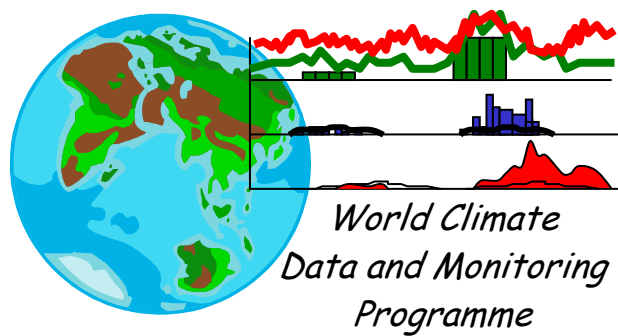


**REPORT OF MEETING OF THE CCI EXPERT TEAM ON OBSERVING
REQUIREMENTS AND STANDARDS FOR CLIMATE**
(Geneva, Switzerland, 28-30 March 2007)

WCDMP-No.

WMO-TD No.



World Meteorological Organization

1 ORGANIZATION OF THE SESSION

1.1 Opening of the meeting

1.1.1 The meeting of the Expert Team on Observing Requirements and Standards for Climate (ET-ORSC- ET1.2), of the Commission for Climatology (CCI); Open Programme Area Group on Climate Data and Data Management was opened by its Leader, Dr. William Wright, at 9h45 on Wednesday 28 March 200 at WMO Headquarters in Geneva, Switzerland. The list of participants is attached in Annex 1.

1.1.2 Following the opening of the session, Prof. Hong YAN, Deputy Secretary-General (DSG) of WMO, welcomed the participants to Geneva. In his statement he highlighted the most important topics related to the meeting. He specifically recalled the issues related to the role of climate observation, its quality and standards in conducting climate analysis and prediction and carrying out robust and consistent assessments needed for climate change studies. He also outlined some challenges for WMO in climate data and monitoring ranging from implementing modern climate data base systems, helping Members with advices on best practices for climate networks, data exchanges, and best use of Automatic Weather Stations to the role of Satellite data in climate monitoring. He considered the Expert team as one of WMO important technical arm in taking up these challenges along with other WMO programs, technical commissions such CBS, CIMO and other WMO sponsored programs such as GCOS.

1.1.3 Dr William Wright thanked DSG for his participation at the opening and welcomed the participants to the meeting. He pointed out some key issues relevant to the work of the meeting with emphasis on climate data continuity and homogeneity as well as the increasing use of AWS. He recalled his recent participation at the meeting of JCOMM Expert Team for Marine Climatology which addressed homogeneity and Ships observation problems. He stressed the need to look for stronger links and synergies with CIMO, CBS, GCOS and GEO. He concluded that the work should continue by email and asked the ET members to continue their work for the ET in their institutions.

1.1.4 Mr Pierre Bessemoulin, President of CCI extended his thanks to the participants, to the ET leader and to the OPAG1. Chair as well as to the WMO secretariat. He highlighted the importance of having ET meetings as early as possible within the CCI intersession. He stressed the need to clearly define priorities, establish a work-plan with Simple, Measurable, Achievable and Time bound (SMART) objectives. He suggested to set up as is being done by other CCI' ETs a web based information exchange among the experts. He concluded with various priorities for the ET works including issues related to CIMO work and its Guide, CCI Guidelines and providing links on other WMO programs.

1.1.5 Dr Raino Heino provided remarks on his role within GCOS as a Member of the GCOS Atmospheric Observing Panel (AOPC) and his active role within IPCC scientific groups. After the Opening ceremony, participants reviewed and adopted the meeting agenda (Annex 2)

2. REPORTS AND T.o.Rs

2.1.1 Report of the OPAG.1 Chair

Dr Raino Heino presented his report including various activities in which he is involved with emphasis on the Euro Climate Support network ECSN of Which Dr [ARYAN] leads the coordination. ET1.2 could promote this work, problems related to the declining snow observation network going along with the decline in snow stations, problems with In homogeneity in Data with example illustrated by Helsinki station time series 1844-2005, he provided examples of changes in observations linked mainly to changing sites, methods and instrument practices and several remarks and major problems that faces climate communities in particular:

