WORLD METEOROLOGICAL ORGANIZATION

WORLD WEATHER WATCH

REGIONAL ASSOCIATION I
WORKING GROUP ON PLANNING AND IMPLEMENTATION OF THE WWW

(Fifth Session)

FINAL REPORT

NAIROBI, 25-29 SEPTEMBER 2006

EXECUTIVE SUMMARY

At the kind invitation of the Government of Kenya, the fifth session of the Working Group (WG) on Planning and Implementation of WWW in RA I was held in Nairobi from 25 to 29 September 2006. In his report, the Chairman of the WG, Mr William Nyakwada gave an account of the status of relevant co-ordination activities and strategies developed to address WWW capacity building issues as part of the work of the Working Group for the period 2001 to 2006. He acknowledged that in six years technology has evolved substantially and that the region faced many new challenges as a result of the new technological developments.

The session considered the contribution of WWW in the RA I to THORPEX and in particular AMMA (African Monsoon Multidisciplinary Analysis) and the potential benefits for RA I. The WG agreed that it was a must to follow up the THORPEX and to see among its achievements what could be of benefit for RA I and what could be implemented. The NMHSs should also do their best to provide data for the THORPEX experiments. AMMA contributed to the evolution of the GOS in RA I. AMMA has enabled the re-activation of several stations, especially upper-air stations. The Group took note with appreciation of the benefit of AMMA to GOS in RA I, but was concerned about the sustainability of AMMA stations after the project . The sustainability of observations beyond the AMMA project should be ensured.

The session reviewed the results of the monitoring of the WWW coordinated by the Secretariat, in particular as regards the availability of SYNOP, TEMP, CLIMAT and CLIMAT TEMP reports from RBSN and RBCN stations. The WG recommended:

- To include PILOT report in the monitoring because these observations are very useful for Africa;
- That NMSs should take advantage of available monitoring software such as the one obtainable from Deutsher Wetterdienst to enhance and harmonize real time data monitoring in RA I;
- That NMSs should exchange monitoring results preferably on a quarterly basis in order to address deficiencies of data availability in RA I;
- That the reasons for missing reports should be investigated through the monitoring exercise;
- A survey should be conducted to assess the contribution of AMDAR to the improvement of upper-air observations in the Region;
- Economic groups consider the possibility of having a joint procurement approach for equipment consumables;

The session reviewed the status of implementation and operation of WWW components and, taking into account the identified gaps and the requirements, formulated recommendations and proposed guidance for the further development of the WWW implementation and services. The rapporteur, Mr Mahaman Saloum, presented the status of the Global Observing Systems (GOS) in Region I. The rapporteur proposed also a new definition of the RBSN and RBCN based on the recommendation of the CBS OPAG on ISS, to which the WG agreed.

The Group recommended that:

- High priority should be given by CBS, CAS, the Region and ASECNA to sustaining the operational AMMA network after the completion of the project.
- The highest priority for each RA I Member should go to maintaining and upgrading its national surface component of the RBSN and RBCN, rehabilitation of observing sites in critical locations through the deployment of AWSs. Therefore, it is essential that Sub-regional Economic Groupings be sensitized on the role of observational networks of surface data to achieving sustainable development.
- Full use of AMDAR ascent/descent data at major airport be encouraged.
- Members distribute, as quickly as possible, certain type of observations made routinely in near real-time but not distributed worldwide.
- In order to ensure a timely data delivery of radiosonde observations of the Region, Members work at the generation of vertical resolution sounding data in BUFR and CREX and implement the transmission as soon as possible.

The WG agreed to the formulation of a strategic plan for the evolution of the GOS, which will enable RA 1 Members to realize the changes in their contribution to the GOS and to the future development of an integration of WMO Observational System.

The session noted with satisfaction the report of Mr Malamine Sonko, the Coordinator of the Subgroup on Regional Aspects of the Information Systems and Services. The session noted that some very serious gaps persist in terms of data collection at national level, as revealed by results of monitoring activities of the GTS. The main reasons for the telecommunications problems are:

- Breakdown or obsolete equipment used for national data collection;
- Under-automation of NMCs;
- Ineffective connections or no connections between NMCs and the relevant RTH;
- Insufficient and/or inadequately trained technical and operational staffs,

The meeting reviewed and updated the information concerning the status of implementation of the GTS circuits in Region I. It noted that there was significant progress in the introduction of the data communication TCP/IP

protocol, in compliance with CBS recommendations. The session noted with appreciation the complementary data communication Internet means implemented in the South West Indian Ocean in La Reunion (France) and RTH-Nairobi to address current GTS gaps in the region. The meeting was informed that CBS has developed several guides relating to integration of Internet in the GTS. The session noted progress made at number of RTHs and automated NMCs. The Session was also informed of the benefit to the GTS through the implementation of the Tsunami Warning System in the Indian Ocean (IO-TWS). The Group considered the structure and objectives of the WMO Information System (WIS) and considered the approach to be of benefit to the region. It was recognized that The first step of the GIS implementation is the immediate integration of GTS in it.

- The WIS functional structure is similar to the GTS one in hierarchical design principle;
- The WIS should address the deficiencies of the current GTS such as garbling bulletins, imperfect dissemination of global exchange data, undesirable message loop and serious delay.

The WG noted that identification of NCs, DCPCs and GISC is controlled by CBS Procedures for identifying centres as well as rules and regulations for managing the flow of information should be defined to include the participation of WMO Regional Associations.

The migration to table driven code forms was considered by the group. The recommendations below were agreed by the WG:

a) There is need to retrain. Training should be completed for countries not yet covered and training should be repeated for RA I.
b) Pilot projects should be implemented. These pilot projects, called Migration Implementation Programmes (MIPs) should be supported if they have implementation as the defined result of their completion
c) RTCs/ NMTCs should make TDCFs (BUFR and CREX) part of their training programmes.
d) Cooperation between NMHSs on Migration to TDCF should be encouraged.

The Rapporteur on GDPFS matters, Mr Bachir Hamadache and the Secretariat presented the status of GDPFS in RA I. RSMC Pretoria runs a global model and an ensemble system. RSMC Algiers, Cairo, Casablanca and Tunis have improved their NWP capabilities. In particular Casablanca runs three operational resolution of ALADIN. RSMC Dakar and Nairobi are entering in the operational mode for NWP; both centres run operationally two types of Limited Area Model (LAM) model, which are giving encouraging results.

A “kick-off” planning meeting of the Severe Weather Forecasting Demonstration Project (SWFDP), Regional Subproject in RA I, was held 31 July to 3 August, 2006. The meeting developed a Regional Subproject Implementation Plan for the project. The principal focus of the project is on the phenomena of heavy precipitation that could cause serious flooding, and strong destructive winds.

The representative of ACMAD, Mr Zilore Mumba presented the current and planned activities of ACMAD in the field of GDPFS. The Group discussed the use of products from Global Model producers received in RA I and made the following recommendations:

(i) A list of necessary products for forecasting in the tropical areas from 0 to 72 hour ranges be developed and the products be made available by advanced centres.
(ii) African forecasting services regularly participate in the committees that define the list of products disseminated for operational use.
(iii) Advanced Centres re-distribute in CREX format on the GTS, AMDAR (ascent/descent) profiles over African airports; since the data is very important for nowcasting and forecasting.
(iv) Workshops on ensemble prediction be organized in the region to allow a better understanding of the philosophy and the techniques used.

The group discussed the development of NWP activities in RA I and adopted the strategy already defined in 2002 (NWP-AFRICA). The WG proposed the creation of a Working Group on the Development of NWP in Africa and defined its terms of reference. The following recommendations were made:

- ACMAD to pursue and enhance its training programme on Limited Area NWP;
- To approach advanced Centres running global models for facilitating the acquisition of boundary conditions adapted to the Limited Area Models (i.e. without useless grid points).
- That RSMCs running models ensure dissemination of the products to NMSs of countries covered by their models and work in a consultation with NMSs to share resources and expertise for further development of NWP in sub-region.
- The concept of <u>consortium</u> be seriously considered to share expertise, knowledge and resources between countries using the same NWP model to enhance progress in the development and improvement of the model and the use of NWP products.

The Rapporteur on Public Weather Service in RA I, Mr Florian Mnikeli NDABAMBI presented the most prominent matters affecting the PWS Programme in RA-1 which included:

- Lack of adequate qualified staff in some meteorological services.
- Poor media coordination and cooperation.

- Inadequate media systems to disseminate weather information.
- Lack or poor cooperation between NMHSs and sectors involved with safety of life and property, this includes disaster management structures.
- Lack of or not enough meteorological awareness among stakeholders and users.
- Lack of skills to produce and present weather bulletin on national television.

The Group recommended in particular the following methods to enhance PWSP in the region:

- NMHSs must advise public and other users as to what to do when high impact weather is expected or occurring.
- Cross border experience and data exchange (to include regional seminars).
- NMHSs establish or enhance cooperation with government, non-governmental organizations including private disaster management institutions and media. Develop a dialogue with regional representative bodies, where these had been established
- ACMAD is encouraged to give advice on provision of guidance forecast for the entire region (NMHSs) take note of lessons that can be learned from the Severe Weather Demonstration project.
- Meteorological centres enhance awareness campaigns; demonstrate capabilities to enhance the image and the visibility of NMHSs.

The session reviewed Co-operation Activities related to the WWW implementation and operation. The session considered in particular the following topics:

- Priorities in requirements of RA I Members
- Priorities in co-operation activities for the WWW (especially considering LDCs)
- Pilot projects implementation

The session was informed of the set of priorities proposed for approval by CBS and on the projects implemented or ongoing in RA I under VCP funding. The Group was informed that many other assistance projects, bi-lateral or multi-lateral, existed in RA I. The Group observed that the sustainability of all these investments need to be ensured by the maintenance of the equipments and Training of the technicians in charge of the maintenance and observation equipment. The Secretariat presented a concept on “integrated and sustainable assistance”. That is the concept of “integrated and sustainable assistance”; a project which integrates the delivered assistance within a chain ensuring correct, improved products delivered to users and which ensures the sustainability, including maintenance for continuous operational activities during the whole life expectancy of the equipments. The Working Group found that this concept was useful.

The session reviewed the Strategic Plan proposed by the Chairman of the Working Group and made appropriate comments and recommended it for a main contribution to the fourteenth session of RA I.

The working group defined its major future tasks for recommendation to the next RA I Session as listed in Annex to this paragraph. The Group agreed that communication between the rapporteurs and coordinators and the chairman should be enhanced especially through email during the intersession period to improve information flow and facilitate actions to address urgent issues affecting the implementation and operation of WWW in the Region.

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1.2 Adoption of the agenda
1.3 Working arrangements

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3.1 Review of decisions

3.2 WWW support to Early Warning Systems, and, in particular, Tsunami Warning Systems in the Indian Ocean, and to the WMO DPM Programme

3.3 WWW Regional contribution to THORPEX and AMMA

3.4 World Weather Watch aspects of the WMO LDCs Strategy

4. STATUS OF WWW IMPLEMENTATION AND OPERATIONS

4.1 Results of monitoring: Availability of SYNOP, TEMP, CLIMAT and CLIMAT TEMP reports at MTN centres
4.2 Results of questionnaire

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5.2 Information Systems and Services (ISS) (including implications of WIS and difficulties of migration to TDCF)
5.3 Data Processing and Forecasting System (DPFS) (including severe weather demonstration project)
5.4 Public Weather Services (PWS)
5.5 WWW-related Co-operation Activities

6. THE STRATEGIC PLAN TO ENHANCE THE CONTRIBUTION OF WORLD WEATHER WATCH TO THE REDUCTION OF THE RISKS ASSOCIATED WITH SEVERE WEATHER AND CLIMATE EXTREMES AFFECTING AFRICA IN SUPPORT OF SUSTAINABLE DEVELOPMENT

7. FUTURE WORK PROGRAMME

8. CLOSURE OF THE SESSION

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REPORT OF THE FIFTH SESSION OF THE WORKING GROUP ON PLANNING AND IMPLEMENTATION OF WWW IN RA I

(Nairobi, 25-29 September 2006)

1. OPENING OF THE SESSION

1.1 At the kind invitation of the Government of Kenya, the fifth session of the Working Group on Planning and Implementation of WWW in RA I was held at the Kenya Meteorological Department facilities in Nairobi. The session was called to order at 10.00 a.m. on Monday, 25 September 2005, by Mr William Nyakwada (Kenya), Chairman of the Working Group on Planning and Implementation of the World Weather Watch (WWW) in Region I.

1.1.1 Mr Nyakwada, in his capacity as Chairman of the Working Group, welcomed all those attending the opening ceremony of the session. He recalled that Africa had great economical and agricultural potential, but this was at risk with extreme severe weather or long drought. He reminded the session the great responsibility that the region through the Heads of NMHSs had bestowed on the group. He recalled that the WWW was the bedrock of NMCs and he noted that the visibility of NMHSs was critical and could only be achieved through quality output services and that these can only be produced with an adequate amount of data of quality. The responsibility of the group was to develop a realistic strategy to increase efficiency of WWW in the Region. The NMHSs require equipment, human resources and visibility for the decision makers and the public. The Regional Association is waiting for the WG to develop recommendations, which are implementable within the Region.

1.1.2 On behalf of Mr Michel Jarraud, Secretary-General of WMO, Dr Jack Hayes, Director of the World Weather Watch Department in the WMO Secretariat, thanked the Government of Kenya, represented by Mr Gerrishon Ikiara, Permanent Secretary, Ministry of Transport, for hosting the session and for the excellent arrangements and facilities. He thanked the officers who worked hard to organize the session, in particular, Mr William Nyakwada, and also Mr Kahuha. He thanked also especially the chairman of the Working Group, Mr William Nyakwada, for his work during these five years. He recalled that WWW was the backbone of all meteorological applications, and it must be efficient to deliver proper products for the public and economic needs, especially for Disaster Prevention and Mitigation. The group should identify deficiencies and refine the strategy to address them. Some example needs:

- More Upper-air observations
- Efficient national data collection
- Efficient Message Switching Systems
- More automation
- Spare parts and maintenance facilities
- Training of staff, especially for Information Technology
- More visibility towards governments and potential users

He noted, however, that positive things have happened during the last 5 years such as:

- Acquisition of MSG (PUMA project), RETIM 2000 stations
- All countries have some access to Satellite pictures, and to some NWP products from Global Model producers
- The GTS has been upgraded as benefit of the Tsunami warning programme
- THORPEX-AMMA Experiment has increased observations and NWP developments
- Limited Area Model for NWP now run in 10 countries

He asked the Group to consider in particular:

- Review of the RBSN , the telecommunications , the Public Weather Service, consider the role of RSMCs and ACMAD, review the training requirements
- Assess again the deficiencies
- Analyze the problems
- Make recommendation for capacity building projects and define priorities, to be considered by the next session of the Regional Association in February in 2007.

The Director of the WWW thanked again the Chairman and core members of the group: the coordinator and the rapporteurs on their different specialties, for their contribution to the work of the group. He wished a good and constructive work as well as a good stay in Nairobi.

1.1.3 Mr Stanlaus Gachara, Deputy Director, representing Dr Joseph Mukabana, the Permanent Representative of Kenya with WMO, welcomed the participants and stressed the importance of identifying problems and finding solutions if we want efficient meteorological services in Africa.

1.1.4 Mr Gerrishon Ikiara, the Permanent Secretary, Ministry of Transport, on behalf of Kenya Government, welcomed all the participants. He recalled that WWW was the core programme of the WMO. He recalled that the tasks of this Working Group were to improve GOS, GTS, DPFS and PWS in Africa. Its goals were enhanced standardization, and more accurate observations for better forecasting. That is crucial for aviation and the whole economy. The best technology should be used but also the most cost effective. Economical activities dependant on weather must have information provided with the best technologies. All Meteorological Services were interdependent; and one could not have a weak link in the system. Sometimes, meteorological services had the information but were not able to communicate. NMHSs have to be closer to the public. It is important to make the correct dissemination of accurate information. It was equally important to adapt it to the user community. Communities are more and more sensitive to severe weather and extreme climate events. NMHS should contribute to mitigation of disasters. Government should be able to take the necessary actions, even only few hours before the a severe weather event to reduce impacts. There is a need to increase quantity and quality of meteorological information. There is a need to implement Automatic Weather Stations, to improve telecommunications and, to use Internet facilities. Governments did not understand the difficulties of meteorological services. The NMHS needed to be more dynamic to market themselves and show the benefit to their government, to work to get priority in budgeting. They must work closely with the Media and the private sectors, showing that better knowledge of the climate and weather, permits sustainable development. Mr Gerrishon Ikiara called on all the participants to participate fully in this meeting. He thanked WMO, for the support to KMD and confirmed of Kenya willingness to share its experience. He wished a good meeting and declared the session officially opened.

1.2 Organization of the session

The session adopted the agenda as given at Page (IV). The session agreed on its working hours. There were 20 participants from 10 countries, ACMAD, ASECNA, ICAO and WMO. The list of participants is shown in the Annex to this paragraph.

2. REPORT OF THE CHAIRMAN OF THE WORKING GROUP

2.1 The Chairman gave an account of the status of relevant co-ordination activities and strategies developed to enhance the efficiency of WWW as part of the work of the Working Group for the period 2001 to 2006. He acknowledged that in six years, technology has evolved substantially and that the region faced many new challenges as a result of the new technological developments. Some issues, which were raised in the report, were addressed under relevant agenda items.

2.2 The chairman stressed that performance of WWW in the region has continued to be unsatisfactory. The availability of data from the region, as revealed in the Annual and Special Monitoring of the performance of the WWW has continued to be unsatisfactory. The 13th Session of the Commission for Basic System held in St Petersburg, Russian Federation, from 23 February – 3 March 2005 indicated the following as to have priority for implementation:

i. Improving and restoring the existing and building the new upper air capabilities of RBSNs;

ii. Improving data quality, regularity and coverage of surface observations of the RBSNs;
iii. Using cost effective observing systems AWSs, AMDAR, ASAP and drifting buoys;
iv. Improving the data quality and coverage provided by the RBCNs;
v. Connection of each National Meteorological Centre (NMC) to the GTS for the exchange of observational data and processed information.

These were important strategies that need consideration for aiming at improving the WWW Basic systems in the region. There is also a need to take into consideration the implementation of WMO Information systems in the region (WIS).

2.3 The working group provided hope for the region. It was expected to recommend what was best for the development of WWW in Africa. WWW is the bedrock of meteorological services. A weak WWW is a threat to quality services and reflects itself in the frequent disasters finding the people of the region unprepared.

3. CONSIDERATION OF THE DECISIONS OF XIII-RA I, CBS-XIII, XIV-CONGRESS AND EC-LVIII INCLUDING REQUIREMENTS FOR WWW SUPPORT TO OTHER PROGRAMMES

3.1 The working group focussed its work in response to the specific major tasks which XII-RA I session agreed should receive priority. These are further design and monitoring of the implementation and operation of the regional basic synoptic network (RSBN), review of regional telecommunication networks and monitoring their implementation and operation, monitoring the status of implementation and operation of regional Data-processing Centres and National Meteorological centres, including development of NWP. Others are further development due to the Tsunami Warning Systems, the implementation of the WMO Information System (WIS) and the migration to Table Driven Code Forms and finally operation of Public Weather Services (PWS) in the region.

3.2 The WG session considered that the terms of reference for the WG and the rapporteurs and coordinateurs had to be reviewed, when considering the evolution of technology and priorities after five years, and these are proposed in chapter 7.

