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**WORKING GROUP ON PLANNING AND IMPLEMENTATION OF THE WWW IN REGION II**
***Fifth Session***

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# REPORT OF THE CHAIRMAN OF THE WORKING GROUP ON PLANNING AND IMPLEMENTATION OF WORLD WEATHER WATCH IN RA II (WG PIW)

*(Submitted by A. K. Bhatnagar, India, the chairman of the RA II WG PIW )*


Summary and purpose of document

This document provides information on the activities of the RA II WG PIW and its chairman.


## ACTION PROPOSED

The group is invited to take into account the information provided in the document when considering individual agenda items.

# REPORT OF CHAIRMAN OF THE WORKING GROUP ON PLANNING AND IMPLEMENTATION OF WORLD WEATHER WATCH IN RA II (WG-PIW)

(FOR 2007)

## 1. INTRODUCTION:

The 13th session of the Regional Association II (Asia) held in Hong Kong, China from 7 to 15 December 2004, re-established the Working Group on Planning and Implementation of the World Weather Watch (WG/PIW) vide Resolution No 4.1/1 (XIII-RA II). The terms of reference and composition of the WG are given at Appendix- A.

Significant progress has been made since the previous meeting of the 13th Session of RA II of WMO in Hong Kong, China and Extra-ordinary Session of CBS. Many scientists from RA II countries have participated in various WMO meetings related to development of observational system, data processing and forecasting system, telecommunication and public weather service.

## 2. CHAIRMAN'S ACTIVITIES

Annual report for 2005 was prepared with the assistance of the members of the working group and submitted to the President, taking into consideration recommendations of EC, CBS XIII and subsequent recommendations of the CBS Management Group (Geneva 2005).

The Chairman attended CBS XIII at St Petersburg, Russian Federation, in February 2005 and CBS Ext 06 at Seoul, Republic of Korea in November 2006 and contributed to the discussions on the progress and issues related to WWW in the Region. At CBS XIII all Chairs of the Regional Working Groups on WWW from six RAs were present. An informal meeting of the Chairs of WG on PIW of all the six Regional Associations was held on 1 March 2005 on the sidelines of CBS-XIII to exchange information on how the responsibilities were carried out in each region. It was agreed to exchange reports and key documents to assist each other. There was a feeling that the Working Groups should meet more frequently than once every 4 years. It was also discussed that opportunities need to be explored for a small meeting of the Rapporteurs to be held in conjunction with other Regional meetings. A need was felt to prepare a short guide (only a few pages) for WG Chairs on the procedures to carry out their roles. Gerhard Steinhorst (RA VI) kindly volunteered to write down a page or two on this. This could then be maintained by the WMO Secretariat and provided to new appointees. The group also agreed to send copies of the Annual Reports they prepared and other key documents to the other Working Group Chairs. Comments on the meeting were included under Item 9 of the record of CBS-XIII.

At CBS (Ext 06) a meeting of Regional Chairs of the Working Groups on WWW was held at lunch-time on 14 November 2006. There were representatives from all six regions. Dr. Jack Hayes, the new Director of the WWW Department in the WMO Secretariat also attended. The meeting reviewed the report of the meeting held at CBS-XIII in 2005. Several Chairs had distributed reports of their Working Group meetings to the group.

Guidelines for procedures in use in RA VI had been prepared by the RA VI Chair and distributed to the group and to the WWW Department. Jack Hayes agreed that the WWW Department would take ownership of this document, and maintain it as a guide to Regional Working Groups.

It was suggested that a list of all rapporteurs appointed by the Regional Associations be provided. They also expressed a need for assistance on clarifying tasks and priorities, and the reporting expectations. William Nyakwada (RA I) noted the difficulties in conducting surveys across his

region. There is generally a low response. This presents a challenge of ownership of decisions and getting commitment to action plans that are based on such surveys.
The financial constraints on Working Group meetings were acknowledged, but the meeting suggested that it would be beneficial if there were the opportunity for the twice per four years at least of core group. All agreed that an initial face-to-face meeting is important; work by e-mail is then much easier. The meeting also noted that meetings by video conference was an option that should be considered. There was discussion on the role of Regional Advisory Groups. In some regions these were taking on greater importance. Jack advised the Chairs to demonstrate the importance of the WWW to their Regions by effective action.