- Changes in national networks with increasing implementation of AWS to replace classical manual stations;
- The problem of Data availability and existing Gaps in the time series;
- The need for daily data for climate extreme studies;
- The importance of quality control and homogenization in climate studies;
- The Role of Data archaeology and data rescue to complement extend the length of available time series,

2.1.2 Report of the ET leader

In his Report, Dr William Wright provided information on the Australian experience in AWS and outlined the existing end to end approach in climate data management. He reported some negative impacts related to AWSs such as the loss of visual observations, the rainfall measurement accuracy, the inadequacy for climate change analysis period. Climate services are also concerned with the rainfall accuracy such as during drought period decision on the payment for drought relief is sensitive to the rainfall measurement therefore its accuracy has direct financial implications . The report defined three major tasks for the ET work: Task 1: Follow-up on Automatic Weather Stations AWS and provide CCI advices related to their use in climate observations; Task 2: Develop guidelines documents in particular for developing countries including Climate Data Management Systems, communication infrastructure problems, maintenance and training issues for observation networks and cost-benefit analysis for AWS and Task 3: Accomplishment of the Guidelines on QC/QA which commenced in 2005 . The report concluded by exhorting all team members to work as one team with ultimate goal to benefit NMHSs and assist them in carrying out their climate role and activities.

2.2 Terms of Reference (Ref. CCI-XIV, November 2005)

The meeting reviewed the Expert Terms of References as defined by CCI in its fourteenth session, Beijing 3-10 November 2005. These are:

(a) To review and make recommendations regarding the adequacy and choice of observing instruments and sensors to meet climate needs, including *in situ*, remote-sensing systems and automated methods;

(b) To review and develop recommendations on procedures and practices necessary to support the long-term homogeneity of climate data, including:

- (i) Procedures to be carried out in the migration from man-made to automated measurements, and during changes to sensors and site;
- (ii) Procedures to be carried out during instrument maintenance and calibration;
- (iii) Instrument comparisons to identify biases, drift and sensitivity;
- (iv) Maintenance, monitoring and reporting on observing environments including instrument exposure;

- (c) To specify the basic characteristics and standards of national and regional climate networks and their observations, including AWSs and remote sensing platforms, needed in support of climate activities;
- (d) To help ensure that guidance and procedures are developed to assist with improved data exchange, particularly with regard to satisfying the requirements of the Reference Climate Stations, RBCN and the relevant GCOS networks;
- (e) To coordinate and collaborate with the OPAG Rapporteurs, CBS, JCOMM, CIMO, GEOSS, GCOS, WCRP (e.g. on polar data for the IPY) and other groups as required or as opportunities arise;
- (f) To explore, document and make recommendations for addressing the needs for capacity building in each region, pertinent to this topic;
- (g) To submit reports in accordance with timetables established by the OPAG chair and/or Management Group.

During the discussion of ET' T.o.Rs, several issues were raised such as the level requirement in the measurement accuracy to meet by instrument industry, data spikes due to maintenance and calibration procedures, remote sensing and reference climate basic stations, their inventory and the issue of climate messages. It was suggested that ET should work on recommending intermediate approach in addressing accuracy issues by setting minimum level and high levels in the accuracy measurements for climate parameters. As for solid precipitation measurement by AWS, the ET feels that this measurement still needs major improvement and that precipitation measurement by Radar is not very useful in precipitation measurement.

3 IMPLICATION OF IPCC REPORTS

Dr Raino Heino made a presentation on the IPCC recently published reports with focus on the main finding in the WG I report released in February 2006.

