	Alternative Used	Duplicate, derived or more basic data has already used from this location and so the data was not used
7 (level 1)	Quality Issue	There has been a quality issue associated with the data resulting in it not being used by the NWP system
8 (level 1)	Other Reason	Another reason, other than data quality has resulted in the data not being used, further flags elaborate this reason
9 (level 1)	No content	Although a message was received the content was found to be null and so no use of the data could be made.

FUNCTIONAL CHARACTERISTICS OF AN INCIDENT MANAGEMENT SYSTEM

1) Issues and Incidents

Whilst anyone can raise an issue with an observational data source the decision on whether the issue is raised into an incident will be the responsibility of the Regional Lead Centre that will take into consideration global, regional and local factors that may be at the cause of the issue. This decision making function requires considerable knowledge of the characteristics of the observing systems, local operating practices and use of the data, especially by global NWP systems. In addition good interpretation and communication skills are required to ensure the correct information is obtained from the entity raising the issue and constructive relationships are maintained with all parties, especially during the existence of an incident.

2) Functional aspects of an Incident Management System

Once an issue have been deemed serious enough to be raised as an incident with the observing system operator an 'incident ticket' is required.

To ensure the efficient operation of an Incident Management System, the Regional Lead Centre should develop and utilize as standard a template as possible for the raising, tracking and resolving of an operational incident. The template should enable the following information to be recorded:

- A unique reference number for the incident
- Date of incident ticket creation
- The name of the person or organization who raised the issue, including contact details
- A full description of issue, including the dates of the issue firstly being identified, characteristics of the issue, source observing systems identified and application areas impacted by the issue.
- Category of incident type (examples: availability of data, timeliness of data & quality of data)
- Priority level assigned to incident
- Urgency level assigned to incident
- A record of current ownership of the incident and a list of any parties who had previous ownership and when ownership was assigned or changed
- A record of the activities undertaken to resolve the incident, by whom and when – essentially a work log of the tasks undertaken during the lifetime of the ticket.
- A description of the solution to the incident to enable root cause analysis and future incident resolution
- Status of the Ticket (examples: Unassigned / Assigned / Resolved / Closed)

Once in existence the ticket describing the incident should enable the following:

- Editing of information fields to allow updated information to be included in the ticket once it becomes available.
- Changing of the priority, urgency or assignment of the incident to account for the dynamic nature of the impact of the issue.

In addition the Incident Management System needs to be accessed by those managing or resolving the incidents and those designing improved observing systems, therefore the following functionality is required:

- Utilises IT systems to minimize the generation of paper records.
- Maintains lists of issues, both current and historical and the associated incidents