The following were suggested as priorities for the Working Groups on WWW:

- Evolution of the GOS, particularly the development of regional plans
  (Action: T Hart to circulate the plan developed by RA I)
- Migration to Table Driven Code Forms (MTDCF) – identification of training needs
- WIS – raising awareness in NMHSs
- Disaster Prevention and Mitigation – assisting in the development of this cross-cutting programme.

Dr. Hayes also felt that the WMO Strategic Plan would need to be supported by corresponding plans at the Regional Association level. This should assist in clearly expressing priorities. Regarding MTDCF, Jack Hayes said that Members should not see it as a threat. As long as there is a need for a particular code it will continue.

Dr. Jack Hayes offered to request the Secretariat Programme Managers to scan relevant WMO records for key issues that needed action by the Working Groups. He invited the Chairs to contact him by telephone to discuss issues and problems with him.

Action Items

A list of issues and action items, identifying responsibility, kindly prepared by Dr. Jack Hayes is:

- Need to sustain documentation on roles and responsibilities, etc, for Members and Working Group. Consider developing in coordination with Regional Chairs a small handbook of relevant information to assist the working group.

ACTION: WWW Dept

- Need to improve linkage/communication between WWW Dept and Regional Chairs.

ACTION: WWW Dept Regional Focal Points to initiate contact and develop a programme to improve communication.

- Make available to Regional Association meetings information on the roles and responsibilities of Chairs of the WG/PIW. This would build on the guidelines used in RA VI which had been distributed among the Regional Chairs and to the WWW Dept. It could be provided as INF document.

ACTION: WWW Dept

- Develop ideas for increasing frequency of WG/PIW meetings within each Region to two per financial period – one at the beginning to plan a regional agenda and one toward the end to assess progress and prepare a report for the relevant RA meeting.

ACTION: WWW Dept and Regional Chairs.

- Develop guidance and ensure WG/PIW Members in each Region understand the working group's mission and their responsibilities.

ACTION: Regional Chairs – assisted by WWW Dept.

- Develop and distribute a "key issues" list from relevant documents (Abridged texts from Congress, Executive Council, etc) to Regional Chairs.

ACTION: WWW Dept

- Distribute the RA I plan for Evolution of the Global Observing System (GOS) to other Regional Chairs.

ACTION: Terry Hart, Chair, RA V WG/PIW.
STATUS: Completed during CBS.

- Share Annual Reports with other Regional Chairs.

ACTION: Regional Chairs.

- Make available list of all Rapporteurs and Coordinators for each Region to WG Chairs.

ACTION: WWW Dept

## 3. PROGRESS ON IMPLEMENTATION OF WWW IN THE REGION

Chairman has collected reports from the Rapporteurs and members of the Working Group on PIW (RA II) in their respective field and included the same in this report. The progress is as follows:

### 3.1. Public Weather Services

3.1.1 Activities

The following meetings/training courses relevant to the Region were attended by members:

(a) Meeting of the OPAG Expert Team on PWS in Support of Disaster Prevention and Mitigation, Beijing, China, June 2006,
(b) WMO VCP Training course on city forecasts, Hong Kong, China, October 2006,
(c) PWS Workshop on Warnings of Real-time Hazards by using Nowcasting Technology, Sydney, Australia, October 2006,
(d) Asia Conferences on Disaster Reduction in Seoul, Republic of Korea in 2006 and Astana, Kazakhstan in 2007,
(e) OPAG/PWS survey on severe weather warning services in 2006,
(f) Coordination Meeting of the World Weather Information Service (WWIS) Website Hosts, Hong Kong, China, January 2007,
(g) First Meeting of Joint (PWS-WWRP) Nowcasting Applications & Services (JONAS) Steering Committee, Geneva, Switzerland, April 2007, and
(h) Meeting of the CBS OPAG/PWS Implementation Coordination Team (ICT), Muscat, Oman, June 2007.