[[Add here :Dr Raino's Main Conclusion](#)]

4. LINKS TO OTHERS WMO AND INTERNATIONAL PROGRAMMES

4.1 GCOS

4.1.1 Dr Hans Tuensen and Mr William Westermeyer provided two presentations on GCOS including its goals and strategy based on promoting the scientific requirements for climate observations. The overall science leadership is provided through various GCOS panels such as AOPC for atmospheric observations, OOPC for Ocean observations and TOPC for Terrestrial Observations. GCOS interacts closely with CGMS, CEOS, IGOS and GEOSS. The meeting was also informed on the GCOS monitoring principles and various GCOS Baseline Networks including GSN, GUAN, GRUAN, BSRN. The GCOS second adequacy report (2AR) issued in April 2003 identified 44 Essential climate variables 16 Atmospheric, 15 oceanic and 13 terrestrial. The GCOS Implementation plan (October 2004) identified 131 actions for the five years period and the agent for their implementation including WMO, CGMS, CEOS, Panels. The "satellite supplement" to the requirements for climate products provided fundamental Climate data records with detailed specifications in conjunction with in situ observations (CEOS/WMO Data base).

4.1.2 Mr William Westermeyer provided information on GCOS workshop program aimed at assessing baseline networks, national and regional needs and deficiencies in climate data and the purpose of GCOS regional workshops in addressing these issues. The meeting was also informed on CLIM-DEV Africa project aiming at recomposing the importance of climate data and services in meeting the Millennium Development Goals in Africa with emphasis on Climate Risk Management. The project objectives are structured around 4 Result Areas: Policy Awareness, Climate Risk Management, Climate support services with priority for MDGs and, Observations; Data Management and infrastructure upgrade. During the discussion on this item, It was emphasized the need for closer liaison with WCP department for the implementation of climate services in CLIM DEV project.

4.1 GEOSS

4.2.1 Mr Brian O'Donell informed the meeting on GEO. Since its formal constitution 2 years ago, GEO encompasses now 65 nations at ministry level and 43 agencies. Its goal is to provide a better link among all existing observations systems through the establishment of Global Earth Observation System of Systems, GEOSS. The GEO 10 year implementation plan defined 9 benefit areas including climate. WMO participation in GEO is important; it is involved in 46 tasks out of 92 tasks identified for 2006 and 23 out of 46 identified for the period of 2007-2009. The meeting was also informed on various climate tasks established for this period.

4.2 UNFCCC (WMO involvement in)

Mr Amir Delju from WCP department provided a presentation on "Climate Data for adaptation to climate change" which included background information on UNFCCC process since COP1 in 1995 through COP/12 in 2006 and its work program (Nairobi Work Program). He provided the definition of the nine areas of activity of this program and WCP/CCI contributions in providing expertise and organizing workshops. He outlined the main challenges in coping with climate variability and change such as those issues related to CCI work in Data quality and climate Networks.

4.3 CBS (ET on EGOS)

Dr Raino Heino provided a presentation on the CBS Expert Team on Evolution of the Global Observing System ET-EGOS, its activity such as in the rolling requirements for EGOS, the implementation and recommendations on the evolution, the work on AWS and for redesigning GOS.

[Main Conclusions from Raino's presentation...]

4.4 CIMO

4.4.1 Mr Bessemoulin Informed the meeting about CIMO mission and the new CIMO guide which will provide guidance on the measurement accuracy. The new CIMO guide will include a chapter on extreme events such as tornadoes and he informed also that CCI guide on Climatological practices will make reference to the CIMO guide in its relevant chapters.

4.4.2 Mr Bruce Sumner informed that HEMI Association works closely with CIMO and provided information on various inter-comparison experiments held and planned in various areas such as in Mauritius where 36 manufacturers were involved during three weeks for GPS- RS inter-comparison. Other CIMO/WMO inter-comparison experiments are planned in Italy and Algeria. There was a convergence among participant views on the usefulness and the need for continuing these inter-comparison experiments.

4.5 SPACE PROGRAMME

4.5.1 Mr Jérôme Lafeuille provided in-depth presentation on the concept of Rolling Requirement Review (RRR) and the CEOS-WMO data base which aim at generating and maintaining User Requirements for an observing system. This process started in 1994 and is being now handled by the CBS ET-EGOS. The purpose is to define how present, planned and proposed observation systems meet User Requirements (URs) for different application areas within WMO.