3.3 The session was informed and took note of Cg-XIV, CBS-XIII and EC-LVIII decisions and guidance. It took action under the relevant agenda items of the session on the following relevant issues addressed to the Regional Associations, in particular to RA I:

- Despite the gradual increase in data availability globally, the amount of data available in RA I was still very low. To help remedy this situation the Council requested RA I, with the support of the Secretary-General, to revisit the implementation strategy for enhancing WWW basic systems with respect to RA I, with the aim of increasing data availability in this Region.

- CBS in collaboration with CAS and regional associations to continue the development and implementation support of adaptable observing programmes and systems to improve the early-warning capability of NMHSs as an important contribution to the cross-cutting NDPM (Natural Disaster Prevention and Mitigation).

- Noting that the capability was already in operation at some RTHs, the Council urged more Members operating RTHs to implement the Internet-based services for complementary data-collection, in compliance with the recommended practices developed by CBS. It also re-affirmed the importance that CBS pursue the development/update of guidance material for the use of the Internet with minimized operational and security risks, and for the use of adequate ICT for NMHSs of developing countries;

- The need for a coordinated, effective plan for building capacity in developing countries to enable them to participate in WIS, and the importance of involving developing countries'

experts in the development work of WIS to take account of the realistic capabilities, opportunities and constraints for the participation of the NMHSs of the developing countries in the WIS.

- Recognizing the advantages and usefulness of bulk purchase for Members and the successful experience in the bulk procurement of upper-air consumables under the GCOS Trust Fund and the satellite receiving equipment for Africa under the PUMA project, the Council agreed that the WMO Secretariat should implement a system for joint purchase of consumables and spare parts for developing Members.

Recommendations

3.3.1 The Working Group (WG) recommended that criteria such as an implementation matrix, should be designed to monitor the implementation of the recommended actions. Every year a report should be prepared by the rapporteurs or coordinators and the Secretariat to give the status of implementation of the recommendations.

3.3.2 The WG recommended that joint bulk procurement should be considered as an option of reducing costs of consumables

THORPEX-AMMA

3.4 The session considered the WWW contribution of RA I to THORPEX and in particular AMMA (African Monsoon Multidisciplinary Analysis) and the potential benefits for RA I.

3.4.1 THORPEX plans to examine global-to-regional influences on the predictability of high-impact weather and establish the potential to produce significant statistically verifiable improvements in forecasts of those time scales. CBS-XIII noted that some components of the THORPEX project (e.g. TIGGE) and adaptive observing strategies have been demonstrated as effective principally in mid-latitude regions and the theoretical framework and procedures are not as well developed for tropical regions except tropical cyclones. CBS-XIII requested when contributing to THORPEX to keep in mind the application to tropical countries in their input to the planning and design of THORPEX projects.

Objectives

3.4.2 The AMMA International Working Group 5 (WG 5) deals with High Impact Weather Prediction and Predictability. It deals specifically to link AMMA and THORPEX activities related to the West African Monsoon. WG5 is concerned with high impact weather for West Africa (onset and duration of wet/dry spells including monsoon onset; risk of heavy rainfall/floods, the downstream Atlantic (tropical cyclogenesis and intensity change, role of the Saharan Air Layer), and the extratropics (extratropical transition, excitation of Rossby wave trains). The co-leaders of WG5 are scientists involved in AMMA and THORPEX from Africa, Europe and the US.

3.4.3 One of the main priorities of WG5 is to assess the impact of the additional data gained during the AMMA Enhanced Observing Period (EOP) of 2005-2007 and the Special Observing Period (SOP) in 2006 on numerical weather prediction for West Africa, the downstream Atlantic and the extratropics. Of particular interest are data from the enhanced radiosonde network and the driftsonde test. AMMA scientists working with ASECNA and African Meteorological Services have upgraded the regional sounding network, re-established stations that were silent in recent years (e.g. Abidjan), and established several new stations. This effort has also included improvements, where appropriate, to the transmission of data to the GTS. This has been a major effort involving several hundred people and substantial coordination by AMMA.

3.4.4 In WG5 the following activities are in progress or being initiated.

- Data Impact Studies. (to make recommendations for what the future observing system

should be in the West African region that will support prediction of high impact weather).

- Development and assessment of new forecast tools and products. Tailored products and software have been developed by AMMA for the region and African forecasters have been trained to use them. Discussions have started to explore ways to sustain these efforts and in the long-term see if they can be transferred to other regions on the continent.
- Adaptive Observations and Ensemble Forecasting. The question of whether an adaptive observing strategy should be considered during the SOP was raised and it was concluded that we do not know whether techniques applied elsewhere to calculate sensitive areas are appropriate for West Africa. This is an area where WG5 working with THORPEX scientists will coordinate research to address this question using the data gained during the EOP/SOP. The work has implications for the design of ensemble perturbations also.

3.4.5 ACMAD was involved in forecast part of AMMA. ACMAD, in conjunction with the AMMA forecast group, has developed new analysis and forecast tools for West Africa called West African Synthetic Forecasts (WASF). These tools will be extended for trial in other parts of Africa.

3.4.6 ACMAD took the initiative and in conjunction with WMO is preparing a THORPEX Africa science plan. The plan will be finalized through input from African stakeholders at a forum in November 2006. The plan is due to be submitted to RA I for adoption, including constitution of THORPEX Africa Regional Committee.

Issues

3.4.7 The WG agreed that it was a must to follow THORPEX and to see among its achievements what could be of benefit for RA I and what could be implemented. The NMHSs should also do their best to provide data for the THORPEX experiments.

3.4.8 The rapporteur for GOS recalled that there was a CAS and a CBS component in AMMA. AMMA contributed to the evolution of the GOS in RA I. AMMA has enabled the re-activation of several stations, especially upper-air stations. The Group took note with appreciation of the benefit for GOS in RA I, but was concerned by the future after AMMA. The sustainability of observations beyond the AMMA project should be ensured. Stations should continue to operate (see also paragraph 5.1.6). The Group was pleased to hear the representative of ASECNA indicating the willingness of ASECNA to keep running the new AMMA radiosonde stations after the end of the project.

4. STATUS OF WWW IMPLEMENTATION AND OPERATION

Diagnostic

4.1 The session reviewed the results of the monitoring of the WWW co-ordinated by the Secretariat, in particular as regards the availability of SYNOP, TEMP, CLIMAT and CLIMAT TEMP reports from RBSN and RBCN stations (see also Annex to paragraph 5.1).

Type of data	Reports received on average during the July and October 2005 SMM, and the January and April 2006	Reports expected to be prepared*
SYNOP	51%	90%
Part A of TEMP	29%	82%

Note: the percentages are calculated with the RBSN as the reference

4.1.1 The data received from Africa were below compared to the other WMO Regions. The

Rapporteur on GOS pointed that for surface, countries made effort the last 6 months; in particular Somalia, Angola, Congo, Nigeria, Liberia had improved. Less than 20 stations were silent. For TEMP, 91 stations, less than 50 % of these stations were having a complete programme. Fortunately, AMMA had improved the numbers of operating TEMP stations.

4.1.2 For CLIMAT reports the availability was very low.

Type of data	Reports received at MTN centres during the October 2005 AGM	Reports expected to be prepared*
CLIMAT	29%	65%
CLIMAT TEMP	32%	96%

Note: the percentages are calculated with the RBCN as the reference

The coding of CLIMAT is still difficult and is not always performed. There was however an improvement observed after April 2006.

4.1.3 In Africa there are many stations, which work well, but the observations are not transmitted in real time. The observing schedule is not always realized. Implementation of observations is not done, or the stations have been closed and this is not passed to WMO and the volume A is not updated. Overall there is no improvement in the availability. The volume C1, if not updated, affects the results of the monitoring exercise. Results are sent to countries for explanation and action, and often, there is no answer.

Recommendations

4.1.4 The WG recommended:

- To include PILOT report in the monitoring because these observations are very useful for Africa;
- That NMSs should take advantage of available monitoring software such as the one obtainable at ftp://ftp4.dwd.de/WMO/Metdata_monitor to enhance and harmonize real time data monitoring in RA I;
- That NMSs should exchange monitoring results preferably on a quarterly basis in order to address deficiencies of data availability in RA I;
- That the reasons for missing reports should be investigated through the monitoring exercise;
- A survey should be conducted to assess the contribution of AMDAR to the improvement of upper-air observations in the Region;
- Economic groups should consider the possibility of bulk purchase to reduce the cost of operation and consumables;
- NMHSs be encouraged to use linkages for good observations networks to better meteorological and climate applications, which help to prevent catastrophe and poverty.

RESULTS OF 2005 QUESTIONNAIRE

4.2 The results of the 2005 questionnaire distributed to RA I countries to assess the operation and progress of implementation of WWW in RA-I had been distributed before the session to the participants (see http://www.wmo.int/web/www/Planning-Impl/RA-1/Nairobi2006/Doc4-2(1).doc). The Answers arrived up to January 2006. Twenty one countries sent the filled form: Algeria, Benin, Chad, Congo-Brazzavile, Cote d'Ivoire, Egypt, Ethiopia, La Réunion, Gambia, Guinea-Bissau, Kenya, Libya, Morocco, Mauritius, Niger, Senegal, Seychelles, Spain, Tanzania, Tunisia, Uganda. Although there are fifty-two countries in Africa, this list gave a good spectrum of the status of meteorological services in RA I.

4.2.1 Lack of consumable and lack or parts are noted as a main problem of the GOS. One fourth of the countries are satisfied with their MSS system. Internet is starting to be used for collection and transmission of observations. All countries receive products from Global Model centres via at least one reception system (GTS, MDD, MSG, VSAT, Internet, SADIS or FAX), and the majority of countries have several different reception systems. However, few apply post-processing techniques to the received products. Most countries are satisfied with their Public weather Service.

4.2.2 To remedy the deficiencies, more training is required in all fields of the WWW. Finding new donors for funding is suggested in many cases, as well as increasing areas of responsibility of awareness of governments on the benefits of meteorology. International assistance and multi-lateral cooperation are also recommended.

5. REGIONAL ASPECTS OF THE WWW COMPONENTS

The session reviewed the status of implementation and operation of WWW components and, taking into account the identified gaps and the requirements, formulated recommendations and proposed guidance for the further development of the WWW implementation and services.

5.1 INTEGRATED OBSERVING SYSTEMS (IOS)

RBSN-RBCN

The rapporteur, Mr Mahaman Saloum, presented the status of the Global Observing Systems (GOS) in Region I (see diagnostic and achievements in Annex to this paragraph). The rapporteur proposed also a new definition of the RBSN and RBCN based on the recommendation of the CBS OPAG on ISS (see the methodology explained in Appendix to Annex and for the lists of stations see http://www.wmo.int/web/www/Planning-Impl/RA-1/Nairobi2006/APPENDIX%20A.xls and http://www.wmo.int/web/www/Planning-Impl/RA-1/Nairobi2006/APPENDIX%20B.xls).

The Group agreed to these updates. Then, the Group considered how the GOS could be improved and developed some recommendations.

Diagnostic

5.1.1. In many areas of Africa the GOS simply does not exist because of deficiencies: failure to catch up with rapid technological developments, poor economic environment, difficulties in establishing stations in remote or uninhabitable areas, inadequate or lack of telecommunication facilities and capacities for the operation and maintenance of equipment (e.g. barometers not calibrated), high cost of consumables especially for upper air stations, lack of qualified personnel.

Issues

5.1.2. The evolution of the GOS in RA -1 must address some of the issues that fall into the following three categories: (a) lack of public infrastructure such as electricity, telecommunication, transport facilities etc., (b) lack of expertise to do the job, of training, etc., and (c) funding for equipment, consumables, spare parts, manpower, etc. The lack of infrastructure and expertise may be the result of a lack of funding.

5.1.3. The evolution must take into account upgrading, restoring, substituting and capacity building (especially in the use of new technologies). Two aspects needed to be considered: the use of the data and the production of the data. It is possible that some countries do not and will not be able to

produce the data and will therefore only be users of data. To help African countries produce data for international exchange, due consideration must be given to the three issues previously identified, i.e. lack of public infrastructure, expertise and funding. When looking at candidate observing systems, consideration must be given not only to the needs of NWP but also of many other applications, including human resource capacities in forecasting.

Relevant recommendations addressing the Evolution of Surface Based Sub-Systems of GOS for Africa

Issues

5.1.4 The appropriate recommendations developed by the ICT on IOS relevant to the evolution of the GOS in Africa address mainly the aspects of the production of the conventional data of the surface based subsystem network (RBSN) and in situ observing systems. These recommendations for the evolution of the GOS in Africa are:

5.1.4.1 Towards the redesign of the GOS, a first step should be to identify observing systems that are less dependent on infrastructure, expertise, and funding. These are satellite, AMDAR, and AWSs. However, a minimum set of reliable RAOBs is required not only as a backbone to the upper air network, but also to validate the satellite and AWS observations. Migration toward the BUFR code (as a reliable and flexible representation of the data) is required. If resources are available, the highest priority should go to (a) maintaining the RBSN and RBCN, noting that GUAN stations are part of the RBSN, and (b) to rehabilitate observing sites in critical locations.

5.1.4.2 **G1 Distribution** – Some observations made routinely are not distributed in near real-time but are of interest for use in meteorological applications.
G2 Documentation – All observational data sources should be accompanied by good documentation including metadata, careful QC and monitoring.
G3 Timeliness and completeness – There should be a timely distribution of radiosonde observations with all observation points included in the message, together with the time and position of each data point; information on instrument calibration prior to launch and information on sensor type. Appropriate coding standards should be used to ensure that the content (e.g vertical resolution) of original measurements sufficient to meet the user requirements is retained during transmission.
G4 Baseline System – Provide comprehensive and uniform coverage with at least 12-hour frequency of temperature, wind and moisture profiles over mid latitude continental areas and coastal regions. In tropical regions, the wind profile information is particularly important.
G6 Ozone sondes – Near real-time distribution of ozone sonde data is required for calibration and validation of newly launched instruments and for potential use in NWP.
G9 AMDAR - AMDAR technology should provide more ascent/descent profiles with improved vertical resolution, where the vertical profile data from radiosondes and pilot balloons are sparse as well as into times that are currently not well observed such as during night times. And soon humidity profiles must be added to temperature and wind, when humidity sensors will be fitted in the aircrafts.
G20 More profiles in the tropics – Temperature, wind and if possible the humidity profile measurements (from radiosondes, PILOT and aircrafts) should be enhanced in the tropical belt, in particular over Africa.

General outlines to address the identified recommendations and actions

Issues

5.1.5 The following general outlines should be taken into account during the implementation of EGOS-IP recommendations in Africa:

- The evolution of the GOS in Africa, and in developing countries in general, must take into account upgrading, restoring, substitution and capacity building, especially in the use of new

technologies of observing systems that are less dependent on local infrastructure. In some circumstances these include satellite, AMDAR, dropsondes and AWSs. Nonetheless, a minimum set of reliable RAOBs is required as a backbone to the GUAN and RBCN; these are also used to validate satellite and AWS observations.

- Migration toward the table driven codes (BUFR and CREX) as a flexible, reliable representation of the data, including stations metadata will improve quality.

- The production of vertical profiles by AMDAR in many data sparse areas is worth testing.

- It is important to conduct Observing System Experiments (OSEs) to study the impact of additional observations (e.g AMDAR) in areas in Africa of sparse conventional observations (e.g RAOB) and discuss possible observing system experiments to explore enhancing the observations in these areas. This is in fact a requirement to study the impact of all AMDAR data in Central and Southern Africa on the global NWP. The AMMA Programme provides an opportunity for impact studies and subsequent network design.

- The information METEOCAST Ground Receivers should be expanded to include other data types for routine applications (synoptic, aviation and nowcasting).

- Developments through the AMMA Project offer a possible route forward in some parts of West Africa, and special attention should be paid to maintaining the selected parts of the network (particularly the RAOBs in ASECNA countries, Ghana and Nigeria) after the AMMA Project is concluded. The Group noted that the AMMA programme has addressed gaps by reactivating observing sites and created new sites, for upper-air and surface observations. The Group stressed again its concern with the continuity of observations after the end of the AMMA project.

Recommendations

5.1.6 The Group recommended that:

- High priority should be given by CBS, CAS, the Region and ASECNA to sustaining the operational AMMA network after the completion of the project. In particular, RA I should make all efforts to maintain the rehabilitated sites and sustained the new stations of AMMA.

- A study-analysis be carried out to identify which of the stations are absolutely necessary after AMMA and make all efforts to maintain the relevant stations and a programme of actions be implemented with all avenues possible to be considered, in particular:
  - Every country should be concerned and contribute.
  - ASECNA should confirm commitment for upper-air stations after AMMA.
  - The possible substitution of upper-air profiles by AMDAR.
  - Development of a strategy to continue observations in non-ASECNA countries.
  - Consideration of regional grouping (similar to EUMETNET, COSNA, etc..).

- RA I consider an experiment in another part of Africa, similar to the AMMA programme. The example of the AMMA programme for observations and the definition of an appropriate optimum network be expanded to other parts of Africa.

- The highest priority for each RA I Member should go to:
  (a) maintaining and upgrading its national surface component of the RBSN and RBCN, with emphasis on the implementation of the best practices of the GSN and
  (b) rehabilitation of observing sites in critical locations through the deployment of AWSs (viable and cost effective compared to manned stations). Therefore, it is essential

that Sub-regional Economic Groupings (NEPAD, ECOWAS, SADC, IGAD, CEMAC etc.) be sensitized on the role of observational networks of surface data (meteorological, environmental, climatological) to achieving sustainable development of our countries through the prevention of natural disasters and catastrophes associated with severe weather, climate and water.

- Full use of AMDAR ascent/descent data at major airports takes place. Thus high priority should be given by the Region, the WMO Secretariat and the AMDAR Panel to help ASECNA achieve by the end of 2007 the implementation of a full operational AMDAR programme in West and Central Africa. Consequently, the WMO Secretariat, within the framework of the implementation of the recommendations issued by the Task Team ASECNA-WMO (Dakar 2005) and in close collaboration with the AMDAR Panel (point of contact with E-AMDAR that has reconfirmed its commitment to provide ASECNA targeted AMDAR data), should assist ASECNA to realise a full sub regional AMDAR observation programme, particularly the funding of the data display system and the installation of software and configuration of long-haul aircrafts from Air France.

- Members distribute, as quickly as possible, certain type of observations made routinely in near real-time but not distributed worldwide. These information are of interest for use in other meteorological applications:
  b) Observations made by Pilot sounding – In the tropics, the wind profile information is considered to be of particular importance.
  c) Observations made with high temporal frequency should be distributed globally at least hourly. Examples include regular aviation observations (METAR, SPECI, high resolution Radar observations, AWSs, Buoys Hourly SYNOP, precipitation and wind from local or regional mesonet, soil moisture and temperature).
  d) The need for good metadata exchange in support of observational data sometimes in real-time is essential.

- Members operating ground based GPS measurements for total water vapor to collect these data and exchange them.

- In order to ensure a timely data delivery of radiosonde observations of the Region, Members work at the generation of vertical resolution sounding data in BUFR and CREX and implement the transmission as soon as possible, following the technical specifications defined by CBS in the Guidance for Migration. The delivery of the profile data in several stages may be necessary to accommodate the interests of other applications.

Strategic Plan towards the Integration of WMO Observing Systems

5.1.7 Finally the formulation of a proposal of a strategic plan for the evolution of the GOS, which will enable RA 1 Members to realize the changes in their contribution to the GOS and to the future development of an integration of WMO Observational System, was found necessary.