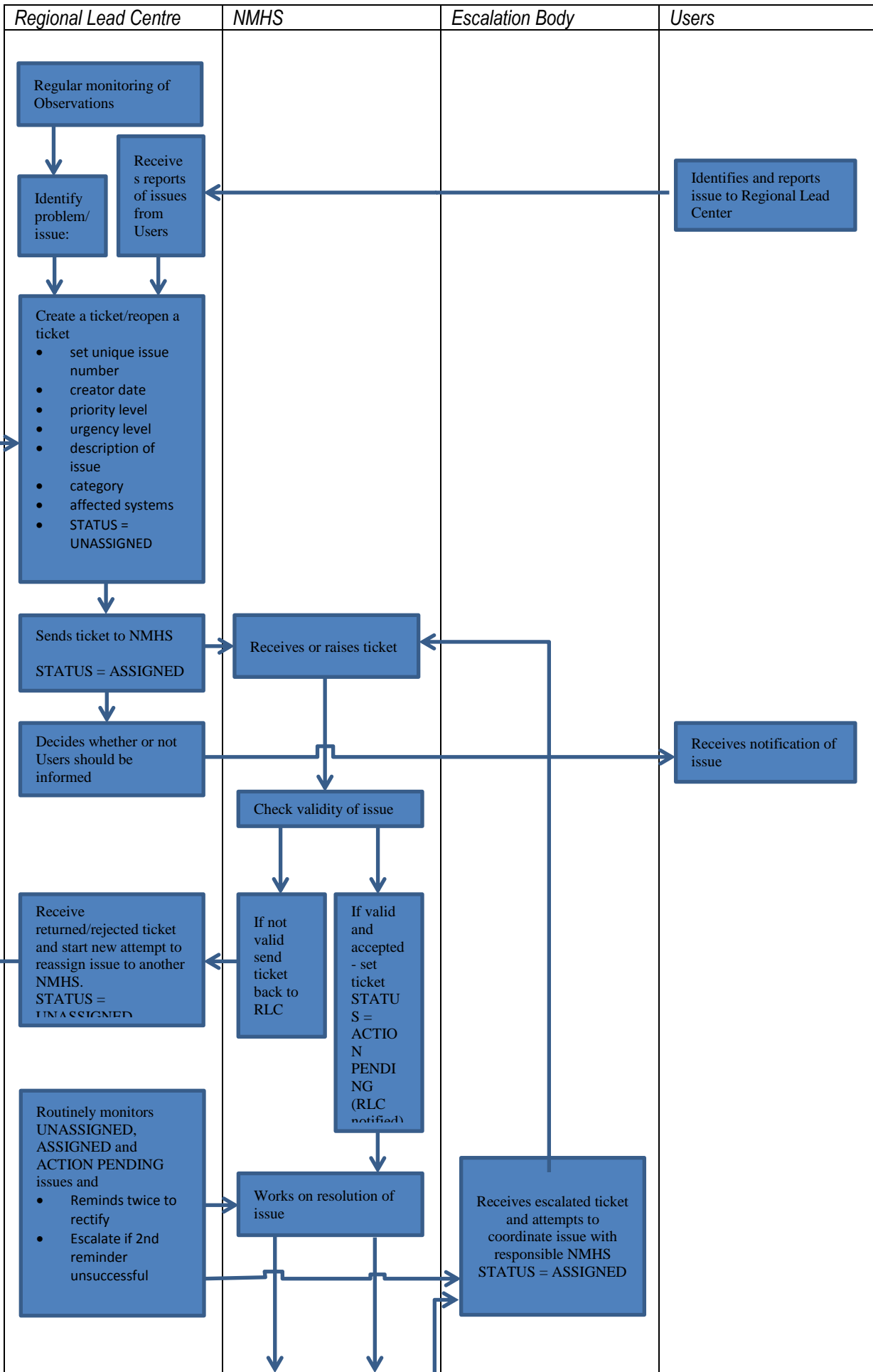
- Source of information on current state of incidents and Functionality to inform data users and other key people as required
- Distribute information about issues and assigned incidents to multiple persons or organisations across national boundaries
- Source of information, a knowledge base, on resolutions to previous incidents and typical response times
- Source of business rules to enable escalation triggering or prioritization & urgency changes
- Monitor the performance of the IMS and its effectiveness in supporting the operation of the observing.

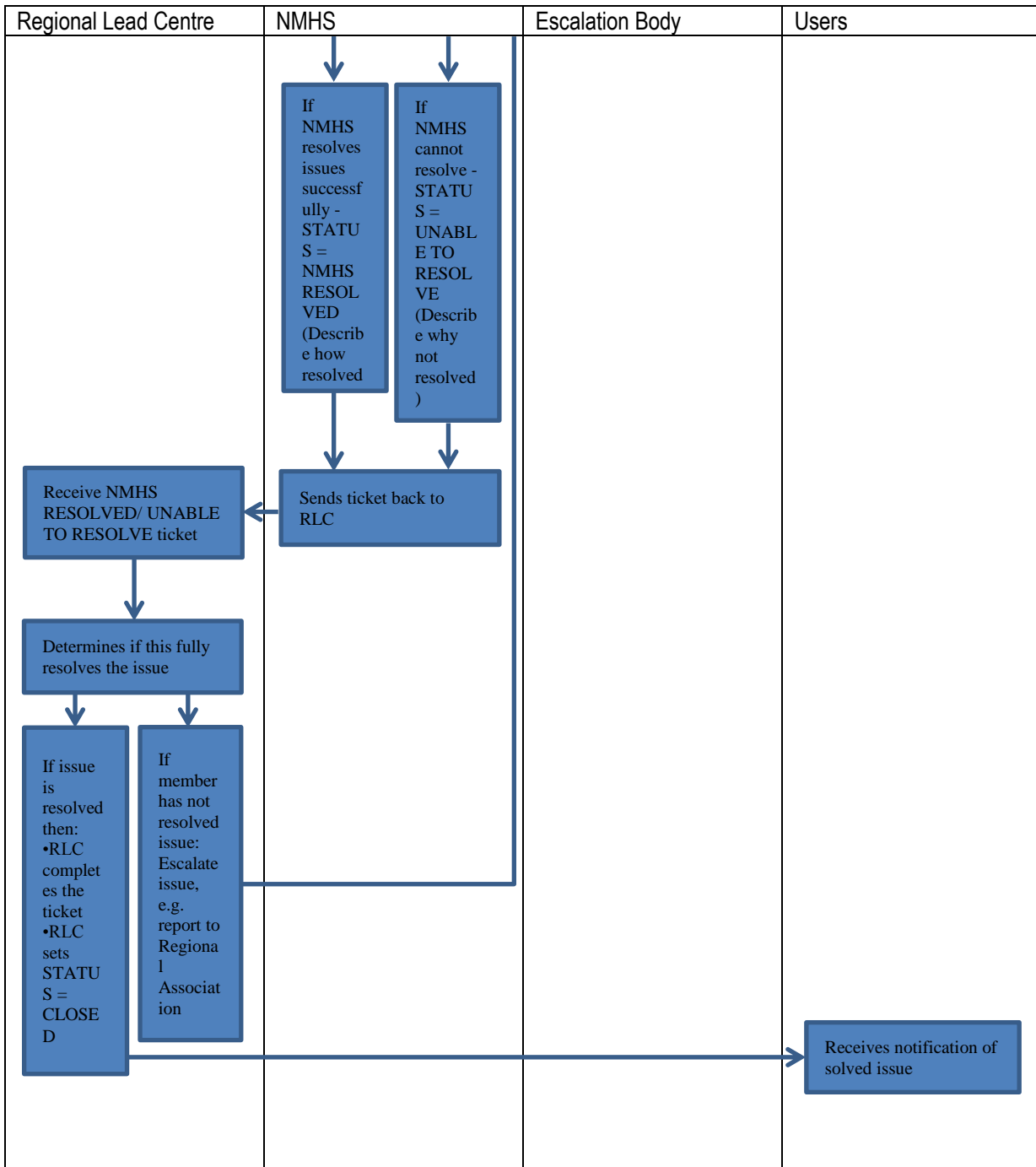
Business rules will be needed to enable:

- The unique identifier to be issued
- The priority and urgency level to be set (and adjusted in needed)
- When escalation is needed
- When the incident status is to be changed (for example from assigned to resolved)

Process Description Pool Diagram

The 'pool diagram' on the following pages depicts how the task of 'solving an issue' is conducted within in the 'swim lane' of one of the responsible actors and how the task is passed on between the actors to enable the effective resolution of the incident, in this case the Regional Lead Centre, NMHS, Escalation Body and Users.





Description of the Evaluation Centres

To assist with the definition of the Collection and Evaluation Centres the following table was developed by the Workshop. Note these centres may be logical separate from the Quality Monitoring Centres and the Incident Management System but could be collocated or integrated depending upon the local decisions that are made for the effect operation of the function.

Evaluation Centres	
Inputs	Tools
<ul style="list-style-type: none"> • Quality Monitoring Outputs from NWP Quality Monitoring Centres, in agreed formats including flags data and any relevant supporting information such as O-B stats. • Oscar Surface Reports to provide status information on the expected performance of current observing station / platform status • WIS and RTH information to provide the status of the telecoms at the time of the issue or incident to ensure root cause of issue or incident to be identified • Local context information to ensure that only matters in the control of the Members can be considered when raising incidents (to avoid raising incidents during times of natural disasters or civil conflict) • Other sources of international observational information, such as global data centre information, reports for other parties 	<ul style="list-style-type: none"> • Competent Staff trained to use the tools described below, to co-ordinate the response to the issues and incidents raised and understand the strengths and weaknesses of the Quality Monitoring outputs and typical observing system failure modes • Analysis tools to allow the observational data to be tested against the monitoring criteria and results generated. (Could be a spreadsheet or something more sophisticated) • Contextual Tools to allow the local conditions to be considered in the context of the issues and incidents being raised. (Assess to Weather Information, System Exposure information, NWP Model Features) • Presentation Tools to generate easy to understand outputs that inform the Members of the reason for the incidents being raised • Reporting Tools to allow information to be presented to Members, Users and other Stakeholders on the status of the observing networks and any issues and incidents raised. • Communications Tools to enable information to be sent to Members, Users and other Stakeholders about the status of Incidents and Issues raised. (Could be email or something more sophisticated).
Procedures	Outputs
<ul style="list-style-type: none"> • Global Operating Procedures that are agreed for implementation by all Collection and Evaluation Centres. These would form minimum standards encompassing existing regulations and escalation procedures • Local Operating Procedures that are applicable to the operation of that specific Collection and Evaluation Centre with procedures tuned to expected performance standards • Governance Procedures for the effective operation of the Collection and Evaluation Centre including the auditing of the operation of the Centre by a WIGOS body (to be identified) 	<ul style="list-style-type: none"> • Issue Reports • (Potential) Incident Reports, potential as the Incident Management System may have reason to not classify the issue identified as an incident. • Routine Performance reports providing Members, Users & other Stakeholders with performance information about the state of the observing platforms/systems and the performance of the Centre itself • Source of Knowledge on the performance of the observing platforms/systems/networks in the area or domain • Technical Support to Members either in the form of advice or physical support.

STRUCTURE AND PROCESS DIAGRAM OF THE WDQMS

WIGOS Data Quality Monitoring System Process Map