The key points developed through his presentation deals on how URs are specified within RRR through the required geophysical variables (level2), Horizontal resolution, vertical resolution, accuracy, [to be completed by Jerome], Observation cycle, Timeliness, and the concept of a "specified breakthrough" which was introduced in 2006 as an optimum value between a minimum and a maximum in the requirements;

4.5.2 He Informed as well on a coming workshop in Geneva, 21-22 June for redesigning space based component of GOS

4.6 JCOMM

4.6.1 Dr W.Wright reported on his participation in the meeting of the JCOMM Expert Team on Marine Climatology (ET-MC) which was held in Geneva 26-27 April 2007 back to back to the ET-ORSC meeting. The main key point discussed during that meeting included : ET-MC aim to develop extreme wind wave Climatology (SWH > 14 meters), Sea Ice climatology was a key point

discussed during the meeting, the Issue of decreasing VOS, the need to standardize electronic log books and digitization of historical SHIP log books and metadata;

4.6.2 As an action relevant to CCI work, CCI ET2.2 on climate monitoring including the use of satellite and marine data and products is to be invited to take part in the Task Team : TT-MOCS?
To be expelled by Dr Wright and describe its relevance to CCI work

5 CURRENT KNOWLEDGE ON SELECTED TOPICS

5.1.1 Dr W.Wright provided more information on AWS climate related issues in the context of the 10 climate monitoring principles. He outlined the AWS benefits such as: high frequency in the records, better determination of extremes , possibility of its deployment in remote areas, cost-effectiveness, a better quality control tool and consistency in measurements. On the other side, he listed some of their shortcomings including data losses, Inhomogenity when migrating from conventional(manual) to AWS, management and maintenance problem, data spikes, rainfall accuracy problem and loss of visual observations. These negative sides have implications such as unsuitability for climate change studies, climatology of several parameters; phenomena and visual parameters are affected, the rainfall measurements accuracy have also implications on financial decision such as during drought periods for relief payments to the farmers. He concluded with the existing Australian standards for AWS network including:

- Data availability greater than 99 %;
- Need for Visual observation sensors;
- Need for an alert system for failure, and adequate data backup ;
- Consider redundant sensors (Us reference Network);
- High precision measurements meeting Wmo standards;
- Regular inspection and maintenance;
- Preferably inter with conventional stations to provide a check;
- Quality control procedures (Guidelines)

5.1.2.AWS in developing countries

5.1.2.1 Dr Wright described as well the AWS present status and characteristics in developing countries such as in RA.V. AWS are not widespread used, lack of funding, inadequate expertise and maintenance problems and problem of vandalism that affect AWS implemented in remote areas. There is as well the tendency that low labor cost encourage continuing with conventional network. At regional level the RA.V working group on climate related matters is involved in the CIMO/WMO guidelines on AWS specifications.

5.1.2.2 Mr Bruce Sumner provided further information on facts related to AWS such as the increase in total number of AWS among WMO RBSN with a proportion of 23 %. He stated that with the current AWS technology the accuracy has increased and the costs are decreased.

5.1.2.3 Dr C.Boroneant gave an extensive presentation of the present status of AWS in Romania with comparative study providing comparison between AWS and conventional stations. Romania Network has 162 stations among which 99 are AWS. Parallel measurements were conducted in some areas including 15 stations to compute monthly bias in the main climate parameters using: hourly T, P,H. She noted significant differences in particular AWS tend to overestimate Min T and underestimate Max T. The differences appear almost in all range of time hourly, daily and monthly values. The causes of these differences are related to both human and technical (sensors) factors.