Goals

5.1.7.1 With regard to the conventional basic data to be exchanged internationally, this regional strategic plan with the support of WMO Secretariat, African Economic Groupings (ECOWAS, IGAD, SADEC, CEMAC etc.) should address:

- The feasibility of the creation of a regional or sub-regional African Composite Observing System (ACOS) playing the same role in Africa as EOCOS in Europe, NAOS in America and COSNA in the North Atlantic.
- The organization and funding of major programmes of specific observations over data sparse

regions of Africa including Sahara and Kalahari deserts and the Congo Basin rain forest as the example of the international Polar Year (IPY).

- The full involvement of the Region in the THORPEX Programme through the establishment of an African Regional THORPEX Committee and in the planned GEOSS activities, in cooperation with WMO Programmes and Projects in order to enable the Region to have a full cross-benefit with the WWW Programme.

Funding issues

5.1.7.2 Some examples of funding programmes to enable Members implement changes in their contribution to the integration of WMO Observation Systems are given:

a) Participation in projects/experiments to demonstrate and motivate the adoption for the changes to observing systems. In relation to new systems for instance, it is often helpful to witness the feasibility and usefulness of an operational system before committing the ressources needed. One means of doing this is through participation in projects or experiments (e.g. AMMA, THORPEX and others).
b) The collaboration with other Members to form a grouping or sub-regional programme to implement cost-effective changes to observing systems. There are many examples of countries working together to more efficiently tackle changes to observing programmes including EUCOS, ASECNA (for synoptic and aviation applications). It is essential for the WMO Secretariat to assist such groupings to come together and shape plans that enable Members to better achieve their desired observation programmes.
c) Most of the above specific actions could be tackled by a grouping of countries in a manner that require less resources than for each country to tackle the actions alone. Furthermore, with regard to the production of conventional data, to tackle the changes the proposed regional strategic plan with the supports of WMO, NEPAD and Economic Groupings.

5.2 INFORMATION SYSTEMS AND SERVICES (ISS) (INCLUDING IMPLICATIONS OF WIS AND DIFFICULTIES OF MIGRATION TO TDCF)

5.2.1 GLOBAL TELECOMMUNICATIONS SYSTEMS IN RA I

5.2.1.1 The session noted with satisfaction the report of Mr Malamine Sonko, the Coordinator of the Subgroup on Regional Aspects of the Information Systems and Services. The report noted the activities conducted by the sub group and the state of implementation and operations of meteorological telecommunications in Region I, including recommendations to address identified gaps. The report noted progress made but also shortcomings in the implementation and the operation of the ISS in the Region both at national and regional levels.

National Meteorological Telecommunication Networks

5.2.1.2 The session noted that some very serious gaps persist in terms of data collection at national level, as revealed by results of monitoring activities (Annual Global Monitoring and Special Main Telecommunication centres Monitoring) of the GTS (see item 4.1). The reasons for the telecommunications problems are as follows:

- Total or partial lack of the equipment needed for national data collection;
- Breakdown or obsolescence of the equipment used for national data collection;
- Use of inefficient techniques;

- Under-automation of NMCs;
- Ineffective connections or no connections between NMCs and the relevant RTH; and
- Failure to adhere strictly to the GTS operating procedures at NMCs,
- Insufficient and/or inadequately trained personnel to maintain and operate equipment.
- Etc.

Point-to-point circuits

5.2.1.3 The meeting reviewed and updated the information concerning the status of implementation of the GTS circuits in Region I. It noted that there was significant progress in the introduction of the data communication TCP/IP protocol, in compliance with CBS recommendations.

5.2.1.4 The RMTN plan comprises 87 circuits of which 70 have been implemented and are in operation. The detailed description of the circuits is given in Annex to this paragraph.

5.2.1.5 The session recorded that in addition to the gaps in national message collection, the following problems have been noted: RTH Nairobi has planned to discontinue its link with Toulouse because of the very high cost; the Zambia NMHS wrote to relinquish the RTH Lusaka responsibility; and a regional circuit Nairobi-Addis Ababa was not working due to different protocols used at the two TSPs. The proposal to establish the link through VSAT could not be implemented due to National Policies in Addis-Ababa.

5.2.1.6 The session noted with appreciation the complementary data communication internet means implemented in the South West Indian Ocean from La Reunion (France) to address current GTS gaps in that sub-region. The meeting noted with appreciation the offer of RMSC La Reunion (France) to provide Internet/GTS interface guidelines software for this purpose to other interested centres in the region. The meeting was informed that CBS has developed the following guides relating to Internet now integrated to GTS and available in WMO Web server:

- a Guide on Internet practices updated in September 2006;

- a Guide on the use of FTP and FTP servers at WWW centres updated in September 2006;

- a Guide on Information technology security updated in July 2006

Implementation of centres

5.2.1.7 The session noted progress made in a number of RTHs and automated NMCs.

(i) The status on implementation of the four MTN centres of the Region: RTH Algiers, Cairo, Dakar and Nairobi is given in Annex to this paragraph.

(ii) The four other regional centres, RTHs Brazzaville, Niamey, Pretoria and Lusaka were also automated but two of them have difficulties. RTH Niamey has its two MSSs (two MESSIR-COM Servers and two AMS1500 Servers) that are not in operation due to electrical problems after a thunderstorm. RTH Lusaka has no MSS in operation presently and RTH Brazzaville has a MSS (AMS1500) which can handle only alphanumerical data.

(iii) During the last two years the number of NMCs automated has increased, particularly in the South

West Indian Ocean, the Eastern and Western parts of the Region. The TRANSMET and MESSIR-COM systems have been installed in more than ten Member Countries via WMO DCP or EC programmes.

Satellite-based systems

5.2.1.8 For the reception of Meteosat Second Generation (MSG) data, EUMETCast receiving stations in the framework of the PUMA project have been installed already in all the countries in Region I. The regional specialised centres (DMC Nairobi, ACMAD, EAMAC, RTC-Nairobi and at the ASECNA Technical Direction in Dakar) have been equipped with training capacities covering both technical staff (system engineering) and operational staff (forecasting). Training and installation of MSG reception means have concerned all the WMO Member countries in the Region I. It was noted with appreciation that the current digital LRIT and HRIT transmissions and the DCS are fully working. The LRIT includes the MDD programme.

5.2.1.9 The receiving software of the new generation satellite distribution system for information relating to air navigation (SADIS - as part of the ICAO aeronautical fixed service) is not yet installed in most countries; and they cannot decode GRIB2 (Wind and temperature at flight levels) and BUFR information (SIGWX). Some centres used Internet as back up system to download alphanumeric, graphical and binary OPMET data and products from WAFC London server.

5.2.1.10 France and Germany are operating satellite-base distribution systems called RETIM-Africa and DWD-SAT, respectively. RETIM-Africa, transmitted in C band, covers the whole Region I and DWDSAT covers the northern part of the Region I. A Coordination Committee on RETIM-Africa was designated. The telecommunication technology for RETIM Africa uses the satellite-based Digital Video Broadcast (DVB-S) technology, which was designed for digital TV broadcast, with low cost receiving stations. DVB, as a digital high-capacity transmission system, can transmit data files and supports standard procedures (IP, FTP) that are recommended for the GTS. The Committee noted that CBS-XIII identified DVB-S services as a highly cost-effective solution in terms of recurrent and investment costs for meteorological data-distribution with large capacity (multiple 10 Mbps); CBS recommended DVB-S for improving the implementation of GTS data-distribution systems. Many NMHS have been equipped with RETIM Africa receiving systems (reception station and workstation), in particular in the South West Indian Ocean, and South/East and Western parts of Region I.

Radio broadcasts

5.2.1.11 The session noted that only two RTHs (Nairobi and Pretoria) are operating radio facsimile and Radio Teletype (RTT) broadcasts. The session emphasized that HF radio broadcasts have high recurrent costs for their operation and maintenance and a limited efficiency. In view of these high recurrent costs and the aging equipment, several RTHs have already reduced the number of transmitting frequencies and are planning to phase-out their HF radiobroadcasts in the near future. Noting the progress made in the implementation of the RMTN, the session confirmed the plan to phase out HF radio broadcasts. It urged NMCs still relying on the reception of HF broadcasts to implement more effective telecommunications systems, with possible cooperation assistance. Centres operating HF broadcasts should also identify the remaining users and assist them in identifying other means for receiving information.

Use of the Internet

5.2.1.12 The session noted that the Internet was playing an increasing role for the exchange, access to and delivery of a wide range of data and products in complement to the GTS. It also emphasized its particular importance for some smaller NMHSs, especially developing countries and LDCs, as the only affordable telecommunication means, including for transmitting observational data into the GTS. The Council urged more Members operating RTHs to implement the Internet-based services for

complementary data-collection, in compliance with the recommended practices developed by CBS. It is noted that many RTHs and NMCs were operating a Web server, and it is noted with appreciation that all the RTHs and almost all NMCs have access to the Internet, at least for E-mail services, and a number of NMCs are also maintaining a Web site. RTHs' Web servers are used as an efficient complementary mean for providing data and products to the NMCs, in particular for those NMCs with low-speed or no connection to the GTS. They should automatically transfer data to NMCs by E-mail and provide access to authorized NMCs via FTP for downloading data and products.

5.2.1.13 It was noted that many centres operate a virtual private network (VPN) over the Internet between centres, and provide observational data and products. Also, the Guidelines developed by OPAG-ISS for use of Internet to transmit observational data bulletins are very operated.

WMO Operational Information Service (OIS)

5.2.1.14 The session was informed that the objective of the Operational Information Service (OIS) is to collect from, and distribute to WMO Members and WWW Centres a detailed and up-to-date information on the facilities, services and products made available in the day-to-day operation of the WWW. The following operational information is posted on the WMO server under http://www.wmo.ch/web/www/ois/ois-home.htm:

- WMO Publication No. 9, Volume A - Observing Stations
- Catalogue of Radiosondes and upper-air wind systems in use by Members
- Regional basic synoptic and climatological networks
- WMO Publication No. 9, Volume C1 - Catalogue of Meteorological Bulletins
- WMO Publication No. 9, Volume C2 - Transmission programmes
- Routeing catalogues of bulletins
- Monitoring Reports (quality and quantity)
- WMO Publication No. 9, Volume D - Information for Shipping
- WMO Publication No. 47 - International List of Selected, Supplementary and Auxiliary ships
- Operational Newsletter on the World Weather Watch and Marine Meteorological Services
- Additional data and products as defined in Resolution 40 (Cg-XII)

5.2.1.15 With respect to updating Volume C1 - Catalogue of meteorological bulletins, the session was informed that 14 MTN centres have taken the necessary action to conform to the required format in producing the semi-annual updates, of which 8 MTN centres provided advanced notification of changes. The Joint implementation-coordination meeting on the MTN and meeting of the CBS Expert Team on GTS-WIS Operations and implementation (Geneva, May 2006) (ICM-MTN/ET-OI (2006)) stressed that the value of the Catalogue would greatly improve if all MTN centres could provide notifications whenever changes occur and if the remaining 2 MTN Centres in Region I (Cairo and Nairobi) could also participate in providing their input.

5.2.1.16 The session agreed that each RTH should prepare a routeing catalogue accessible by other GTS centres, in particular by its associated NMC. The routeing directory should be updated monthly if possible, but not less than every three months. There are still MTN centres in Region I (Dakar and Nairobi), which have not made their routeing catalogue accessible.

Radio frequencies for Meteorological Activities

5.2.1.17 The session noted with appreciation the very favourable outcome of the World Radiocommunication Conference 2000 as regards the several items of interest for meteorology. The active participation of WMO in the ITU preparatory activities was instrumental in ensuring that meteorological requirements were recognized and supported. Meteorological requirements in the band 401-406 MHz for meteorological aids (radiosondes) and meteorological satellite operation were acknowledged for the foreseeable future, and current allocations were not changed in the band 1670-1710 MHz, which is a main band for meteorological satellite operation world-wide and in its lower part

for radiosondes operation by many NMHSs. The allocations to spaceborne passive remote sensing of increasing importance for meteorology in the frequency range 71-275 GHz were re-organized to meet present and foreseeable future requirements, taking into account technological and scientific advances. The S band (2700-2900 MHz) that is used worldwide by meteorological radars, was not retained by WRC-2000 as a band for the IMT-2000 operation (third generation of mobile phones). However, the issue may be reconsidered by WRC-2007.

5.2.1.18 The session noted that the pressure on radio frequency bands would, however, continue with the increasing development and expansion of new radiocommunication systems. EC-LII re-emphasized the importance of continuing to defend the frequency allocations to meteorological systems and environmental satellites. The session was informed that the preliminary agenda for the next World Radiocommunication Conference (WRC-2007) included items of importance for meteorology, including the band 1683-1690 MHz, and it noted that CBS and the Secretariat are pursuing their participation in the relevant ITU-R activities. The session stressed the importance that WMO continue informing the NMHSs on the question, and that the NMHSs co-ordinate these issues with their national telecommunication administration.

Monitoring activities

5.2.1.19 The session noted with appreciation that RTH Dakar has tested in operation in October 2005, as recommended by the CBS-XIII held in Saint Petersburg (Russian Federation), a monitoring application on a PC (METDATA MONITORING software) developed by Germany (DWD) to implement the WWW monitoring exercises. Results were very positive were sent to WMO Secretariat for analysis.
RTH Dakar recognized that its October 2005 IWM statistics did not include the statistics of NMCs associated to RTH Dakar. One of the reasons is that usually NMCs did not exchange their monitoring to the associated RTH and just a few NMCs participate in the monitoring activities.

Tsunami Warning System in the Indian Ocean

5.2.1.20 The Session was informed of the benefit for the GTS of the implementation of the Tsunami Warning System in the Indian Ocean (IO-TWS). WMO, in coordination with US/ISDR, UNESCO/IOC, and NMHSs has actively promoted and taken action for ensuring the most effective use of the GTS for the immediate support of the Interim Tsunami Advisory Information service as well as for the longer-term support of the Tsunami Warning System in the Indian Ocean, within a multi-hazard Early Warning approach.

5.2.1.21 "Tsunami Watch Information" (TWI) bulletins that are targeted primarily at the countries of the Indian Ocean Region are issued when required by The Pacific Tsunami Warning Center (PTWC, NOAA/NWS, Hawaii, USA) and the Japan Meteorological Agency (JMA, Tokyo, Japan) with the abbreviated heading WEIO40 RJTD and WEIO23 PHEB respectively, via RTH Tokyo and WMC/RTH Washington. Regional Telecommunication Hubs (RTHs), and in particular RTHs on the MTN, have updated their routeing directories to ensure the efficient routeing and distribution of these TWI messages by all relevant routes, and in particular towards RTHs serving associated NMCs on the Indian Ocean rim, and to RTHs operating satellite-based data distribution systems covering any part of the Indian Ocean rim. The diagram of the routeing of TWI bulletins over the GTS is found in Annex to this paragraph. TWI bulletins are also inserted in the transmission programme of satellite-based data distribution systems, including RETIM-Africa, EUMETCast and METEOSAT MDD (until end 2005) (West IO), CMA PCVSAT (N-E IO), ISCS and EMWIN (East IO).

5.2.1.22 National GTS components had to be upgraded, where needed, for enabling all countries to participate in and contribute to the IO-TWS information exchange and an operational multi-hazard warning system. GTS expert team missions for on-site assessment for upgrading national GTS components had been carried out during the period July–September 2005 to the IO countries that expressed their need for assistance, including: Bangladesh, Maldives, Myanmar, Sri Lanka, Comoros,

Djibouti, Kenya, Pakistan and Tanzania. A Coordination Meeting on GTS Upgrade in the Indian Ocean to support multi-hazard early warning systems, including Tsunami warning was held in Geneva, WMO Headquarters, from 17-19 October 2005. The meeting reviewed and consolidated the projects proposals developed by the expert teams (technical feasibility, cost, implementation schedule) for ensuring a consistent GTS upgrade plan for the whole Indian Ocean rim, with a view to a coordinated implementation plan. Some potential donors, including France and the USA participated and announced their firm or imminent decision to fund the actual implementation of several projects. In the framework of this project, France has funded and implemented upgraded GTS facilities at RTH Nairobi and provincial centre Mombassa (Kenya), at NMC Dar-es-Salaam (Tanzania) and at a coastal provincial centre in Madagascar (see Annex to paragraph 5.5.2). USA is funding and implementing the GTS upgrade in Maldives and Sri Lanka. WMO is implementing, with funds from the Flash Appeal provided by ISDR, NMC national GTS upgrade projects in Bangladesh, Myanmar and Pakistan, based on the consolidated national GTS upgrade projects. GTS upgrades in the S-W Indian Ocean that were already implemented in the framework of the WMO Tropical Cyclone Programme greatly contributed to ensure the effective support of the GTS to the exchange of multi-hazard early warnings.

5.2.2 WMO Information System

5.2.2.1 The Secretariat representative presented the WMO information System. Already near the end of the 1990s it became apparent that the various WMO Programmes either had their own information systems, or were in the process of developing them independently of each other. The resulting multiplicity of systems and practices has since then generated incompatibilities, inefficiencies, duplication of effort and higher overall costs for Members. Continuing uncoordinated development would exacerbate these problems and further isolate the WMO Programmes from each other and hinder the information exchange of a wider international user community.

5.2.2.2 Therefore, the Commission for Basic Systems (CBS) developed the concept of an overarching, integrated WMO Information System (WIS) that would meet the requirements of all WMO Programmes, affiliated international organizations and programmes, as well as relevant national non-NMHS users such as disaster prevention and mitigation agencies and research facilities. WIS should provide the following fundamental types of services:

(i) Routine collection and dissemination service for time and operation-critical data and products. This service is based on real-time “push” mechanism including multicast and broadcast.
(ii) Data Discovery, Access and Retrieval (DAR) service. This service is based on request/reply “pull” mechanism with sophisticated data management and standardization.
(iii) Timely delivery service for data and products. This service is based on delayed mode “push” mechanism with trigger functions such as scheduling by timetable and monitoring the accumulation amount of required data.

5.2.2.3 The Fourteenth World Meteorological Congress (Cg-XIV, 2003) approved this approach. The fifty-sixth session of the WMO Executive Council (EC-LVI, 2004) set up a high-level coordination mechanism involving all WMO technical commissions to ensure the orderly, coordinated evolution of WIS.

5.2.2.4 The main functional components of WIS are: National Centres (NC), Data Collection and Production Centres (DCPC), Global Information System Centres (GISC) and data communication networks connecting the components. The terms are used for describing the necessary functions, not actual organizational entities. There may be organizations, such as NMHSs, which combine all three functions within their structure.

5.2.2.5 The concept of WIS requires development of the following major functions and the necessary software packages:

- Metadata catalogues;

- Internet portal;
- Data acquisition service;
- Data discovery service;
- Data distribution service: push and pull;
- Monitoring;
- Operational aspects like data synchronisation, back-up, administrative issues, etc.

Issues

5.2.2.6 The Group considered the structure and objectives of the WIS and registered their appreciation to the development of this approach. It was observed that the approach would facilitate data sharing among NMHSs and Users. The Group noted that:

- The first step of the GIS implementation is the immediate integration of GTS in it;
- The WIS functional structure (i.e. GISC-DCPC-NC) is similar to the GTS one (i.e. WMC-RTH-NMC or RTH on MTN-RTH not on MTN-NMC) in hierarchical design principle;
- However the WIS should eradicate the deficiencies of the current GTS such as garbling bulletins, imperfect dissemination of global exchange data, undesirable message loop and serious delay.