6. FRAMING WORK-TASKS

Participants agreed to focus on three main tasks as proposed by the ET leader (item 2.1.2 above) and that for all assignments, the first draft for exchange is due in November 2007

6.1 TASK 1 on Automatic Weather Stations

The meeting recognized that AWS are increasing in numbers (23% of GBSN of WMO in 2006) and already a very major part of the world's network is automated, and this will only increase, they have the capacity to increase the availability, accessibility, density and the management of climate records and there is trend for the sensors in becoming more accurate, and in principle can address any desired level of precision and the costs of providing this accuracy are getting proportionately lower. The Task was assigned to the Task Team (TT) composed of [Demircan](#), [Boroneant](#), [Hassan](#), [Kruiger](#), [Wright](#) . The following actions were agreed:

6.1.1 Develop an updated list of standards for AWSs for climate purposes including:

6.1.1.1 Revising, and where necessary amending, the existing recommendations for sensor precision/network spacing;

6.1.1.2 Develop recommended standards for climate work for non-instrumental observations, such as visibility, cloud type and amount, phenomena, and sea state; and provide options and advice on cost-effective means of establishing this capacity within AWS;

6.1.1.3 Standards for data back-up and transmission, sensor redundancy, and possibly also inspection and maintenance; Guidance on network design, including the relative location of AWSs and manual stations for optimizing complementary aspects of the two data types and for AWS data QC;

6.1.1.4 Any other factors pertinent to the objective of ensuring AWSs provide data that best fits climate needs.

6.1.2 Work on the required precision of climate-related variables [Priority 1 \(W. Wright\)](#);

6.1.2.1 CBS request to revisit the standards required for AWS. Ideally to do this for all variables, but especially ECVs.

6.1.2.2 Several sources of advice on this matter could be found available on WMO web site, CIMO guide, guide for marine meteorology, N. Plummer publications on the subject, Ernest Rudel publications on AWS, GCOS, IGBP, ICSU, UNEP etc.). Task Team will investigate the sources of advice;

6.1.2.3 First step is to identify the key parameters to be measured for climate purposes. [\(C. Boroneant, B. Wright\)](#);

6.1.2.4 Task team to provide guidelines on a set of ECVs and other phenomena to be measured (how is this arrived at?). Are there “essential” versus “desirable” variables? (Temperature, precipitations, humidity, pressure, surface wind). TT to define whether any extra variables are needed such as SST. Also good to read document making original recommendations as to reasoning behind why these were set as they were;

6.1.2.5 Are the current suggested precision and network spacing variables too stringent? If so, can we define a “breakpoint” which indicates the most cost-effective values that are acceptable to the climate program (consider RRR). [Priority 2 /3](#);

6.1.2.6 Precipitation is a particularly important variable that poses problems for AWSs (e.g., frequently reads low). More significant problem with solid precipitation: is there a case for specific instrumentation or additives (e.g., heating elements on all stations regularly exposed to extreme cold?) [Priority 3](#);

6.1.2.7 Is there a case for “tiered” networks? – i.e., where a certain subset of AWSs have considerably enhanced capacity – e.g., being equipped with visual/phenomena sensors such as lightning detectors. [Priority 1 \(NCDC?, B. Wright\)](#);

6.1.2.8 Noting the continual conflict between meeting the needs for the climate program and resource limitations in most countries, this ET would like to seek Policy guidance from WMO on question of cost-effectiveness versus high standards – is there a policy? [Priority 2/3](#)

6.1.3 Develop guidance and advices continuity and homogeneity issues

AWS can potentially lead to a loss of continuity of the climate record through problems such as data losses, introduction of inhomogeneities (e.g., migration from manual to AWS), existence of data spikes. The Task Team will investigate, and make recommendations on:

6.1.3.1 Inspection frequency, mechanism for data back-ups (e.g. should all AWSs be fitted with loggers, and with what characteristics (e.g., how many days data?), system alarms on failure, whether to have redundant sensors. How to avoid data spikes and data corruption. [Priority 1 \(Demircan\)](#),

6.1.3.2 Investigate the sources of information such as CIMO (guide), CBS, manufacturers guides (Climate needs to be addressed) and the requirements for completeness of data this will inform recommendations (Australian requirements of 99% - check general applicability);

6.1.3.3 Provide advices on AWS Network management for climate needs.

6.1.4 Work on the issue of loss of visual observations [Priority 1 \(R. Hassan\)](#)

6.1.4.1 Need for specialized observational sensors; options include: tiered stations, some with high-end capacity; or else intersperse with conventional stations with capacity to observe phenomena, visual obs, etc.

6.1.5 Change management: Parallel observations and comparison [Priority1 \(C. Boroneant, Demican\)](#)

6.1.5.1 Ideally it is necessary to do this for minimum period of two years at each station, but this not affordable in all cases. For instance, given budgetary constraints some NMHS try to minimize “overlap” between two representative sensors. One option is to make this a requirement rather than just a recommendation to NMHSs;

6.1.5.2 Two types of measurements: CWS to AWS, and when moving one station from one site to another. Task Team (TT) will look at the period of overlap and the number of stations for the comparison noting, e.g., Constanta’s presentation showing significant differences in the intercomparison between different regions, and determine whether the inter comparison should be done at only selected stations;

6.1.5.3 Investigate existing differences in AWS/CWS for hourly, daily and monthly Data, to assess the non systematic causes: human and technical, and to determine in general the various reasons for differences between AWS/CWS (response time, etc.), Visit CIMO Guide (policy management) and provide recommendations on how to reduce these differences including greater QC, greater consistency in instrument sitting, Calibration/overlap, etc. TT will look as well at other experiences where parallel comparisons were successful.

6.2 TASK 2. Develop, or contribute to, a Guidelines document for climate observational standards in developing countries

This task involves, inter alia, collaboration with GCOS Lead Centres. The Task Team (TT) is Composed of ([Howe, Isobe, Wright, Kruger](#)). TT will address several issues and special problems of lack of funding, expertise, maintenance, vandalism, and work towards referring to potential solutions; Existing works will be considered such as those studies undertaken by Neil Plummer (Australia) et al on cost/effectiveness of AWS. There is also a need to propose solutions for maintenance problems and establish a case for defining where AWS would be of particular benefit. The GCOS concern about having AWS as GSN stations is to be addressed with GCOS appropriate panel to see how will this be supported by the international community to ensure a high quality and systematic climate records

6.2.1 Topics to be covered by the guidelines document

6.2.1.1. Outline of WMO recommended standards ([B. Howe](#))

Includes identifying which variables are key – temp, precip, other ECVs; and what the standards are for these stations. Who might be able to help define these standards?. Use existing CCI standards.

6.2.1.2. Identification of key stations and strategies for ensuring at least minimum number of observations are taken at those stations. ([Isobe](#))

It should include the definition of what is meant by key stations – GCOS, major population centres, stations representative of major climate zones, or all of the above, what criteria to be used to define “key stations”? Does this vary from country to country?) and what are the strategies for a combination of a careful network planning, resource mobilisation, mitigating observation-related problems, etc.)

6.2.1.3. Training and capacity-building activities in observations. ([B. Howe](#))

Develop best practices for in-country visits and suggestions for hands-on training, training to more staff, etc. Training may need to be provided by staff from developed countries – example of PNG where staff has lost ability to do radio-sonde flights. Provide list of examples of successful experiences e.g., a couple of Australian projects. The guidelines might also include recommendations for succession planning and training for trainers, the role of workshops, utilization of WMO RMTCs. TT will seek guidance from CIMO/OPAG on capacity building in developing this part of the guidelines.

6.2.2.4. Strategies for mitigating observation-related problems (W.Wright)

Recommend strategies for mitigating the effects of communications, difficulty in maintenance, remoteness, vandalism/security issues such as use of SMSs and workshops on Climate data management software.

6.2.2.5. Network issues including AWS in developing countries (B. Howe)

Consider the issue of blended Network (CWS-AWS) and look at defining a minimum/maximum number and advice on how to get access to high-end maintenance needed and whether we can use stations established by private companies.

6.2.2.6. Issues related to climate program needs (Isobe)

Define the needs of climate program in particular their requirements in terms of homogeneity, continuity with minimal data loss and adequate quality control. Review the synergies if any, that exists between needs of climate program observations needs and real-time observations?

6.2.2.7 Profile-raising activities in country (Kruger)

Suggest ways in which NMHSs can be helped to emphasize the benefits of robust and reliable observations to their countries' governments, especially pointing to the potential economic benefits. (refer to WMO socio economic benefit of Met services conferences reports, website) and examine the leverage that could be provided by UNFCCC bodies. TT to investigate links to UNFCCC (refer to GCOS and GOS presentations of 29 March 2007).