The session received clarification that the current GTS deficiencies are caused by not hierarchical design but defects of implementation and operation. The WIS functional structure is appropriate to map the WIS components through a smooth evolution from the current components.

5.2.3 Recommendations

The session made the following recommendations:

- The access to information must be protected (e.g. WIS should cope with resolution 40)
- The benefit of WIS to NMHSs must be visible
- The nomination of NCs, DCPCs and GISC should involve all the Regional Association Members
- All RSMCs should be DCPCs by definition.

- RA I to improve the work of the Subgroup by designating a core of Members who will participate regularly to the activity programmes;

- Chairperson of the RA I- PC/ WG to define a mechanism to keep abreast the work of the Sub Group on ISS;

- RA I to define a programme of Pilot Projects and their impacts should be evaluated by the RA I –PC/WG;

- RA I to organize an annual session of the Sub Group on ISS;

- RA I to organize one annual training activity for the Sub Group;

- RA I to keep abreast the progress in the implementation plan and the impact of WIS.

5.2.4 Migration to Table Driven Code Forms

The migration to table driven code forms was considered by the group. The Secretariat representative recalled the actions performed by the CBS Coordination team on the Migration. He indicated in

particular that reporting practices regulations to help programmers of encoding and decoding software had been developed for traditional observations (9 types) including regional practices, e.g. SYNOP observations in RA I. He also informed the group that CBS will probably establish an Ad-Hoc Expert Team within the OPAG-ISS for assessing advantages and disadvantages, including implications (need for defining standardization, data processing development and integration, costs and benefits: flexibility, compression, feasibility of implementation, etc.), of different data representation systems (e.g. BUFR, CREX, XML, NetCDF, HDF) for use in real time operational international exchanges between NMHSs and in transmission of information to users outside the NMHSs. The Ad-Hoc Expert Team should develop recommendations on the most appropriate system depending on the type of exchange applications and report on the possible impacts of its findings on the migration to TDCF. Given the growing use of Internet in Africa, this may open avenue to exchange some data in a more direct manner.

5.2.4.1 It was also indicated that ICAO wished to target completion of migration to BUFR in 2016. The representative of ICAO stressed that with regard to BUFR coded OPMET information, the AFTN as currently designed cannot directly handle BUFR coded messages. As the AFTN system is unable to handle messages in binary format, translation for Air Traffic Message Handling System (AMHS) will be necessary in order to support BUFR-coded OPMET messaging. ICAO regional bodies have been requested to plan for the full implementation of BUFR coded OPMET messages by 2015. Annex 3 of the ICAO Convention will be amended accordingly to meet new requirements.
The ICAO representative commended the WG on its holistic approach on addressing problems of data and products generation and distribution in the region. The aviation industry will no doubt benefit from the improved availability of aeronautical meteorological information.

5.2.4.2 The results of the 2002 questionnaire gave some indication on the difficulties and status of the migration, which were analyzed by Mr G. Obua, rapporteur on Data Management. The session noted that many Region I Member countries had not responded to the WMO circular letter concerning the designation of national comities and of coordinator for activities to be done in the framework of migration to TDCF. The session recognized that training activities have been done in some countries while some others have started experimental activities in coding and exchanging in CREX.

5.2.4.3 The rapporteur on Codes, Mr William Chillambo explained to the group the progress and training undertaken in Tanzania to introduce the CREX codes which can be implemented in Africa with the present situation of the GTS. CREX could be interim solution before the automation and migration to BUFR. The representative of Dakar RSMC explained also the use made of CREX for transmitting squall line information. The group adhered to the following statements on CREX as listed in Annex to this paragraph.

5.2.4.4 The following issues were stressed by the WG:

- Member countries have difficulties to start the migration process, even to develop a national migration plan (perhaps 25% only), derived from the international plan with analysis of impacts, costs, solutions, sources of funding (as necessary), national training, technical planning and schedule, perhaps a similar number of countries were currently developing one.
- Reason for slow start: If one tries to consider the reasons of such a lack of actions by the WMO Members for the Migration, one sees that even Members who have the technology are not taking steps towards the migration. Developing countries needed the experience of advanced countries to start, and waited for it. There is surely a problem of visibility of the migration.

Recommendations

5.2.4.5 The WG made the following recommendations:

e) A letter be sent to PRs by the Secretariat reminding them of the importance of migration. The CT/MTDCF will prepare a letter that the Secretariat should send to the WMO Members Permanent Representatives (and ASECNA and ACMAD). The letter should recall the necessary nomination of national focal point for codes migration. There will be two annexes: a one page information giving the main lines of actions to be taken and a detailed document which would be called Migration Guidance.

f) The Regional Rapporteurs on ISS, Data Management and Codes and the RTH focal points should be systematically involved and informed.

g) There is need to retrain. Training should be completed for countries not yet covered and training should be repeated for RA I.

h) Pilot projects should be implemented. These pilot projects, called Migration Implementation Programmes (MIPs) should be supported if they have implementation as the defined result of their completion

i) RMTCs/ NMTCs should make TDCFs (BUFR and CREX) part of their training programmes.

j) Cooperation between NMHSs on Migration to TDCF should be encouraged. Countries who have already made progress should make available their software and experience to other NMHss who have not yet started the migration programme.

5.3 DATA PROCESSING AND FORECASTING SYSTEM (DPFS) (INCLUDING SEVERE WEATHER DEMONSTRATION PROJECT)

The Rapporteur on GDPFS matters, Mr Bachir Hamadache and the Secretariat presented the status of GDPFS in RA I.

Nowcasting to Medium-range forecasting

RSMCs

5.3.1 Main Data-Processing and Forecasting System Centres in RA I have continued to maintain and enhance their operational numerical weather prediction (NWP) systems as well as specialized products and services provided by the designated RSMCs, and contribute to the overall operations of the GDPFS. RSMC Pretoria still runs a global model and several regional models. Pretoria runs also an ensemble system with 16 members up to 14 days. RSMC Algiers, RSMC Cairo, RSMC Casablanca and RSMC Tunis have improved their NWP capabilities. In particular Casablanca runs three operational resolution of ALADIN. ALADIN NORAF covers an area beyond the Equator; its products would be useful for West African and Sahelian countries. RSMC Dakar and Nairobi are entering in the operational mode for NWP; both centres run operationally two types of Limited Area Model (LAM) model, which are giving encouraging results.

NMCs

5.3.2 There has been substantial progress in the area of NWP by some NMCs. Following a WMO Regional Training Workshop on NWP for countries ready to implement operational NWP held in Casablanca from 12 to 17 September 2005 and additional training given by Germany, five countries: Botswana, Kenya, Mozambique, Senegal and Tanzania started to implement operational LAM in their countries. The difficulties are the acquisition of latest data sets for boundary conditions in a “reasonable time” and sufficient computer power for useful production of NWP fields. The majority of NMCs are not in a position to run their own LAM, and these are useful only if the resolution is superior to those of available products from Global Models, which now are reaching the 25 km, and also are

operationally available in a reasonable time to be used by the forecasters. Almost all NMCs have access to graphical products from advanced centres via GTS, MDD, MSG, SADIS, VSAT or Internet. The dissemination of regional models products between RSMCs and NMCs should be implemented to help their forecasting activities. ACMAD should continue to play a leading role in this matter. Nowcasting operations are hampered by lack of Radar images in two thirds of the countries. All countries have however access to some satellite images.

Ensemble Prediction Systems (EPS)

5.3.3 Many NMCs have access to several Global Model results and can apply the “poor person“ ensemble techniques. Two thirds of NMCs have access to EPS products and most RSMCs can make use of these products, especially those of ECMWF, who has recently extended its product area of coverage over the tropics for precipitation probability and the Extreme Forecasting Index (EFI). These fields are accessible by Internet through a password for WMO Members; they give good signal for strong events, which could occur beyond day-3. The Indian Ocean Centres make use of these products for Tropical Cyclone foprecasting. Some information was given on probability forecasting which is becoming really the tools for forecasting beyond day-3 in a training workshop on use of GDPFS products for French speaking countries in Dakar in November 2005.

Long-Range Forecasting (LRF)

5.3.4 Global Producing Centres (GPCs) for Long-Range Forecasts (LRF) will be proposed for official designation at the coming CBS in November 2006. For this purpose, LRF products from a minimum list are required to be made available by GPCs to NMCs and Regional and Sub-regional Climate Centres (*still to be officially nominated*). The list of products has been introduced in the Manual on the GDPFS (WMO-No.485) and form part of a requirements list for the designation of GPCs for LRF, which in particular demands fixed production cycles and time of issuance, and products accessible through the GPC Web site and/or disseminated through the GTS and/or Internet. The Minimum list of LRF products to be made available by global producing centres includes:

- Monthly averages/accumulations for a season
- Mean and spread of the distribution and calibrated probability information for forecast categories from ensemble prediction system for:
    - Two metre temperature over land
    - Sea surface temperature
    - Precipitation
    - Z500, MSLP, T850

Regional severe weather forecasting – risk management

5.3.5 CBS-XIII (2005) acknowledged the continuing need for improving severe weather forecasting and that it would be best addressed first within Regional Associations, taking into account capabilities of the Members and severe weather issues that need to be tackled as a priority within different regions. A demonstration project on severe weather forecasting of such events as heavy rainfall, severe wind storms is being implemented as a concrete contribution of the WWW Programme to the WMO Programme on Natural Disaster Prevention and Mitigation. It is important to recognize the scope and goal of the project to test the usefulness of the products currently available from NWP centres, or products that could be made available from current systems, with the goal to improving severe weather forecasting services in countries where sophisticated model outputs are not currently used. A Demonstration Project Steering Group, chaired by the Chairman of the OPAG on DPFS was formed to finalize the terms of the Project as well as to establish suitable regional projects.

5.3.5.1 A “kick-off” planning meeting of the Severe Weather Forecasting Demonstration Project (SWFDP), Regional Subproject in RA I, was held 31 July to 3 August, 2006 at the Regional Specialized Meteorological Centre Pretoria at the kind invitation of the Government of South Africa. The major outcome of this meeting was the development of the Regional Subproject Implementation Plan for this first subproject of the SWFDP in the south-eastern region of Africa, a plan that clearly specifies how the subproject will work to ensure its success in this region. The principal focus of the project is on the phenomena of heavy precipitation that could cause serious flooding, and strong destructive winds. The formation of a Regional Subproject Management Team was achieved, a necessary part of the Implementation Plan. The timeline for implementation is very short, i.e., to commence 6 November 2006.

5.3.5.2 The participating centres include global centres at ECMWF, Met Office UK (Exeter), and NCEP-CPC (Africa Desk, USA); regional centres RSMC Pretoria, RSMC La Réunion (Tropical Cyclones RA I), and ACMAD; and national centres of Botswana, Madagascar, Mozambique, Tanzania, and Zimbabwe. The RSMC Pretoria will act as the single Regional Centre for collecting and synthesizing weather and forecast data and products from all participating global and regional centres, and produce a daily severe weather forecast guidance product to be made available to all NMHSs of the region. Preparatory training specifically for the SWFDP-RA I for operational forecasters from the participating NMCs is being organized to take place at RSMC Pretoria from 31 October to 3 November 2006, prior to the commencement of the actual experimental phase of the project. Tentatively set for 6 November 2006. After completion of the SWFDP, another plan will be needed for the transition from the demonstration stage to the operational implementation.

Emergency Response Activities

5.3.6 Toulouse and Exeter are the RSMCs designated for activity specialization in nuclear emergency response over RA I and maintained their operations for the provision of specialized atmospheric transport model products under the WMO Regional and Global Arrangements. These Centres are also able to respond with specialised support for other kinds of environmental emergencies. Toulouse is also designated a Volcanic Ash Advisory Centre that provides specialized ash clouds trajectories and dispersion forecasts for aviation purposes.

ACMAD activities for GDPFS

5.3.7 The representative of ACMAD, Mr Zilore Mumba presented the current and planned activities of ACMAD in the field of GDPFS:

5.3.7.1 A major thrust in ACMAD activities in the domain of GDPFS can be traced back to the initiative to launch what ACMAD then proposed as the African Strategy in Numerical Weather Prediction (SAPREM) in 1998. The strategy was crystallized into the new proposed NWP-Africa Strategy in the 2002 Pretoria meeting, which benefited from the participation of NOAA, UK MET, Meteo-France, DWD, WMO and several African NMSs. This new strategy took account of the fact that African NMSs are at different levels of development in NWP. The strategy therefore, prescribes four phases of implementation of NWP in Africa:

Phase I Use of NWP output in NMS forecasting systems
Phase II Running of NWP models in NMSs
Phase III Running of NWP models in NMSs with fine-tuning
Phase IV Running of NWP models with analysis

5.3.7.2 ACMAD activities, in support of NMSs, in GDPFS are guided by the above NWP-Africa strategy document, some of the actions (*overview of activities in GDPFS*) being:

(i) Support for Phase I

a) *On the job training of forecasters in the interpretation and use of NWP model output. This is an on going activity.*
b) *Development of NWP-Africa training module, in conjunction with WMO. The module is to be a training tool, which will be used regularly, and will include an interactive e-learning system to be accessible for African forecasters.*
c) *Significant progress made in innovative forecasting methodologies realized in the framework of the AMMA SOP forecasting exercise, to be tried in other parts of Africa.*
d) *Initiative to develop nowcasting and other aspects of forecasting (satellite) imagery interpretation, marine forecasting, …) to be embarked on in the near future.*

(ii) Support to Phase II

Support to NMSs desiring and ready to implement NWP in provided through:

(a) *Support to Seminars on implementation of NWP Modelling in NMSs, organized regularly by WMO;*
(b) *Installation of the RM3 limited Area Model, to be used by NMSs to learn to run a model, do simulations and study model sensitivities to various factors*, etc.

(iii) Support to Phase III and IV

As may be requested by the Centre concerned.

Recommendations

5.3.8 The Group discussed the use of products from Global Model producers received in RA I and made the following recommendations:

About reception of NWP products from advanced centres

(ii) A list of necessary products for forecasting in the tropical areas from 0 to 72 hour ranges be compiled (see Annex to this paragraph), and the products be made available by advanced centers in collaboration with the GDPFS centers in the Region.

(v) To speed up the installation of RETIM Systems in the region. Organisations involved in the process should work at finding the needed financial resources.

(vi) The GDPFS centers in the region be involved in the committees who define the list of products disseminated for their operational use.

(vii) ACMAD and RSMCs to complete verification programmes of received NWP products and to make the results available to all interested countries.

(viii) ACMAD and RSMCs should continue with the efforts for skill and development in interpretation and use of numerical products over Africa to improve the capacities of NMHSs.

(ix) ACMAD and RSMCs should study newly available products, act as a filter, and develop recommendations for the implementation of their operational use in African countries.

(x) Advanced Centres to re-distribute in CREX format on the GTS, AMDAR (ascent/descent) profiles over African airports; these data would be so important for nowcasting and forecasting.

Related to ensemble forecasting products:

(xi) To pursue the organization of workshops in the region on ensemble prediction to allow a better

understanding of the philosophy and the techniques used. Forecasters have to prepare themselves to a cultural change for using probabilities and the many available products generated by ensemble forecasting.

(xii) The NMHSs that do not have the password enabling access to ECMWF product on internet products for WMO Members should request for it.

For NWP development

5.3.9 The group discussed the development of NWP activities in RA I and endorsed the strategy developed in 2002 (NWP-AFRICA). See Annex to this paragraph.

5.3.10 The WG endorsed the recommendations of the Regional Training Workshop on NWP for countries ready to implement operational NWP held in Casablanca from 12 to 17 September 2005 (see below paragraph 5.3.11) and proposed the formation of a Working Group on the Development of NWP in Africa. The proposed terms of reference of the WG on DNWP were:

DNWP working group tasks

1. Review the NWP Africa strategy to increase the availability and use of NWP in RA-1
2. Diagnose the existing situation in the field of NWP in RA1.
3. Models used in RA1 and on which domain they run.
4. Update the requirements of the following
    a. Human resource and its profile
    b. Computing power
    c. Telecommunication (direct links, internet, satellite…)
    d. Initial and Lateral Boundary Conditions.
5. Advise the countries that are ready to implement LAM.
6. Exchange verification and post processing techniques.
7. Exchange parameterization techniques in the Region.
8. Investigate and advise on
    a. Data assimilation
    b. EPS
    c. Interface with WAM model

5.3.11 The following recommendations related to NWP development were made:

- Organize expert mission for assistance to Countries trying to implement NWP
- Training at advanced centres for NMCs staff (fellowship)
- A calendar of proposed WMO actions for NWP development in RA I:
    - *October 2006*: Report to WMO (jmartellet@wmo.int) on status of development, implementation (use as input for Meeting of RA I in January 2007),
    - *April 2007*: Report to WMO (jmartellet@wmo.int) on status of development, implementation
    - *2008::* Recommend the meeting of the WG on NWP for RA 1
    - *2007 or 2008::* convene a workshop including new Members, if any, and only for those who were in Casablanca workshop of 2005 who have achieved implementation (Programme: Sharing, on problems, new developments and perhaps, information on data assimilation).

- ACMAD to pursue and enhance its training programme on Limited Area NWP;
- Approach advanced Centres running global models for facilitating the acquisition of boundary conditions adapted to the Limited Area Models (i.e. without useless grid points) and to explore the possibility of transmitting the boundary conditions via satellite with large bandwidth to facilitate the acquisition of these data.

- That RSMCs running models ensure dissemination of the products to NMSs of countries covered by their models and work in a consultation with NMSs to share resources and expertise for further development of NWP in sub-region.
- The concept of consortium be seriously considered to share expertise, knowledge and resources between countries using the same NWP model to enhance progress in development and improvement of the model and the use of NWP products.

5.4 PUBLIC WEATHER SERVICES (PWS)

5.4.1 The Rapporteur on Public Weather Service in RA I, Mr Florian Mnikeli NDABAMBI presented the most prominent matters affecting the PWS Programme in RA-1:

- Not enough qualified staff in some met services.
- Communication problems.
- Poor data processing and management.
- Poor media coordination and cooperation.
- Inadequate media systems to disseminate weather information.
- Lack or poor cooperation between NMHSs and sectors involved with safety of life and property, this includes disaster management structures.
- Lack of or not enough meteorological awareness among stakeholders and users.
- Negative public perceptions to weather forecasts, public don't fully understand forecast products.
- Use of various un-identified weather sources that produce poor quality weather information. The users automatically assume that the weather information is coming from NMHS.
- Weather presentation skills (including language challenges in some countries).
- Lack of skills to produce and present weather bulletin on national television.

Recommendations

5.4.2 The Group recommended the following methods to enhance PWSP in the region (RA-1):

- NMHSs must perform user climate survey to find out whether the information disseminated by NMHSs is in line with the user needs (regular impact assessment). The method and results of the surveys must be communicated to WMO and to the Rapporteur so that they can be shared with other members.
- NMHSs must advise public and other users as to what to do when high impact weather is expected or occurring.
- NMHSs must conduct survey on public perception on accuracy of weather information.
- NMHSs are encouraged to develop media and marketing strategies.
- Cross border experience and data exchange (to include regional seminars).
- WMO should give advanced media and weather broadcasting training to personnel.
- NMHSs must establish or enhance cooperation with government, non-governmental organizations including private disaster management organization and media. Develop a dialogue with regional representative bodies, where these had been established
- ACMAD is encouraged to give advice on provision of guidance forecast for the entire region (NMHSs) must take note of lessons that can be learned from the Severe Weather Demonstration project.
- Meteorological centres should enhance awareness campaigns; demonstrate capabilities to enhance the image and the visibility of NMHSs.
- NMHSS should maintain their position of NMHSs as suppliers of choice by applying excellence

in science and technology, understanding, respecting and responding to user's needs and enhancement of relationships with stakeholders.

- WMO should continue to support NMHSs on socio economic applications of PWS.
- Personnel that have been trained on dealing with media by WMO and other partners should be used by NMHSs as trainers (Usage of WMO publication "WMO/TD No. 1278" encouraged).

5.5 WWW-RELATED CO-OPERATION ACTIVITIES IN RA I

5.5.1 The session reviewed Co-operation Activities related to the WWW implementation and operation. The session considered in particular the following topics:

- Priorities in requirements of RA I Members
- Priorities in co-operation activities for the WWW (especially considering LDCs)
- Pilot projects implementation

The session was informed of the set of priorities proposed for approval by CBS as indicated in Annex to this paragraph. The projects implemented or ongoing in RA I under VCP funding are also listed in the Annex. The Group was informed that many other assistance projects bi-lateral or multi-lateral existed in RA I.

5.5.2 The WG appreciated the support in particular of France who provided a big assistance related to the Tsunami Warning System (see description of project provided by Mr Laurent Zerbib in Annex to this paragraph). The realization of the past few years in the Indian Ocean can be an example of the multi-hazard strategy recommended by WMO. The meteorological services of the South -West of the Indian Ocean: Seychelles, Mauritius, Comoros and Madagascar have been equipped with a very efficient system, which has considerably improved the transmission and the visualization of the Meteorological information around the RSMC of la Reunion. This architecture has considerably improved the efficiency of the meteorological services facing the Cyclonic risk and the project has been classified as the best project of cooperation of the year in 2005 by the Fond Européen de Développement (FED), which funded it. Recognizing the capacity of this system for a multi -hazard strategy, similar systems have been installed in Kenya and Tanzania.

Recommendation

5.5.3 The Group recommended that the responsible NMHSs ensure recommendation that sustainability of all these investments need::

- Maintenance of the equipments and.
- Training of the technicians in charge of the maintenance and operation equipment to support the sustainability of the systems.

Integrated and sustainable assistance

5.5.4 The Secretariat presented a concept on “integrated and sustainable assistance”. The Working Group found that this concept was useful. The purpose was to propose ideas for optimizing the benefit of World Weather Watch capacity building projects in RA I. Donors are looking for beneficial impacts and sustainable projects. A capacity building project supported financially by external donors should be shown as delivering results to satisfy needs and requirements of beneficiaries and to motivate the donors for further help and additional funding.

Key for success: integration in the chain of processes

5.5.4.1 The specificity of the NMHSs is that their tasks related to the World Weather Watch are parts of an integrated production chain:

> Making of the observations, transmission of the observations nationally (and international sharing of the observations), acquisition of the observations, processing of the observations, making the forecast or the climate products, delivery of the products through appropriate ways: bulletins, warnings, studies, TV-broadcasts, etc...

Therefore, one should concentrate on projects, which consider the integration of all the processes and deliver results in accordance with the requirements, rather than projects, which are limited to single step within the chain of processes. For example, what is the point of purchasing AWS (Automatic Weather Stations) if the observations are not delivered to the forecasting centre? Or there is no point of delivering studio facilities to a country if the national observations are not available at the NMC. The whole chain of processes from observation acquisition to delivery of meteorological information for the user community has always to be considered.

Key for success: sustainability

5.5.4.2 Another aspect to consider is sustainability, which implies always including maintenance of the equipment delivered within the project, whether national, or through cooperation, bi-lateral or multi-lateral, whatever aid project. It means ensuring availability of spare parts as well as of competent technician(s) to perform the maintenance. If maintenance is not ensured, sooner or later interruption of the service will take place, and the operation will not be sustainable.

Recommendation

5.5.4.3 These facts have to be considered thoroughly when a capacity building project is designed. That is the concept of "integrated and sustainable assistance"; a project which integrates the delivered assistance within a chain ensuring correct, improved products delivered to users and which ensures the sustainability, including maintenance for continuous operational activities during the whole life expectancy of the equipments.

6. THE STRATEGIC PLAN TO ENHANCE THE CONTRIBUTION OF WORLD WEATHER WATCH TO THE REDUCTION OF THE RISKS ASSOCIATED WITH SEVERE WEATHER AND CLIMATE EXTREMES AFFECTING AFRICA IN SUPPORT OF SUSTAINABLE DEVELOPMENT

6.1 The session reviewed the Strategic Plan proposed by the Chairman of the Working Group (see http://www.wmo.int/web/www/Planning-Impl/RA-1/Nairobi2006/WWW%20REV%20STRATEGY_FINAL_DRAFT.pdf) and made appropriate comments and recommended it for a main contribution to the fourteenth session of RA I.

6.2 The Working Group appreciated the progress made on the implementation of the Strategic Plan on the implementation and improvement of World Weather Watch Basic Systems in RA-I (Africa). The Working Group further appreciated the continued support by WMO for the implementation of the Strategy. It adopted the Strategy for onward presentation to the next RA I Session and made the following recommendations:

- An executive summary be included in the proposed strategy;
- The RA-I decides on the time frame for the implementation of the strategy;
- An implementation plan with time frame, targets and resources be developed in line with the agreed time frame;
- The proposed projects be further developed for implementation by taking into consideration the existing projects and programmes.

7. FUTURE WORK PROGRAMME

The Group agreed that more exchanges between the rapporteurs and coordinators and the chairman should be performed by email between the sessions to perform better and share more the problems and the technical developments. The working group defined its major future tasks for recommendation to the next RA I Session as listed in Annex to this paragraph.

8. CLOSURE OF THE SESSION

The Chairman, after having lead the Fifth Session of the Working Group with diplomacy and efficiency, thanked all the coordinator, the rapporteurs and the other participants for their good work and contribution and declared the meeting closed at 13.20 on Friday 29 September 2006.

ANNEX TO PARAGRAPH 1.2

RA I WORKING GROUP ON PLANNING AND IMPLEMENTATION OF THE WWW FIFTH SESSION
(Nairobi, 25-29 September 2006)

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ANNEX TO PARAGRAPH 5.1

ACHIEVEMENTS

SURFACE-BASED SUBSYSTEM OF THE GOS

Regional Basic Synoptic Network (RBSN)

1. Since the last session of RA I/WG/PIW (2001) and in accordance with the decision of the thirteenth session of RA I (Mbabane, Swaziland, 2002) which approved a total of 611 surface (SYNOP) stations in the RBSN, the number of stations has basically remained unchanged. The number of RBSN upper-air (TEMP) stations too remained almost unchanged with the closure of a single station reducing the total number of stations from 92 to 91. The current approved RBSN list (July 2006) as adjusted by the WMO Secretariat in accordance with the station change information provided by RA I members is comprised of 715 (SYNOP, TEMP (RW) and PILOT (W)) reporting stations in total. This session proposed an updated RBSN list for consideration at the fourteenth session of RA I, which is scheduled for early 2007 (see Appendix).

2. The level of implementation of the RBSN synoptic stations in the region that make eight observations per day has remained around 60 per cent since the establishment of a revised RBSN in 2002 (XIII-RA I). The percentage of non-operational synoptic stations too remained unchanged at 2 per cent (10 stations) of the RBSN during the same period.

Table I

Status of implementation[1] of surface synoptic stations in the RBSNs (Global and Region I) and results of the Annual Global Monitoring (AGM) of the Operation of the WWW availability of SYNOP data at MTN centres - October 2005 compared to those in 2002/2004

Year	Total number of stations in the RBSN	Stations making at least 8 observations per day (0000, 0300, 0600, 0900, 1200, 1500, 1800 and 2100 UTC)	Stations making observations at the main standard hours (0000, 0600, 1200 and 1800 UTC) per day	Stations making some observations daily	Stations not yet established or otherwise non-operational	Percentage of SYNOP reports received against number of reports expected (AGM)
	Region I					
2002	588	399 (68%)	60 (10%)	125 (21%)	4 (1%)	50%
2004	611	366 (60%)	61 (10%)	174 (28%)	10 (2%)	52%
2005	611	370 (61%)	61 (10%)	170 (27%)	10 (2%)	55%
Global 2005	4169	3002 (72%)	377 (9%)	580 (14%)	210 (5%)	78%

[1]as committed to by Members in Weather Reporting (WMO-No. 9) Volume A.

Table II

Status of implementation[1] of RBSN upper-air stations and results of the Annual Global Monitoring (AGM) of the Operation of the WWW availability of TEMP data at MTN centres - October 2005 compared to those in 2002/2004 (W = Radiowind, R = Radiosonde)[2]

Year	Total number of stations in the RBSN		Number of stations making observations at the 2 main standard hours (0000 and 1200 UTC) per day				Number of stations making at least one observation per day				Number of stations not yet established or otherwise non-operational				Percentage of TEMP reports received against number of reports expected (AGM)
	Region I														
	W	R	W		R		W		R		W		R		
2002	106	91	24	(23%)	24	(26%)	53	(50%)	48	(53%)	29	(27%)	19	(21%)	27%
2004	105	92	24	(23%)	23	(25%)	53	(50%)	46	(50%)	28	(27%)	23	(25%)	35%
2005	104	91	24	(23%)	23	(25%)	53	(51%)	46	(51%)	27	(26%)	22	(24%)	35%
Global 2005	882	799	571	(65%)	551	(69%)	216	(24%)	198	(25%)	96	(11%)	50	(6%)	70%

[1]as committed to by Members in Weather Reporting (WMO-No. 9) Volume A.
[2]all radiosonde (R) stations are also included in the total number of radiowind (W) stations - they are not independent. The difference provides the number of upper-air stations that make wind observations only, a total of 13 stations in RA I (2005).

3. The level of implementation of the RBSN upper-air stations making two soundings per day has remained consistent at around 23 per cent (radiowind) and 25 per cent (radiosonde) since 2002. The percentage of non-operational upper-air stations remains a concern at 26 per cent (27 radiowind stations) and 24 per cent (22 radiosonde stations).

4. According to the results of the Annual Global Monitoring (AGM) as reflected in Tables I and II, the percentage of SYNOP reports from RA I actually received at MTN centres since 2002 (XIII-RA I) has shown a positive trend from 50 per cent up to 55 per cent in 2005. The percentage of TEMP reports received during this period in comparison with expected reports from RBSN stations has stabilized around 35 per cent after a low of 27 per cent in 2002. The existing gaps in the observational data coverage continued to be mainly due to the absence of observations or telecommunication problems and due to obsolete equipment, lack of consumables and spare parts

Regional Basic Climatological Network (RBCN)

5. In accordance with the decision of the thirteenth session of RA I (Mbabane, Swaziland, 2002) a new RBCN consisting of 637 CLIMAT and 28 CLIMAT TEMP reporting stations was established and approved as recommended by the RA I/WG/PIW (2001). This network includes GCOS Surface Network (GSN) and the GCOS Upper- Air Network (GUAN) stations, supplemented by other CLIMAT and CLIMAT TEMP reporting stations needed to meet national and regional requirements. The current approved RBCN list (July 2006) as adjusted by the WMO Secretariat in accordance with the station change information provided by RA I members remained unchanged at 665 stations in total. Similar to the RBSN list, this session wished to propose an updated RBCN list for consideration at the fourteenth session of RA I.

6. The status of implementation of RBCN list of stations reporting CLIMAT and CLIMAT TEMP according to information provided by Members is presented in Tables III and IV. With the rationalization and establishment of the new RBCN since 2002 (XIII-RA I), the contribution of RA I to the global RBCN constitute 24 per cent and 6 per cent in providing CLIMAT and CLIMAT TEMP reports respectively. The level of implementation of stations reporting CLIMAT is around 65 per cent in 2005 showing a positive increase in comparison to around 62 per cent in the years 2002/2004. The implementation of stations reporting CLIMAT

TEMP reached 96 per cent in 2005, an increase from 89 per cent in 2002.

Table III
Status of implementation[1] of RBCN (CLIMAT) reporting stations and results of the Annual Global Monitoring (AGM) of the Operation of the WWW availability of CLIMAT data at MTN centres - October 2005 compared to those from 2002 – 2005

Year	Total number of stations in the RBCN		Total number of stations implemented				Maximum number of CLIMAT reports received against number of reports expected (AGM)			
	RA I	Global	RA I		Global		RA I		Global	
2002	616	2575	368	(60%)	1836	(71%)	194	(31%)	1600	(62%)
2003	637	2595	393	(62%)	1968	(76%)	166	(26%)	1599	(62%)
2004	637	2600	392	(62%)	1966	(76%)	186	(29%)	1679	(65%)
2005	637	2682	413	(65%)	2167	(81%)	186	(29%)	1790	(67%)

[1]as committed to by Members in Weather Reporting (WMO-No. 9) Volume A.

Table IV
Status of implementation[1] of RBCN (CLIMAT TEMP) reporting stations and results of the Annual Global Monitoring (AGM) of the Operation of the WWW availability of CLIMAT TEMP data at MTN centres - October 2005 compared to those from 2002 –2005

Year	Total number of stations in the RBCN		Total number of stations implemented				Maximum number of CLIMAT TEMP reports received against number of reports expected (AGM)			
	RA I	Global	RA I		Global		RA I		Global	
2002	19	511	17	(89%)	398	(78%)	12	(63%)	361	(71%)
2003	28	512	27	(96%)	386	(75%)	15	(54%)	343	(67%)
2004	28	507	25	(89%)	326	(64%)	15	(54%)	347	(68%)
2005	28	502	27	(96%)	411	(82%)	9	(32%)	325	(65%)

[1]as committed to by Members in Weather Reporting (WMO-No. 9) Volume A.

7. The results of the Annual Global Monitoring (AGM) as reflected in Tables III and IV show that the number of CLIMAT and CLIMAT TEMP reports actually received compared to the number of reports expected has shown stability since the establishment of the RBCN in 2002 (XIII-RA I). CLIMAT reports have stabilized around 29 per cent in 2004/5 while the percentage of CLIMAT TEMP reports remained just above 50 per cent in 2003/4. However, due to improved software and monitoring criteria adopted in 2005 the percentage of CLIMAT TEMP reports received is recorded at a low of 32 per cent during the October 2005 AGM. Overall in 2005, the percentage of reports received at MTN Centres from RA I against the global average number of CLIMAT and CLIMAT TEMP reports received was 10 per cent and 3 per cent respectively.

8. In order to increase the availability of climatological data, further efforts by Members should be made to ensure that their operational observing stations compiled and transmitted the CLIMAT/CLIMAT TEMP messages according to existing regulations. The Secretariat initiated the preparation of special guidance material related to the operational procedures and practices to be used in the field by observers and technicians in compiling and transmitting CLIMAT and CLIMAT TEMP messages over the GTS. This document (about 100 pages with illustrations, tables and graphics) which explains step by step the whole procedure of compiling and transmitting CLIMAT and CLIMAT TEMP reports is produced in four languages and is being distributed to users on CD-ROM; via the WMO Web site and also as a printed copy. For better implementation of the above guidance material in practice, a sub-regional training seminar on CLIMAT and CLIMAT TEMP reporting was organized in Casablanca, Morocco (December 2005) in cooperation with GCOS.

Marine observations

9. According to submissions to WMO Publication number 47, Members had recruited a total of about 69 VOS ships in early 2006, most of them under the South African flag. This represents about 3% of the global total. It should be noted that very few ships were recruited by RA I Members and that very few observations from those ships have been distributed on the GTS. Fortunately, ships recruited by countries from other WMO Regional Associations did report many observations from the area of interest to the Association. However, it also should be noted that there are large areas in the Atlantic Ocean and the Indian Ocean, especially in the Gulf of Guinea, and the Arabian Gulf where ship reports are very sparse and where no other in situ marine observing systems such as drifting buoys are available.

10. While ship reports reasonably adequately cover the major shipping lanes (e.g. Cape of Good Hope to Western African coasts, and Cape of Good Hope to Singapore), moored and drifting buoys play an important role in providing observations from the remaining large ocean areas. The Working Group noted with satisfaction that (i) the International South Atlantic Buoy Programme (ISABP), and (ii) the International Buoy Programme for the Indian Ocean, both coordinated through the DBCP, have succeeded in substantially increasing the deployment of drifting buoys in the South Atlantic and the Indian Ocean respectively, and hence the availability of data from these platforms on the GTS. The global drifter array has now reached completion with about 1250 buoys maintained worldwide. About 350 of these do report air pressure, mainly in extra-tropical regions. About 288 drifting buoys and 15 moored buoys did provide 20952 and 4625 real-time observations on the GTS in June 2006 in the ocean area included in the region from 60S to 35N and from 30W to 80E. Coverage of RA I waters is now adequate, especially the South Atlantic south of 30S. However, the Working Group noted that the DBCP had reported at its twenty-first meeting (Buenos Aires, October 2005), that the drifting buoy data timeliness was poor in the South Atlantic Ocean as less than 60% of the data collected by Argos through its global system were received in real time in a region between 35S and 5N (30% in the Gulf of Guinea, 80% in most of the rest of the world oceans). It noted that the DBCP recommended installation of an Argos Local User Terminal on Saint Helenas and the connection of the existing LUT at Gough Island to the Argos global network of receiving stations.

11. The PIRATA project has deployed a network of moored buoys in the equatorial Atlantic. PIRATA is now in consolidation phase, and intended to demonstrate the utility of the data for climate forecasting and operational meteorology. Southwest extension of PIRATA is now in place and the Southeast and Northeast extensions are being under review.

12. The Working Group noted the quality monitoring efforts and quality information feedback mechanisms that had been put in place under the Data Buoy Cooperation Panel (DBCP) and the JCOMM Ship Observations Team. It noted that the RMS of the differences between observational data and ECMWF first guess field had decreased substantially in the last 10 years.

13. The Working Group noted the results of the DBCP data users and Technology workshop (Reading, UK, 27-28 March 2006). It was pleased to hear that the Association had been strongly represented at the workshop by representatives of Kenya, Mauritius, Nigeria, Senegal, and South Africa, and that the workshop had recommended that the DBCP should organize a training course for buoy data and buoy operation, targeting African and Western Indian Ocean region, in cooperation with IODE/ODIN Africa. The latter will be discussed at the twenty-second DBCP session in La Jolla, USA, 16-20 October 2006.

AMDAR programme

14. The Southern African Regional AMDAR programme is now operational, and particularly since October 2005, the coverage over the region increased to 3000+ reports (South African Airways alone are now producing ~3400/day), as its contribution to the observing system in the region. The coverage has now been extended further with the implementation of the Agreement between Norway and SAWS on the provision of E-AMDAR data over areas not covered by the SAA aircraft. It is important to note that data provided by this pilot project is also providing data over Eastern Africa. Work continues on the establishment of a substantial targeted programme (E-AMDAR) for the ASECNA area. Negotiations are still going on between the AMDAR Panel (E-

AMDAR, Météo France and Air France) and are related to the development of a simple PC-based data display system (based on existing FSL (NOAA/NWS). The next step in establishing the regional programme is the review of the potential long-haul aircrafts operating into the ASECNA countries and the development of the ASECNA AMDAR Programme with the national airlines. Prior to this action, an ASECNA AMDAR workshop was held in Dakar in November 2002. An AMDAR Technical training workshop is planned for early November 2006 in Nairobi for the benefit of 12 Eastern and Southern African countries.