6.2.2.8. Strategies for resource mobilization (W. Wright)

TT will identify the major potential funding sources – own Government, Aid Agencies, World Bank (?), UNFCCC-related, etc. If successful in previous task, this will lead to some funding from countries' own Governments. Even then, may need to be supplemented by funding from elsewhere. TT will also investigate whether there already exists a WMO-linked mechanism for funding/support for countries that need it, and if not, could make the recommendation that consideration be given to establishing such a fund.

In terms of staffing/training: is a "buddy" system an option – i.e. where certain countries within a Region provide temporary support to others? Example in Pacific where Fiji has capacity to support some of its smaller island neighbours. Review the role of Regional centres CIIFEN, ACMAD, ICPAC, DMCs etc.

6.2.2.9 Suggestions for further activities/investigations (W. Wright)

Investigate whether satellite imagery holds any potential here – perhaps for estimating wind speed and solar energy;

Thinking outside square: e.g., do carbon trading schemes have potential to support activities in developing countries?

6.2.2.10 Liaison with other Technical commissions (All)

The Task Team should consult with other technical commissions whose work involves Least-Developed Countries – e.g., CIMO, CBS – there may be existing documents, policies and practices. Also, GCOS Lead Centre surveys into why countries are having trouble meeting requirements for CLIMAT messages.

6.3 TASK 3: Guidelines on Quality Assurance/Quality Control of surface meteorological data".

The Task Team is composed of (Boroneant, Kruger, Howe, Wright, Heino, NCDC). Its task is to Complete the Guidelines document on Quality Control/Quality Assurance commenced in 2005 with particular mention that this task is relatively straightforward (but not necessarily easy) task, because the task is already started. The history was that, in the previous Inter-sessional Period, it was recommended that CCI produce a guidance document on QA/QC that was relatively short (around 50 pages or so, and including specific examples, including illustrations)

6.3.1 The existing outline was accepted as basically adequate, with minor amendments, taking into consideration:

6.3.1.1. Extension of basic variables to include MSLP, and possibly other ECVs. These latter would be the subject of "Chapter 6" of existing structure. This is one area where NCDC might be willing to contribute;

6.3.1.2. The experts in current team might not have the statistical expertise to address this task, refer Chapter 4 back to NCDC with request that they do this (and perhaps provide detail on other techniques, such as MISH;

6.3.1.3. Reference to the CCI Guide on Climatological Practices;

6.3.1.4. Inclusion of techniques for homogenizing daily data;

6.3.1.5. Investigation on whether QC should be incorporated at the instrument/software level, or in delayed mode QC, or both.

6.3.2 The Guidelines document should fit within the overall Data Quality “strategy” of the WMO, and that there was already abundant guidance on QC/QA from existing sources within other technical commissions and programs (e.g., WWW Guide; CIMO guide, guide to GOS). The Task Team should, within the confines of the existing proposed framework, assess what’s in these existing sources, and assess what is relevant to climate applications (in which case they might be cross-referenced), and what needs separate treatment to meet climate needs. A recommendation concerning the availability and use of generic QC software packages should be included within the Guide. Bruce Sumner has agreed to make copies of the relevant publications for Task Team members engaged in this task.

6.3.2 The proposed Structure of the Guidelines on Quality Assurance/Quality Control of surface meteorological data will consist of Eight (8) chapters:

Chapter I : [To be defined] NCDC (W. Wright)

Chapter II : [To be defined] (W.Wright)

Chapter III : Basic QC (B. Howe)

Chapter IV : Single Stations Checks (NCDC)

Chapter V : Spatial checks (B. Wright)

Chapter VI : Other parameters (R. Heino)

Chapter VII : In-homogeneities (C. Boroneant)

Chapter VIII : Evaluation (B. Howe)

And three appendices:

A.1 Australian approach (B. Wright)

A.2 Potential applications to AWS/QC (C. Boroneant)

A.3 End to end approach (collecting statistics on network health)

7. SUMMARY OF RECOMMENDATIONS

I. Automatic Weather Stations (AWS)

Recommendation 1 : At least some manual stations be retained for optimizing the complementary aspects of AWS and manual stations.