SPACE-BASED SUBSYSTEM OF THE GOS

15. Primary geostationary coverage of Region I is performed by the first spacecraft of the EUMETSAT Meteosat Second Generation series (MSG-1), now renamed Meteosat-8, which was launched on 28 August 2002 and became fully operational on 29 January 2004. The spacecraft provides full-disk images of the Earth and atmosphere every 15 minutes in 12 spectral Visible and Infrared channels. The spacecraft is operated at 3.4°W but the images are rectified to the nominal 0° longitude location before dissemination.

16. The second satellite of the same series (MSG-2) was successfully launched on 21 December 2005. After in-orbit commissioning at 6.5°W it will become Meteosat-9 and will provide back-up for Meteosat-8 at 0° for the primary coverage of Europe, Africa and the Eastern Atlantic.

The first generation Meteosat-7 was operated at 0° longitude in parallel with Meteosat-8 until 14 June 2006, in order to allow sufficient time to the users for a smooth transition from the first to the second generation.

17. Additional coverage of the Eastern part of Region I has been provided since July 1998 by the Indian Ocean Data Coverage mission (IODC), relying on the first generation satellite Meteosat-5 relocated at 63° E. Meteosat-5 had been in orbit since March 1991 and was used for an exceptionally long time. It has to be deactivated and deorbited in the course of 2007. The IODC mission will be taken over by Meteosat-7 in December 2006, once this satellite will be relocated from 0° to its new position over the Indian Ocean.

18. Data and products from the Meteosat satellites are disseminated in near-real time via the EUMETCAST Digital Video Broadcast (DVB) system, which includes namely a dissemination flow in KU-band over Europe through the Hotbird-6 telecommunication satellite, complemented with a dissemination flow in C-band over a wider area including Region I, through the Atlantic-Bird-3 telecommunication satellite. The EUMETCAST broadcast service in C-band over Africa also supports the dissemination of meteorological products from the EUMETSAT central facility and from the network of Satellite Application Facilities (SAF), remote-sensing products from the SPOT/Vegetation instrument, as well as the Meteorological Data Distribution (MDD) and Data Collection Platforms (DCP) missions. Details on EUMETSAT data, products and delivery mechanisms can be found on EUMETSAT website (http://www.eumetsat.int/).

19. Most of the NMHS in Region I, as well as 4 sub-regional centres, were equipped with EUMETCAST receiving stations and associated processing capabilities through the PUMA project that was completed end 2005 and included also a strong training component. The PUMA project was complemented by bilateral actions through WMO trust fund for countries that were not eligible to the European Union funded PUMA project. The major evolution of space-based system of the GOS in the Region is the full implementation of the PUMA Project. The project had provided all the NMHSs with MSG ground receiving stations. The new digital services called LRPT and LRIT provide more conventional satellite data reception capabilities.

20. In addition to the geostationary satellite coverage, Region I benefits from the polar-orbiting coverage operationally provided by the United States satellites NOAA-17 on a morning orbit (10:20 descending node) and NOAA-18 on an afternoon orbit (13:40 ascending node), as well as the Chinese FY-1D (08:20, descending node) and the Russian Meteor-3M1 (09:15, ascending node). The launch of the European polar-orbiting METOP satellite is currently planned in October 2007. METOP is expected to provide operational coverage from a mid-morning orbit (9:30 descending node) and will have an extended payload including namely an advanced sounding package and an advanced scatterometer for ocean surface wind measurements.

PERSPECTIVE IN THE IMPROVEMENT OF THE GOS IN AFRICA

Implementation of the GCOS Technical Support Projects in Africa

21. Implementation of the GCOS revitalisation activities has started in many African countries, specially in the SADC region where some of these activities have been completed (Dar Es Salaam (Tanzania), Windhoek (Namibia)); whereas many others are being carried out : Addis Ababa (Ethiopia), Harare (Zimbabwe), Kananga (RDC). Other GCOS Technical Support activities in Africa comprise the supply of partial equipment to some stations: Proton H2 generator to Mauritius and Douala. Activities that are being carried out in current projects include the shipping of H2 generators to Abidjan, Madagascar and Nairobi; while H2 generators are being ordered for Dakar, Luanda (site survey completed). Some projects concerning the surface component of the GCOS are to be started next year namely the joint project with UK for data rescue in Namibia and Tanzania. Moreover, GCOS is working to define upgrade project with Madagascar. This should in term lead to a significant increase in the availability of Climate and Climate TEMP Reports from Africa. Already, a GSN and GUAN certificate of recognition, based on the performance monitoring of the GSN and GUAN Monitoring and Lead Centres, have been initiated by the GCOS AOPC Panel to encourage stations to improve their performance.

Recommendation:
22. Members are invited to communicate the historical data of their GCOS network stations by answering queries sent by the NCDC.

The AMMA observing network

23. Another opportunity to improve the GOS in Africa, specially the upper air component, is the AMMA Project through its radiosonde group (ARG). The general goal of the ARG is to assist/organise the development and maintenance of a co-ordinated network of radiosonde, Pilot balloon, VHF/UHF and GTS Total Columnar Water Vapour (TCWV) stations during the AMMA Extended Observation Period (EOP) scheduled from late 2005 to early 2007 and beyond.

24. In this respect, the upgraded/restored 16 listed RBSN radiosonde stations in the AMMA area: Abidjan, Agadez, Bamako, Bangui, Dakar, Douala, N'Djamena, Ngaoundere, Niamey, Nouadhibou, Nouakchott, Ouagadougou, Sal, Tamanrasset, Tambakounda and Toumbouctou and the 4 newly installed radiosonde stations (Cotonou, Parakou, Tamale, Abuja) are fully operational. The restoration of four additional stations (Conakry, Tessalit, Man and Addis Ababa) is under consideration. Many of these stations that remained silent for years are now operational, even though the problem of the effective availability of some of these observations on the GTS still have to be tackled. It should be noted that all these stations are now operating refurbished Digicora 2 or Digicora 3 (Dakar and Niamey (by ARM)) using digital RS 92 radiosondes with balloons filled with helium.

25. Six high temporal frequency TCWV stations Niamey, Djougou, Gao, Tombouctou, Ouagadougou and Tamale have been installed and most of them are already operationnal. The VHF/UHF profilers, together with the radiosonde and Pilot balloon networks, will provide vertical profiles of wind speed and direction, temperature and humidity at an acceptable temporal and spatial resolution.

26. Ship based radiosonde programmes had also been implemented by the launching of 90 Vaissala sondes in the Gulf of Guinea by the French AMMA/EGEE. Other ship based sounding programmes include the launching of 116 Vaissala sondes (twice daily) by the German AMMA and the SOLAS programmes. All the sounding data are transmitted to the GTS in real-time.

27. Dropsondes are released from the British Bae146 and the French Falcon Based at Zinder (61090). The data collected is also sent to the GTS in real-time.

Review of the Manual of the GOS (Volume II)

28. To start action in reviewing and updating the Volume II, the CBS Rapporteur on Regulatory Material prepared a letter by which Rapporteurs on regional aspects of the GOS were invited to study the matter and send their suggestions and comments. The Rapporteur on GOS for RA I replied to this letter on 24/12/2003. And the Volume II-Africa has been updated, taking into account new elements including a) the use of objective criteria regarding the arrangements and the procedures of revising, updating and amending the RBSN; b) the use of in situ observing systems (AMDAR, AWSs, etc.); c) the composition and the best practices of the GCOS stations (GSN and GUAN); d) the concept and the composition of the RBCN; e) the space-based subsystem and the migration to MSG and f) the instruments and methods of observation programmes (IMOP). The next action to update the Manual will concern the recommendations of the implementation plan for the evolution of the GOS that address the issues of evolution of observing systems in Africa.

APPENDIX

New RBSN proposed

1. The new RBSN has been prepared in the spirit of the recommendations and actions of the Implementation Plan (EGOS-IP). These recommendations concern (i) the distribution of some surface observations made routinely but not distributed in near real-time but are of interest for use in many meteorological applications, (ii) the timeliness distribution and completeness of radiosonde observations generated and their transmission in BUFR in addition to the Temp message, (iii) the production of more vertical profiles (Temp and Pilot) in the Tropics through the reactivation of silent stations and the creation of new RAOB stations.

2. The proposed new RBSN list has been prepared by the Rapporteur based on the above recommendation. The criteria used for the selection of surface operational stations in Volume A to be included in the list of the current RBSN are: (i) the station mean availability rate of reports over the last six SMM (January 2005 to July 2006) must be greater or equal to the national average availability rate during the same monitoring periods; (ii) 20 % of the station maximum availability rate of reports among the last six SMM (January 2005 to July 2006) must be greater or equal to the national average availability rate during the same monitoring periods and (iii) the difference between 20% of the station maximum and station mean availability rates should not be greater than 5% (see list at: http://www.wmo.int/web/www/Planning-Impl/RA-1/Nairobi2006/APPENDIX%20A.xls).

3. The criteria used for the selection of surface operational stations in Volume A to be included in the list of the new proposed RBCN are: 1. (i) and (ii) above and 2. The difference between the 20% of the station maximum and the station mean availability rates should not be greater than 10% (see list at: http://www.wmo.int/web/www/Planning-Impl/RA-1/Nairobi2006/APPENDIX%20B.xls).

4. One of the major observing components of the RBSN in Western and Central Africa and in the Indian Ocean (Madagascar, Comores) is operated by the Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) in its 17 Member States. ASECNA Member Countries had 200 synoptic stations, among which around 130 were operated by the Agency. It also had 22 radiosonde stations, 17 of which were fully operational with Digicora I (RS80-15-G radiosondes) and STAR (RS80-N radiosondes) equipment. State-operated stations were experiencing major difficulties particularly problems relating to transmission capabilities, consumables and obsolete equipment.

5. In the framework of the AMMA Programme, 16 Radiosonde stations (Tamanrasset, N'Djamena, Ouagadougou, Tombouctou, Abidjan, Bamako, Dakar, Bangui, Douala, Ngaoundere, Sal, Tambacounda, Nouakchott, Nouadhibou, Niamey and Agadez) had been upgraded to Digicora II (RS92 radiosondes), implementing the transition to the new family of RS92 radiosondes. Four (4) new Digicora II radiosonde stations (Cotonou, Parakou, Tamale and Abuja) had also been created. With regard to the revision of the upper air component of the RBSN, the newly created AMMA Project network will be considered in the redesign of the RBSN.

ANNEX TO PARAGRAPH 5.2.1.4

STATUS OF IMPLEMENTATION OF CIRCUITS OF THE RMTN

RA I RMTN: 70 operational circuits:

(a) The six circuits on the MTN: Four circuits operate at 64 and more kbit/s using protocol TCP/IP (Cairo-Moscow, Nairobi-Offenbach, Algiers-Toulouse and Cairo-Nairobi), one operates at 28.8 kbit/s using protocol X25 (Dakar-Toulouse) and one low speed telegraphic circuit operating at 100 bauds (Cairo-New Delhi).

(b) The eleven interregional circuits: Four are digital circuits operating at 64 and more kbit/s (Casablanca-Toulouse, Nairobi-Toulouse, Tunis-Toulouse and Pretoria-Washington) using protocols TCP/IP or FTP, one is telephone-type at medium speed (Algiers-Madrid), two are using VSAT at medium speed (Niamey-Toulouse and Tunis-Toulouse) using protocols X25, one is using Internet (Algiers-Jeddah) using VPN. The other 4 interregional circuits are low speed telegraphic circuits (Tunis-Rome, Cairo-Jeddah, Tripoli-Rome and Casablanca-Madrid.

(c) Seventy regional principal and regional circuits:

- One regional principal circuit is operating on Internet (Pretoria-Lusaka) using FTP (socket), three are operating on VSAT (Dakar-Niamey, Dakar-Brazzaville and Brazzaville-Niamey) using protocol X25 at 19.2 kbit/s and four are not in operation (Algiers-Dakar, Algiers-Niamey and Algiers-Nairobi and Niamey-Nairobi of the Loop);

- Eght regional circuits are not in operation (Algiers-Tripoli, Brazzaville –Sao Tome, Dakar-Western Sahara, Lusaka-Harare, Lusaka-Lilongwe, Pretoria-Luanda, Nairobi-Kigali, Nairobi-Bujumbura, Dakar Freetown, Dakar-Monrovia), seven are using AFTN (Dakar-Sal, Dakar-Bissau, Dakar-Banjul, Dakar-Canaries, Brazzaville-Malabo, Brazzaville-Kinshasa, Nairobi-Mogadisco) and more than fifteen are operating on Internet using VPN or e-mail. The others use digital or analogue leased lines at medium circuit at high speed (19.2 to 64 kbit/s) and twelve circuits operate at medium speed.

Detail characteristics of the circuits

(i) The status on implementation and operation of the 6 circuits of the MTN is indicated in the table below:

MTN circuit		**Present status**		**Current plans for upgrade and/or introducing/use of TCP/IP**	
		Connection Type **Capacity**	**Procedure**	**Capacity**	**Procedure**
Algiers	Toulouse	Sat digital leased line 64 kps	TCP/IP (FTP)	64 kps	TCP/IP
Dakar	Toulouse	VSAT 28.8 kps	X25, PVC	VSAT-64kps	TCP/IP-FR
Nairobi	Offenbach	VSAT link 64 kps	TCP/IP(FTP)	VSAT- 64 kps	TCP/IP (FTP)
Nairobi	Cairo	Sat digital leased line 9.6kps	X25,(PVC)	Sat digital leased line 33.6 kps	TCP/IP(FTP)
Cairo	Moscow	Sat leased line 64 kps	TCP/IP (FTP)		
Cairo	New Delhi	Sat leased line 0.1kps	telegraphic	64 kbps	TCP/IP

					(sockets)

(ii) The status on implementation and operation of the 11 interregional circuits in Region I is indicated in the table below:

Interregional Circuit		**Present status**		**Current plans for upgrade and/or introducing/use of TCP/IP**	
		Connection Type Capacity	**Procedure**	**Capacity**	**Procedure**
Casablanca	Toulouse	Digital leased line 128 Kps	TCP/IP (FTP)		
Nairobi	Toulouse	Digital leased line 64 kps	TCP/IP	To be discontinued	
Pretoria	Washington	Digital leased line 64 Kps	TCP/IP		
Algiers	Madrid	Analogue leased line 2.4 Kps	X25		
Niamey	Toulouse	VSAT (via Dakar) 9.6 Kps	X25		
Tunis	Toulouse	Digital leased line 64 kps	FTP		
Tunis	Rome	Analogue leased line 0.1kps	telegraphic		
Algiers	Jeddah	Internet (VPN)	TCP/IP		
Cairo	Jeddah	Analogue leased line 0.1kps	telegraphic		
Tripoli	Rome	Analogue leased line 0.1kps	telegraphic		
Casablanca	Madrid	Analogue leased line 0.05 kps	telegraphic		

(iii) The status on implementation and operation of the main regional and regional circuits in Region I is indicated in the table below:

Main Regional Circuits		**Present status**		**Current plans for upgrade and/or introducing/use of TCP/IP**	
		Connection Type **Capacity**	**Procedure**	**Capacity**	**Procedure**
Algiers	Dakar	NO		-VSAT-64kps -Internet (VPN)	TCP/IP
Algiers	Niamey	NO		VSAT-64kps	TCP/IP
Algiers	Cairo	Digital leased line 64 Kps	FTP	Up to 256 Kps (end 2006)	TCP/IP
Algiers	Nairobi	Via Toulouse			
Brazzaville	Dakar	VSAT 19.2 Kps	X25	VSAT 64 Kps	TCP/IP

Brazzaville	Niamey	VSAT 19.2 Kps	X25	VSAT 64 Kps	TCP/IP

Nairobi	Pretoria	Digital leased line 64Kps	TCP/IP		
Nairobi	Niamey	Via Toulouse	X.25		
Pretoria	Lusaka	Internet	TCP/IP (Sockets)	To be discussed with Lusaka	
Dakar	Niamey	VSAT 19.2 Kps	X25	VSAT 64 Kps	TCP/IP

Regional Circuits		**Present status**		**Current plans for upgrade and/or introducing/use of TCP/IP**	
		Connection Type **Capacity**	**Procedure**	**Capacity**	**Procedure**
Algiers	Tunis	Digital leased line 2.4 Kps	X25		TCP/IP
Algiers	Tripoli	NO			
Algiers	Casablanca	Analogue leased line 0.05 Kps	Telegraphic		
Tunis	Tripoli	Analogue leased line 1.2 Kps			
Cairo	Khartoum	Internet	FTP		
Cairo	Tripoli	Analogue leased line 0.075 Kps	Telegraphic	Digital leased line	TCP/IP
Nairobi	Dar Es Salaam	VSAT 33.6 Kps			
Nairobi	Entebbe	VSAT 33.6 Kps			
Nairobi	Addis Ababa	Internet (E-mail)	TCP/IP		
Nairobi	Bujumbura	AFTN, 0.050 Kps	telegraphic		
Nairobi	Kigali	AFTN, 0.050 Kps	telegraphic		
Nairobi	Mogadiscio	AFTN, 0.050 Kps	telegraphic		
Nairobi	St Denis	Via Toulouse			
Lusaka	NO				
Lusaka	NO				
Pretoria	Gaberone	Digital leased line 64 Kps	TCP/IP		
Pretoria	Windhoek	Digital leased line 64 Kps	TCP/IP		
Pretoria	Luanda	NO		In discussion with Luanda	
Pretoria	Maseru	Digital leased line 64 Kps	TCP/IP		
Pretoria	Maputo	Digital leased line 64 Kps	TCP/IP		
Pretoria	Manzini	Digital leased line 64 Kps	TCP/IP		
Pretoria	Lusaka	Internet	TCP/IP (Sockets)	Upgrade to be discussed with Lusaka	
Pretoria	St Denis	NO	NO		

Pretoria	Lilongwe	Internet	TCP/IP (Sockets)		
Pretoria	Harare	Digital leased line 64 Kps	TCP/IP		
St Denis	Seychelles	TCP/IP 512 kbits/s	FTP		
St Denis	Moroni	TCP/IP 128 kbits/s	FTP		
St Denis	Maputo	TCP/IP	Email		
St Denis	Antananarivo	TCP/IP 128 kbits/s	FTP		
St Denis	Kerguelen	TCP/IP	Email		
St Denis	New Amsterdam	TCP/IP	Email		
St Denis	Mauritius	TCP/IP 512 kbits/s	FTP		
St Denis	Pretoria (Afrique du Sud)	TCP/IP	Email		
St Denis	Addis-Abbaba (Ethiopie)	TCP/IP	Email		
Brazzaville	Sao Tome	NO			
Brazzaville	Kinshasa	VSAT(SATCOM (AFTN) 0.050 Kps	Asynchronous		
Brazzaville	Libreville	VSAT (SATCOM) 1.2 Kps	X25		
Brazzaville	Bangui	VSAT (SATCOM)1.2 Kps	X25		
Brazzaville	Douala	VSAT (SATCOM 1.2 Kps	X25		
Brazzaville	Ndjamena	VSAT (SATCOM 1.2 Kps	X25		
Brazzaville	Malabo	VSAT (AFTN) 0.050 Kps	Asynchronous		
Niamey	Ndjamena	VSAT (SATCOM) 1 9.2 Kps	X25		
Niamey	Ouagadougou	VSAT (SATCOM) 1 9.2 Kps	X25		
Niamey	Accra	VSAT (SATCOM) 1.2 Kps	X25		
Niamey	Cotonou	VSAT (SATCOM) 1.2 Kps	X25		
Niamey	Lagos	VSAT (SATCOM) 0.050 Kps	Telegraphic	Internet(VPN) With Toulouse	TCP/IP
Niamey	Lome	VSAT (SATCOM) 1.2 Kps	X25		
Dakar	Bamako	VSAT (SATCOM) 1 9.2 Kps	X25		
Dakar	Abidjan	VSAT (SATCOM) 1 9.2 Kps	X25		

Dakar	Nouakchott	VSAT (SATCOM) 1 9.2 Kps	X25		
Dakar	Sal	VSAT (CAFSAT) (AFTN) 9.6 Kps	X25		
Dakar	Banjul	Microwave, 0.050 Kps AFTN	Telegraphic	VSAT	
Dakar	Bissau	VSAT (SATCOM) (AFTN), 1.2 Kps	X25		
Dakar	Conakry	VSAT 2.4 Kps	X25		
Dakar	Freetown	VSAT (SATCOM) 2.4kps Via Conakry	X25		
Dakar	Monrovia	VSAT (SATCOM) 2.4kps Via Conakry	X25		
Dakar	Canary	VSAT(CAFSAT) (AFTN) 9.6 Kps	X25		
Dakar	Western Sahara	NO			
Dakar	Antananarivo	VSAT (SATCOM) 19.2 Kps	X25		
Dakar	Casablanca	VSAT (AFTN) 9.6 Kps	X25	Internet (VPN)	TCP/IP
Dakar	St Helena	via Bracknell			
Dakar	Ascension	via Bracknell			

ANNEX TO PARAGRAPH 5.2.1.7

Status on implementation of the four MTN centres of RA I

RTH Algiers:

A new AMSS has been installed In 2004 which can handle all protocols types:
- Ethernet, TCP/IP(FTP, Socket, VPN, …..)
- Internet: E-mail, FTP Server function, Web Server function
- Leased, X25, PSTN, ISDN lines, ….
- Radar and satellite images systems (Ex: MSG, HRPT)
- SADIS, ISCS- WAFS, MSG, RETIM..
- Low speed telegraphic lines, public telex, AFTN,

The RTH is using a software/hardware for the MSS on the fault tolerant computer system and can handle alphanumerical, graphical and binary information.

RTH Cairo:

The present MSS consists of two identical MESSIR-COM servers (one is operating as PILOT= hot standby and the other as standby) in operation since January 1999 and updated on September 2003. Each server (IBM eServer X Series 345) has:
- High flexibility in data centre and consolidated LAN server environment;
- Configured with Intel Pentium X386
- New function include enhanced Auto-Server-Restart (ASR2), Safe –Power –Control, Easy –to –Service enclosures
- Redundant and hot-plug network cards, and memory scrubbing
- Windows 2003 server.

The MSS includes three workstations for Supervision tasks a CISCO PIX Firewall to protect the MSS servers from any potential attack from the network.

RTH Dakar:

The present MSS consists of two identical Unix Software MESSIR-COM servers (one is operating as PILOT= hot standby and the other as standby) in operation since April 1996 for the MTN purposes. This system has never been updated. The standby MSS is not serviceable and the operational system is not reliable due to some software problems and data storage limitation.
A project of modernization of RTH Dakar signed with COROBOR Systems is ongoing, which includes the replacement of the actual MESSIR-COM by a new one in 2006 and installation of a MESSIR BRDO (a database Server) which is yet in Dakar centre.
Another MSS also consists of two identical Unix Software AMS 1500 servers (one is operating as PILOT= hot standby and the other as standby) in operation since January 2000 for the RMTN and AFTN purposes. It has some software problems and data storage limitation and it is planned to replace it by 2007/2008

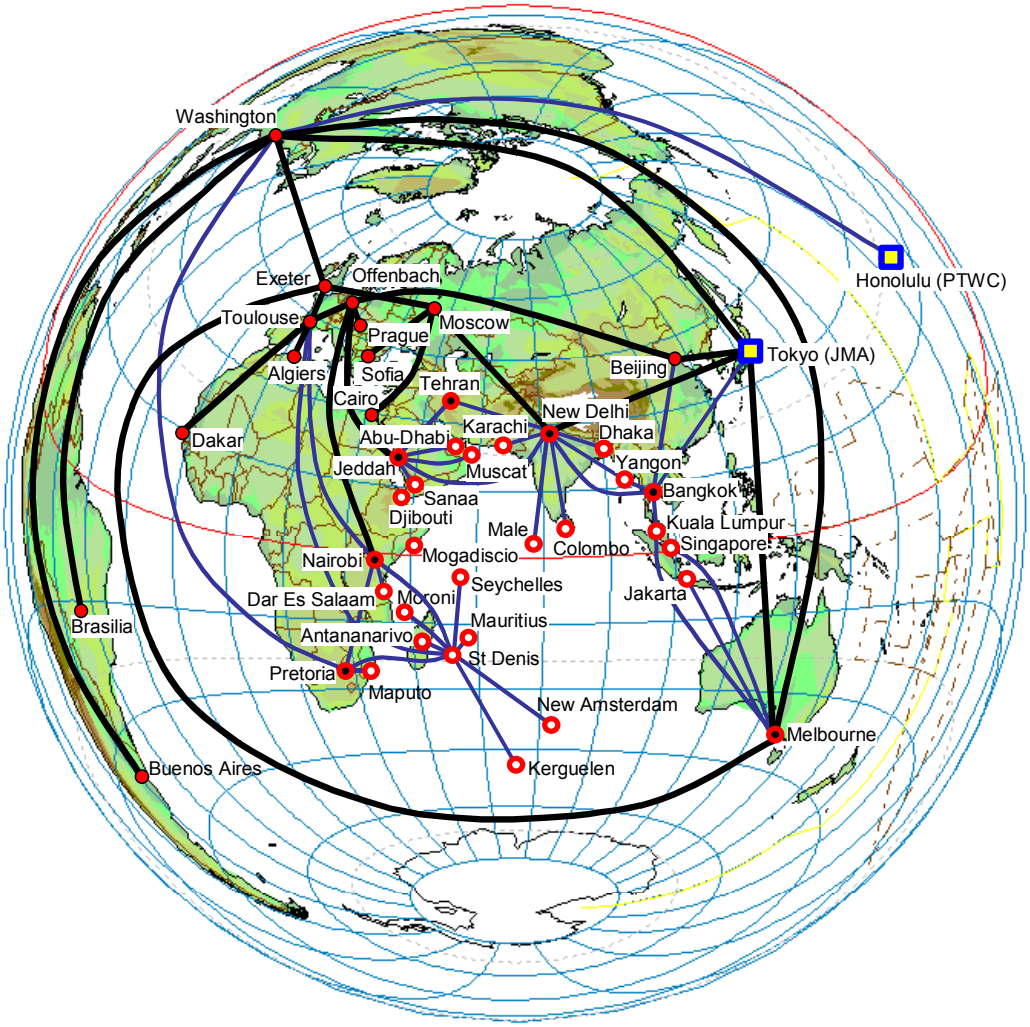
RTH Nairobi:

The new MSS provided by Meteo France International (MFI), a TRANSMET system, was put in operation in July 2006. The new MSS can handle all protocols types:
- Ethernet, TCP/IP(FTP, Socket, VPN, …..)
- Internet: E-mail, FTP Server function, Web Server function
- Leased, X25, PSTN, ISDN lines, ….
- Radar and satellite images systems (Ex: MSG, HRPT)
- SADIS, ISCS- WAFS, MSG, RETIM..
- Low speed telegraphic lines, public telex, AFTN,

The RTH is using a software/hardware for the MSS on the fault tolerant computer system and can handle alphanumerical, graphical and binary information.

ANNEX TO PARAGRAPH 5.2.1.21

Fig.1 - Network of GTS circuits to be used for dissemination of Tsunami watch information (TWI) for the Indian Ocean issued by Tokyo (JMA) and Honolulu (PTWC)



TWI center

RTH associated with NMCs in the Indian Ocean rim

NMC in the Indian Ocean rim

RTH on the MTN

MTN circuit

Selected regional and interregional circuit

ANNEX to paragraph 5.2.4.3

CREX MAIN CHARACTERISTICS

CREX is coded in characters (not bits), in the same manner as traditional WMO codes
CREX has no compression scheme
CREX allows other units than SI units (temperature can be in Celsius rather than Kelvin)
CREX is readable by human
CREX is expandable
CREX is self-descriptive

MAIN CREX USE:

- Represent New Information With Readability Requirements
- New types of data continue to become available
- Requests for additions to current data types continue to be made
- The pace of this evolution continues to accelerate, and the traditional character code forms are not well suited to meet this challenge.
- The self descriptive feature of CREX leads directly to its most significant advantage over the traditional alphanumeric code forms – the ability of CREX to adapt to represent new information quickly and easily – BUFR can do this too. However, since CREX is also an alphanumeric code form it is human readable. This additional characteristic makes it the code form of choice when there is a requirement for manual encoding or no binary transmission is possible.
- As with BUFR, if all the necessary table entries are available one may in principle immediately encode CREX messages with new information and automated decoding software will not have to change at all. If the CREX descriptors required for the new information do not exist, fast track table updates are made each year, and in special circumstances twice per year. The relatively trivial procedure of updating the CREX tables is all that the software would require.

CREX FOR WHAT?

- To code new observations which cannot be coded in BUFR, why? for example because there is no binary transmission capability or processing capability, and for which no Traditional Alphanumeric Codes exists
- After a transmission in BUFR, to convert back from BUFR to alphanumeric form for re-transmission or processing in CREX because a Centre cannot process binary data but wants to benefit of all data passed in the original BUFR message
- To visualize a BUFR message, the conversion is simple, almost one to one (descriptors and data), from bits-field to characters (although display software usually satisfy other requirements: special format, parameter name, etc…)
- CREX could be an interim step for the migration, if one wants to encode more data, without binary capability, then one switches to CREX, but observers need to be trained! As well as national users! And national data processing must be adapted! That has to be planned within a national migration plan.
- CREX is a teaching tool to understand Table Driven Codes.
- Quality and Monitoring Information: Quality and monitoring information can be included in CREX in optional Section 3. Unlike BUFR, there are no CREX data description operators to facilitate the inclusion of quality and/or monitoring messages. The choice to not develop such operators in CREX was made to facilitate its human readability by keeping the code form as simple as possible.
- Facilitate Data Exchange: CREX complements BUFR in the area of data exchange, and its human readability facilitates exchange of data wherever BUFR cannot be used. The combination of BUFR and CREX satisfies data exchange requirements for every conceivable type of meteorological, oceanographic, or other environmental data.
- Reduce Training Costs: Since each traditional alphanumeric code form addresses only one specific type of data, there are many such code forms (47 in WMO Volume I.1, Part A). Because there are so

many traditional alphanumeric code forms, and because individual Members may be using a number of them, Members often find themselves providing training for their employees in a number of these code forms. Such training activities can consume valuable resources. Because CREX and BUFR are self-defining code forms, however, they are capable of replacing all currently used traditional alphanumeric code forms. This means the Members' training program need only instruct their employees on BUFR and CREX. It is therefore to be expected that the migration will ultimately reduce the Members' training costs.

EXAMPLES OFCREX OPERATIONAL EXCHANGE OF:

Ozone data (RA VI, RA II, RA IV)
Radiological data (RA VI)
Tide gauge data (RA IV, RA V)
Hydrological data (RA I, RA VI)
Soil temperature data (RA VI)
Tropical cyclone information (RA II, RA V)
Squall Line information (RA I)

CREX will help the migration to TDCF

Coupled with the fact that it is technically capable of replacing ALL traditional character code forms, CREX becomes a powerful tool to advance the migration to self-descriptive code forms.

Wherever use of BUFR is not possible, CREX should be seriously considered.

And it is a teaching tool.

ANNEX to PARAGRAPH 5.3.8

List of products to be made available for 0 to 72 hours range forecasting in Africa.

Field type	Variables	Date
Surface fields	T, Td	Analyzed and forecasted (every 6hr)
Surface fields	Soil Moisture	Initial and forecasted (every day)
Surface fields	SST	Initial field
Horizontal Cross section : 925 hPa	T (or θ), θ'w used by forecasters (or θe) VH (vector + module) Geopotential Z	Analyzed and forecasted (every 6hr)
Horizontal Cross section : 850 hPa and 700 hPa	VH (vector + module) Vorticity, Convergence/divergence Relative Humidity θ'w used by forecasters (or θe) Option: PV on the 320K surface	Analyzed and forecasted (every 6hr)
Horizontal Cross section : 200 hPa	VH (vector + module) Vorticity, Divergence Relative Humidity	Analyzed and forecasted (every 6hr)
Precipitation	Accumulated over 6 and 24 hr periods	Forecasted (every 6hr and day)
Integrated values	CAPE (max)	Analyzed and forecasted (every 6hr)
Integrated values	Precipitable water	Analyzed and forecasted (every 6hr)
Integrated values	Shear vector between 600 hPa and the surface	Analyzed and forecasted (every 6hr)

NB: Most of the above fields are already available on some NWP web sites. Nevertheless often it's not exactly the same level or variable.

ANNEX to PARAGRAPH 5.3.9

PART I: GENERAL STRATEGY FOR IMPLEMENTING OPERATIONAL RUNNING OF LAM

1. A strategy for the development of NWP in Africa was developed during a special workshop that took place in Roodevallei, South Africa, from 30 September to 2 October 2002. The strategy works since it has been applied and five countries have implemented operational NWP in 2006.

2. The strategy includes four necessary steps for the country that wishes to develop and implement operational NWP.

STEP 1: To gain experience in the field of NWP:

- Access to global products (grid fields) from advanced Centres
- Constitute a products data bank
- Include visualization functions of fields
- Implement verification systems
- Apply post-processing: statistical adaptation

STEP 2: Implementation of a LAM:

To produce useful products for operational forecasting means to offer more than existing available products (i.e. higher resolution than global models products available – ECMWF = 25 km res.) and make the LAM products available in a time delay acceptable for forecasters. It means for sustainability that the NWP team must be prepared to evolve and improve the system to keep useful on the long term). Step 2 is more demanding than Step 1 in know-how and resources (see detail recommendations in Part II).

- Choose the appropriate LAM (physical parameterization, topography, etc..) and therefore corresponding Global Model for
- Connection for boundary conditions fields, with sufficient bandwidth
- Sufficient computer speed
- Application software
- Organization of operational production

STEP 3:

- Running a local model, without data analysis, but with fine tuning system for the local region (best physical parameterization options, optimal domain size, resolution in 3-D, position, refine forcing, topography, soil surface, statistical post-processing)

STEP 4:

- Some knowledge on data assimilation techniques? (if no, black box)
- Add data assimilation: (data nudging techniques)

–More data over area (needs good data collection means)
- Radar data assimilation?

Implications for WMO

3. Suggested corresponding strategy for WMO:

1) for use of NWP products (Step 1)

1.1 Persuade advanced centres to give and make available more useful NWP products for Step 1 (use of NWP products)

1.2 Train developing countries to make best use of available NWP products (various fellowships for attendance of appropriate courses, support to seminars organized by advanced centres, WMO training seminars, CAL modules)

1.3 Ensure access to products in developing countries (good Internet or other types links to obtain

products), enhance local data processing capabilities (if necessary expert assessment missions, followed if necessary by special funding: e.g. World Bank, EU, VCPs)

2) for implementing NWP with LAM (Step 2)

2.1 Train "ready to implement" (= minimum 2 NWP scientists, 1 IT expert, adequate connection facilities and computer power, see details in Part II) countries to understand LAM NWP (various fellowships, WMO training seminars, support to seminars organized by advanced centres, CAL modules)

2.2 Help good candidate countries to have adequate hardware and software system (expert assessment missions, followed if necessary by special funding: e.g. World Bank, EU, VCPs)

2.3 Persuade advanced countries to facilitate and simplify access to their global grid points model for boundary conditions (e.g. special FTP GPV data bases, special satellite links)

2.4 Candidate countries should get special training for operational implementation of LAM (WMO type seminar + training by model producer (grouping or bilateral) + visiting scientist in Country)

2.5 Ensure Step 2 fully operational (ask for reports, share problems in NWP meetings – Regional Working Group on NWP LAM)

3) for improving NWP model (Step 3: fine tuning of model)

Countries themselves should be acting (if necessary more training: training by model producer (grouping or bilateral) + visiting scientist in Country (with WMO support?)), extensive use of verification tools, statistical adaptation

4) for introducing additional data: data nudging, and data assimilation (Step 4)

Countries themselves should be acting: checking necessity, usefulness if really additional data are available and not used at all in the initial assimilation of the boundary conditions. To be implemented it requires great competence and excellent scientific knowledge (WMO could support various fellowships for attendance of appropriate courses, support to seminars organized by advanced centres).

Implementation – Schedule for WMO

4. *The WMO Secretariat department: Regional and Technical Cooperation Activities for Development Department (RCD) should be involved for all financing aspects.*

Step 1: courses (see 1.2) have been given by WMO and by some advanced centres for decades now. More training is still needed for use of products, especially EPS products. 1.3 should follow (RCD should be involved), if 1.3 does not follow quickly, 1.2 could be useless. More work is needed with ETR, COMET to develop appropriate CAL tools.

Step 2: courses (see 2.1) have been started for RA I in 2005 (Botswana, Kenya, Libya, Mozambique, Senegal, Tanzania) and this has been successful since in 2006 Senegal, Kenya, Mozambique are operational and soon will be Botswana and Tanzania. These courses can be repeated for other countries. Some countries have been getting training type 2.3 by DWD (for HRM since a few years, and within bi-lateral or consortium activities (e.g. ALADIN, ETA). For 2.2 RCD should be strongly involved. For 2.3, this has to be put on the agenda of GDPFS and WIS meetings. For 2.4 WMO could give limited support for attending advanced countries courses on specific models (RCD involvement). Within the severe demonstration project for South-East RA I, additional countries could be considered for Step 2. For 2.5 WMO can organize status reports (started for RA I), and a regional working group should be created.

Steps 3 and 4: The countries having satisfactorily implemented Step 2 can consider Step 3 and 4. RCD should be strongly involved to see how financial support can be given. One should wait later for these steps RA I (2008?).

PART II:

RECOMMENDATIONS FOR A COUNTRY CONSIDERED AT A STAGE WHERE IT CAN IMPLEMENT A LAM

Required knowledge (additional training?):

- Some NWP knowledge
  - Modelling (dynamic, physics)? (if no, black box)
- Information technology:
  - Programming (if no, black boxes!)
  - Data management know-how:
    - Data Bases
- Meteorological operational applications systems:
  - Pre-processing, decoding
  - Post-processing
  - Managing operational system, scheduler of programs

Training: what is possible?

Pre-requisite: Countries to be helped must be ready to implement (expertise, enough resources). E.g. 6 only out of 45 found in 2005 in Africa.

- WMO general workshop – one or two weeks (1 or 2 participants per country)
- Workshop by advanced countries (e.g. DWD) *(cheaper formula for WMO)*
- WMO Fellowship to study in advanced countries for limited number of scientists, at least a month.
- Roving seminar by visiting experts (*difficult to find*)
- CAL (e.g COMET): has to be developed, very expensive and perhaps less motivating for learner, but good to review at home courses given already in seminars.