Recommendation 2 : Task Team investigates the sources of advice.

Recommendation 3 : High accuracy from the existing guidelines and second set of minimum standards. Task Team to investigate ways to define minimum standards.

Recommendation 4 : Task Team look at comparison studies by CIMO and on this basis, make recommendations on instrumentation, maintenance, etc. for climate needs.

Recommendation 5 : Task Team look at examples of tiered networks such as US reference climate network. Recommend whether tiered networks are effective ways of meeting climate needs.

Recommendation 6: Task Team to liaise with CIMO and consult also with CBS, GCOS, instrument manufacturers, other?

Recommendation 7 : Climate program needs to define what QC functionality required in AWSs.

Recommendation 8 : Climate programs should build dialogue with manufacturers on QC including metadata issue, flags, QC parameters to be incorporated etc. Manufacturers to provide QC/QA description in the operational manuals.

II. Observational Standards in Developing Countries

Recommendation 9 : accept the existing RBCN standards for network distribution

Recommendation 10 : Optimise the use of existing stations and their equipment.

Recommendation 11 : Task Team to investigate links to UNFCCC refer to GCOS and GOS presentations of 29 March 2007.

III. Quality Assurance/Quality Control of surface meteorological data

Recommendation 12 : Climate program needs to define what QC functionality required in AWSs;

Recommendation 13 : Climate programs should build dialogue with manufacturers on QC including metadata issue, flags, QC parameters to be incorporated etc. Manufacturers to provide QC/QA description in the operational manuals.

VI. Results Delivery

Participants agreed that for all assignments, the first draft text for exchange is due in **November 2007**

ANNEX 1 :List of Participants

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ANNEX 2.

Agenda

DAY 1: 28 March

1. ORGANISATION OF THE SESSION

- 0945-1030 Welcome, Introductions and official opening of the meeting
1030-1045 Tea/Coffee Break
1045-1130 Adoption of the Agenda and working arrangements

2. REPORTS and TORs

- 1130-1200 Commission for Climatology (CCI) - Structure and Challenges
1200-1230 Report of the OPAG1 Chair
1230-1400 Lunch
1400-1430 Report of the Team Leader (1400-1430)
1430-1500 Review of TORs - ORSC

3. IMPLICATION OF IPCC REPORTS

- 15:00-15:45 IPCC WG 1 Recent Report + implications
15:45-1600 Tea/Coffee Break
1600- 1630 IPCC Report (Cont'd)

4. LINKS TO OTHER WMO + INTERNATIONAL PROGRAMS

- 1630 -1715 JCOMM, CIMO, CBS, GCOS, GEOSS, UNFCC

DAY 2: 29 March

- 0845-1030 JCOMM, CIMO, CBS, GCOS, GEOSS (Cntd)
1030-1045 Tea/Coffee Break

5. CURRENT KNOWLEDGE on SELECTED TOPICS

- 1045 – 12:30 Current Knowledge on Selected Topics
- AWS Standards for Climate purposes
- Guidelines on QA/QC of surface meteorological variables
- Guidelines for observational standards in developing countries
12:39:14:00 Lunch
14:00- 15:45 Current Knowledge on Selected Topics (Cntd)
15:45-16:00 Tea/Coffee Break
16:00-16:30 Current Knowledge on Selected Topics (Cntd)

6. FRAMING WORK-TASKS

- 16:30-17:30 Framing Work-Tasks

DAY 3: 30 March

- 08:45-10:30 Framing Work-Tasks (Contd)
10:30- 1045 Tea/Coffee Break

7. RECOMMENDATIONS + FUTURE PLANS

- 10:45-12:30 Recommendations and work-plan
12:30-14:00 Lunch
14: 00- 15:15 Recommendations and work-plan (Contd);

8. OTHER BUSINESS

- 15:15- 15:45 Other Business

CLOSURE OF THE MEETING