Recommendations to countries that are considering running models locally:

- Resolution must be better (in 2006) than 25 km = ECMWF global model resolution; but who has all the products they need from ECMWF?
- Increasing topography and resolution in the numerical simulation (with adequate parameterization, especially, convection) may improve short-range forecasts.
- Necessary meteorological resources:
  - Real time acquisition of boundary conditions
  - Model: higher resolution than available Global Model, Good topography
- Necessary physical resources:
  - Hardware with sufficient speed (trade-off between model resolution and time delay (usefulness for forecasters on duty) and power/memory = cost)
  - One Gflops?
  - Software
  - Application software (data processing, data base, display tools and Model)
  - Connection: 64 Kb/s sustainable on GTS or special link (satellite) or Internet (1 Mb/s?)

Choosing the model

1. Choose a model that is known to be reliable and
2. which has a history of being run in a stable configuration and
3. is sustainable and
4. has a support base from a recognized center for that model and
5. has full documentation on model code structure and performance
6. Source code should be made available
7. Training of staff must be available from the donor

8. Model should be portable and easy to implement.
9. Consider the consortium approach (grouping of countries)

List of known available models (2006):

- NCEP – Eta (now WRF)
- NCAR – MM5 (now WRF)
- Meteo-France – ALADIN (only available for Consortium member countries)
- Deutscher Wetterdienst (Germany) – HRM, LM
- UK Met – Unified model?
- HIRLAM community - HIRLAM Model (only member countries)

A Powerful Workstation (s) is needed:

- A single piece of hardware or cluster (same power as the biggest computers of the eighties):
- With Several functions provided by software:
  - Data and products reception, pre-processing
  - Internet, Intranet
  - Visualisation
  - Data Base, Archiving
  - Post-processing of fields
  - Limited Data Bank of fields
  - Objective interpretation software: Statistical Models, probabilistic forecasting
  - For automatic real time operations: scheduling software
- Finally: Meso-scale LAM forecasting model

Problem of access to boundary conditions:

- requires good Internet access (1 Gb/s?) or special link
- would be helpful if global model Centres would prepare in a kind of data base, only the requested points for the specific LAM areas of the requesting centres.

ANNEX TO PARAGRAPH 5.5.1

Integrated Observing Systems (IOS)

1. In 2005-2006, 12 countries received support for a total of 13 projects concerning observing systems (see Appendix). Four projects aimed at strengthening surface observing stations and nine at strengthening upper-air observing stations.

1.1 The following guidelines for the allocation of priorities for the IOS are submitted to CBS-Ext.(06):

(a) Highest priority should be given to the projects aiming at improving and restoring the existed and building the new upper-air observational capabilities of the RBSN/RBCN with emphasis to the activation of silent upper-air stations and the improvement of coverage over data-sparse areas;

(b) High priority should be given to the projects related to the improvement of data quality, regularity and coverage of surface observations of the RBSN/RBCN with emphasis to the activation of silent stations and the improvement of coverage over data-sparse areas;

(c) High priority should be given to projects related to the introduction and/or use of new cost-effective observing equipment and systems including surface-based AWSs, AMDAR, ASAP and drifting buoys;

(d) Medium priority should be given to the projects related to the improvement/upgrading of stations not included in RBSN/RBCN list of stations.

Information Systems and Services (ISS)

2. Five countries received support for five projects concerning information systems and services in 2005-2006 (see appendix): one project aimed at replacing the message switching systems (MSS) at RTH Nairobi; three at connecting WWW centres to the Internet and one at strengthening the national meteorological telecommunication networks.

2.1 The following guidelines for the allocation of priorities for the ISS are submitted to CBS-Ext.(06):

(a) Highest priority to the implementation of the connection of each NMC to the GTS for the exchange of observational data and processed information (at a minimum speed of 16 Kbits/s using TCP/IP procedures), including reception of satellite-based data-distribution systems;

(b) Highest priority for the exchange of data between RTHs at a minimum speed of 64 Kbits/s using TCP/IP procedures;

(c) Highest priority for the completion of the implementation of the project for an improved MTN;

(d) Highest priority for the collection of data from RBSN stations at NMCs or centres with similar functions;

(e) Highest priority for activities on capacity building facilities and use of Internet and implementation of related facilities in developing countries for improving exchange of meteorological and related information;

(f) High priority for a backup connection of each WWW centre to the GTS;

(g) High priority for the implementation of virtual private network (VPN) connections via the

Internet as a backup for the exchange of data, in particular for RTHs.

2.2 The WMO goals for Members equipped with meteorological satellite receiving equipment were 100 per cent for polar-orbiting satellite data receivers and for geostationary satellite data receivers. The following guidelines for the allocation of priorities are submitted to CBS-Ext.(06):

(a) Highest priority for satellite receivers for those Members without any receiver;

(b) High priority for satellite receivers for those Members without a polar-orbiting receiver or a geostationary receiver;

(c) Medium priority for satellite high resolution receivers for those Members with only low resolution polar-orbiting receiver or only low resolution geostationary receivers;

(d) Low priority for satellite receivers for those Members already exceeding the WWW goal.

Data-processing and Forecasting Systems (DPFS)

3. Two countries received support for two projects concerning data-processing and forecasting systems in 2005-2006 (see appendix).

3.1 The following guidelines for the allocation of priorities for the DPFS are submitted to CBS-Ext.(06):

(a) Highest priority for establishing access at NMHSs to NWP products from advanced centres, for viewing and use as guidance for forecasting applications, in particular severe weather forecasting;

(b) Highest priority for automation of operational data-processing functions, including the processing of observations and post-processing of NWP products, for improvement of all weather forecasting applications, in particular nowcasting;

(c) High priority for training on use of NWP products, in particular use of relevant EPS products, and applications to probabilistic forecasting;

(d) High priority for training on operational data-processing, including on the implementation of post-processing of NWP products and running of a Limited Area Model.

Public Weather Services (PWS)

4. Four countries received support for the provision/upgrading of media weather presentation systems in 2005-2006 (see appendix).

4.1 The following guidelines for the allocation of priorities for the PWS are submitted to CBS-Ext.(06):

(a) Highest priority for TV/media presentation systems comprising high performance computing and communications hardware, peripherals and software, video equipment for television production, as well as the related training of staff;

(b) Highest priority for computer-based meteorological workstations that enabled, through forecaster interaction, the creation of new or enhanced products for users, based on satellite imagery and processed products (inputs);

(c) Highest priority for enhanced Internet access for NMHSs as a communications tool to improve their data access, as well as expand the dissemination methods of their public weather services, and promote the use of official consistent information;

(d) Highest priority for training related to national PWS plans; that included training in media skills

(writing and presentation), product design, and public education and awareness;

(e) Highest priority for fixed and mobile communications systems for the dissemination of public weather services, preferably modern telephone and communication services (e.g., mobile telephones, pagers/short message system and fax-on-demand);

(f) Medium priority for VHF radios to provide radio broadcast and warning alert systems.

APPENDIX

LIST OF COMPLETED AND ONGOING TCO PROJECTS DURING THE PERIOD 2005-2006 RELATED TO WWW AND PWS RELATED TO REGION I

The hereunder tables detail the list of completed and ongoing projects supported through the WMO Voluntary Cooperation Programmes (VCP), WMO Trust Funds or UNDP. For VCP projects, the project indicator (e.g., OB/2/2/2) is given in the second column. Further details on the projects are available in the WMO server through http://www.wmo.int/web/tco/vcp/VCPHome.html.

1. Observing systems

Country	*Project*	*Project title*
COTE D'IVOIRE	OB/1/3/1	Provision of a hydrogen generator for Abidjan upper-air station
ETHIOPIA	OB/1/2/5	Provision of two upper-air observing systems and hydrogen generators for Addis Ababa and Neghelle stations
GUINEA BISSAU	OB/2/2/2	Rehabilitation of meteorological, climatological and agrometeorological observation networks
GUINEA BISSAU	OB/2/2/3	Provision of surface measurement instruments
KENYA	OB/1/3/1	Installation of a hydrogen generating plant with compressor for the GCOS upper-air station
LIBYAN ARAB JAMAHIRIYA	UNDP	Establishment of an automatic weather station network and provision of an integrated terminal weather station at Tripoli airport
MADAGASCAR	OB/1/3/2	Provision of a hydrogen generator for the rehabilitation of upper-air station Ivato
MAURITIUS	OB/1/3/1	Provision of a hydrogen generator for the enhancement of upper-air observations in the South West Indian Ocean
NAMIBIA	OB/1/2/1	Rehabilitation and upgrading of the upper-air sounding systems
SENEGAL	OB/1/3/1	Provision of a hydrogen generator
SWAZILAND	OB/2/2/1	Provision of six net solar radiation and wind speed and direction equipment
UNITED REPUBLIC OF TANZANIA	OB/1/2/3	Provision of an upper-air system and a hydrogen generator for Dar-es-Salaam
ZIMBABWE	OB/1/2/4	Provision of 400 radiosondes and balloons for Harare upper-air station

2. Information Systems and Services

Country	*Project*	*Project title*
GUINEA BISSAU	TE/5/3/1	Provision of Internet connection
KENYA	TE/5/2/5	Replacement of the Automatic Message Switching System (AMSS) for RTH Nairobi
MADAGASCAR	TE/1/2/1	Provision of spare parts for MIRIA 5P DCPs
NIGERIA	TE/5/3/1	Internet connection using a VSAT
ZAMBIA	TE/4/3/1	Enhancement of collection and dissemination of meteorological data and information through the Internet

3. Data-processing and Forecasting Systems

Country	*Project*	*Project title*
GUINEA	DP/1/1/1	Provision of computer equipment for the enhancement of GTS and GDPS at NMC Conakry
UNITED REPUBLIC OF TANZANIA	DP/1/1/2	Provision of two LINUX workstations

4. Public Weather Services

Country	*Project*	*Project title*
DJIBOUTI	VCP UK	Upgrading of TV studio system
ETHIOPIA	VCP UK	Upgrading of TV studio system
SEYCHELLES	VCP UK	Upgrading of TV studio system
UGANDA	DP/1/1/2	Popularization of meteorology in schools

ANNEX TO PARAGRAPH 5.5.2

Tsunami Warning System in Indian Ocean

The realization of the past few years in the Indian Ocean can be an example of the multi-hazard strategy recommended by WMO. The meteorological services of the South -West of the Indian Ocean: Seychelles, Mauritius, Comoros and Madagascar have been equipped with a very efficient system, which has considerably improved the transmission and the visualization of the Meteorological information around the RSMC of la Reunion. This architecture has considerably improved the efficiency of the meteorological services facing the Cyclonic risk and the project has been classified as the best project of cooperation of the year in 2005 by the Fond Européen de Développement (FED), which funded it.

This equipment is composed of 4 essential elements:

- A RETIM system for the reception of the information by satellite using the very efficient technology IP/DVB.

- The same powerful AMSS TRANSMET as the one installed in the RTH of Toulouse and Nairobi, allowing multi-protocol dissemination of the messages using all the technologies (Fax, email, leased line ...etc)

- The same system of visualization as the one used by the most important forecasting services in the world called SYNERGIE.

- INTERNET as a cheap and powerful mean for the exchange of the information in the region but also for sending the elaborated products to the Public

The fact that it is the same equipments has proved to be very powerful tool for minimizing the risk of the Tsunami with the following goals:

- To assure a good reception of the Tsunami warning messages sent by the Tsunami Centers of Japan and Hawaii through the TRANSMET and RETIM elements of the systems

- To improve the warning possibilities of the population through the implementation of a specific warning module on the SYNERGIE system .

Recognizing the capacity of this system for a multi -hazard strategy, it has been decided to install the same systems in the East Coast of Africa (Kenya and Tanzania) to enhance the early warning system network.

ANNEX TO PARAGRAPH 7

PROPOSAL OF UPDATED TERMS OF REFERENCE FOR THE RA I WG-PIW

Decisions and recommendations taken by XIV-RA I

The Fourteenth Session of Regional Association I (Ouagadougou, February 2007) reviewed and agreed on the following issues and tasks of the WG-PIW along with their associated priorities:

Tasks of the Working Group:

a) To monitor the progress made in the implementation and operation of the WWW facilities in the Region and advise on possible improvements and priorities for appropriate actions to be carried out under the WWW Programme and the need for external support, where required;

b) To keep under review the actions taken under the required WWW implementation programme of the Sixth Long Term Plan and the WMO Strategic Plan with a view to updating and further developing the programme relating to RA I;

c) To develop proposals for the further development and full integration of the WWW components and functions with a view to achieving a cost-effective operation and a better supply of WWW data and products throughout the Region;

d) To advise the president of the Association on all matters concerning the WWW;

e) To keep under review education and training requirements related to the implementation and operation of the WWW and Public Weather Services in the Region;

f) To keep under constant review the Regional Main Telecommunications Network and its implementation, and to plan in the implementation of the WMO Information System in the Region including migration of data representation;

g) To identify means for strengthening liaison with those bodies responsible for the implementation of THORPEX, AMMA, GCOS, AMDAR, SADIS and other WWW- related programmes in the Region;

h) To advise on how the WWW can enhance the effectiveness of early warning systems in the Region in a multi- hazard multi-purpose framework;

i) To contribute to the effective coordination between the WWW and the WMO cross-cutting activities such as the Space Programme and Natural Disaster Mitigation and Prevention Programme;

j) To assist in the development of national and regional plans for GEOSS;

1. Regional Aspects of the Information Systems and Services (ISS):
2. Regional Aspects of the Integrated Observing Systems (IOS):
3. Regional Aspects of the Data-processing and Forecasting Systems (DPFS)
4. Regional Aspects of Data Management (DM)
5. Regional Aspects of Data Representations including their Migration
6. Regional Aspects of Public Weather Services

1. Regional Aspects of the Information Systems and Services (ISS):

i) To keep under review the status of implementation and operation of the Regional Main Telecommunications Network, particularly as regards the implementation of the WIS, the capabilities of satellite for collection and distribution and

formulate recommendations with a view to remedying shortcomings;

ii) To study problems and develop improved cost-effective arrangements relating to the exchange of observational data and processed information, within Region I and outside it and formulate recommendations for the coordination of the implementation of telecommunication facilities and techniques;

iii) To keep under review data and information generation, selection and presentation to recipients (NMHSs), including storage and retrieval of data and products and recovery procedures in case of major outages of key facilities

iv) To coordinate information service activities relating to WMO multi-hazard warning systems, including the Tsunami Warning System;

v) To keep abreast of developments in information and telecommunication technology, procedures, services and equipment, including in particular satellite–based telecommunication services, the Internet and related equipment and related equipment, and to advise on their applicability, as appropriated, to the Region;

vi) To identify the training requirements of Members in the Region relating to relevant information and communication techniques;

vii) To advise and report to the Chairperson of the Working Group on all matters concerning regional aspects of the GTS and WIS;

viii) To represent the Region on the CBS Implementation-Coordination Team on ISS.

ix) To keep aware of Metadata development and possible implementation

2. Regional Aspects of the Integrated Observing Systems (IOS):

i) To review and advise on the observational data requirements of Members of the Regional Association in the context of the WWW Programme in the WMO Sixth Long Term Plan and the WMO Strategic Plan;

ii) To monitor performance, review, update and advise on the design of observing systems in the Region, in particular the RBSN of surface and upper –air stations and the Regional Basic Climatological Network, including GOOS,

iii) To keep abreast of matters related to the development and introduction of new observing systems, including both in situ and space-based platforms and advise on their application in the Region,

iv) To liaise with other Rapporteurs and sub-groups in the Region to ensure coordination on matters relating to the GOS, particularly the Co-Rapporteur on the GCOS matters and on Marine Meteorological Services on the development and operation of the GOS in support of marine services.

v) To coordinate the regional input to the agreed plans for the evolution of the GOS with other regional Rapporteurs, the Chair and other members of the OPAG on IOS,

vi) To act as the focal point for the Region in maintaining regulatory material related to the GOS (including the Volume A and the Manual of the GOS)

vii) To advise and report to the Chairperson of the Working Group on all matters concerning regional aspects of the Global Observing Systems

viii) To represent the Region on the CBS Implementation/Coordination Team on Integrated Observing Systems and coordinate the implementation of agreed plans with the Chair and other members of the OPAG on IOS.

3. Regional Aspects of the Data-processing and Forecasting Systems (DPFS)

i) To keep abreast of developments in numerical analysis and prediction systems, techniques and applications which could be introduced at national and regional centres to improve their forecast and warning capability, covering time-scales from now-casting to long range forecast;

ii) To formulate recommendations for coordinated enhanced of meteorological analyses and forecast guidance available to NMHSs in the Region, with a particular focus on the products required to support the forecast services in support of early warnings in a multi-hazard framework, including forecast guidance for high impact weather, environmental emergency response, atmospheric transport and dispersion;

iii) To identify the training requirements of Members in the Region relating to relevant data processing and forecasting techniques;

iv) To contribute to WMO cross cutting activities such as the WMO Space Programme and the National Disaster Prevention and Mitigation Programme in areas related to data-processing and forecasting systems;

v) To advise and report to the Chairperson of the Working Group on all matters concerning data –processing and forecasting activities in the Region;

vi) To represent the Region on the CBS implementation/Coordination Team on Data Processing and Forecasting

4. Regional Aspects of Data Management:

i) To review data, product and information presentation, selection and dissemination to recipients (NMCs);

ii) To collect information on the level of quality control of data and products;

iii) To review the WWW data and products recovery procedures in case of major outages of key facilities;

iv) To keep under review and coordinate both real-timed non-real-time monitoring of the WWW Programme in the Region, including quantity and quality aspects;

v) To coordinate and provide information on real-time and non-real-time monitoring of the integrated WWW system in Region I;

vi) To identify and/or advise on training requirements of Members for the successful implementation of the WWW DM functions in Region I;

vii) To advise and report on DM activities in the Region to the Chairperson of the Working Group

viii) To represent the Region on the CBS Implementation and Coordination Team on Information System and Services and the CBS Working Group on Data Management.

5. Regional Aspects of Data Representations including their Migration

i) To review data and related information presentation, including exchange formats and codes, and conversion between formats and codes;

ii) To follow the development of standardization for meteorological data exchange in XML and NetCDF and consider if useful for the Region;

iii) To keep under review data and information representation, including character and bit-oriented exchange formats and codes and the migration to TDCF, assisting in the preparation of regional and national transition plans for the migration to TDCF;

iv) To take action towards solving coding problems assigned by the Chairperson of the Working Group;

v) To identify and/or advise on training requirements of Members for the successful implementation of approved

exchange formats and codes in Region I;

vi) To advise and report to the Chairperson of the Working Group on all matters concerning meteorological codes and new developments in codes;

vii) To represent the Region on the Subgroup on Data Representation and Codes of the CBS Working Group on Data Management.

6. Regional Aspects of Public Weather Services

i) To Keep under review the implementation of the PWS in Region I;

ii) To advise and report to the Chair person of the Working Group on mattes relating to formulation, presentation and dissemination of forecasts and warnings, and establishing good relations with emergency managers, the media and the private sector;

iii) To keep under review education and training requirements related to the PWSP in Region I;

iv) To contribute to WMO cross-cutting activities such as the WMO Space Programme and the Natural Disaster Prevention and Mitigation Programme in areas related to PWS;

v) To advise on social and economic applications of PWS in collaboration with the THORPEX socio-economic Applications Working Group and other stake holders and users as appropriate;

vi) To advise and report to the Chairperson of the Working Group on all matters concerning Public Weather Services;

vii) To represent the Region on the CBS Implementation/Coordination Team on PWS.