3.1.2 Pilot project on City-specific NWP products for developing countries has made good progress since 2006. Hong Kong, China; Japan and Republic of Korea provide forecast time series for a total of 160 cities in 13 participating Member countries on their websites. Eighteen RA II Members, have joined the project. Kazakhstan reports that Hong Kong Observatory provides 72 hrs weather forecasts, JMA - 84 and 216 hrs forecasts in table and graphic format and KMA - 84 hrs forecast for 18 cities of Kazakhstan. ECWFP provides forecasts 2 times per day for 10 days for 11 cities of the Republic.

3.1.3 World Weather Information Service (WWIS)

As of 1 August 2007, 35 RA II Members participated in the WWIS, with 28 Members contributing forecasts for 209 cities. WWIS operates now in six languages- English, Arabic, Chinese , Portuguese, Spanish and French. Out of a total of 188 WMO Members, 159 participated in WWIS. A total of 115 Members provided forecasts for 1204 cities, while 159 Members provided climatological data for 1218 cities. At the coordination meeting of the WWIS website hosts held in

January 2007 in Hong Kong, China, a roadmap for future WWIS activities was prepared. The roadmap included the eventual merging of the WWIS and Severe Weather Information Centre (SWIC) websites.

3.1.4 Severe Weather Information Centre (SWIC)

CBS XIII at St. Petersburg in February 2005 approved turning the SWIC pilot project into an operational component of the PWSP of WMO. Ten RA II Members, namely Cambodia, China, Democratic People's Republic of Korea, Hong Kong, China, India, Japan, Macao, China, Republic of Korea, Thailand and Viet Nam participated in the SWIC. The SWIC web site (http://severe.worldweather.wmo.int) was developed and maintained by Hong Kong, China, containing initially tropical cyclone advisories issued by all RSMCs, and official warnings issued by NMHSs for their respective countries or regions. Enhanced accessibility of advisories through SWIC was sought from RSMC New Delhi during Tropical Cyclone Gonu in the Arabian Sea that affected Oman in June 2007. SWIC also featured displays of occurrences of thunderstorms and heavy rain/snow decoded from SYNOP reports. A total of 20 WMO Members now participate in the SWIC.

Kazakhstan reports that warnings are issued for 6 severe weather phenomena over Kazakhstan. These are wind speed ( > 30 m/s), blizzard and dust storm
(> 12 hours, wind speed > 15m/s), rainfall (> 30-50 mm), fog (> 6 hours, visibility < 100 m), frost, high fire hazard.

3.1.5 PWS survey on severe weather warning services

According to the survey conducted by the ET/DPM in collaboration with the ET/SPI on severe weather warning services of WMO Members in 2006, the top four severe weather hazards, as indicated by respondents, were related to: Rain (65%); Hot and Dry Weather (52%); Low Visibility and Other Hazards (48%) and Tropical Cyclones (47%). The main challenge/obstacle in the provision of alerts/warnings for all hazard types was “forecast accuracy” while “public understanding of warnings” was also indicated as an obstacle for the provision of warnings for RAIN. Capacity building in nowcasting should therefore be given high priority in the Region.

3.1.6 New initiatives and upcoming events on PWS include:

(i) Following the PWS Workshop on Warnings of Real-time Hazards by Using Nowcasting Technology in Sydney in October 2006, a Joint (PWS-WWRP) Nowcasting Applications and Services (JONAS) Steering Committee was formed to further develop the framework and oversee the implementation of a strategy to promulgate the PWS application of nowcasting technology in developing countries, in particular, the establishment of a pilot open test bed on nowcasting applications and services. RA II Members are encouraged to participate and make use of the open test bed when ready.

(ii) At the Asia Conference on Disaster Reduction 2007 in June in Kazakhstan, the Chair of OPAG ET/DPM presented a proposal on the pilot project entitled “Public Outreach Campaign in RA II about Meteorological and Hydrological Services in Disaster Risk Reduction”.

(iii) The ICT-PWS at its meeting in Muscat in 2007 decided to embark on a pilot project whereby a coordinated training and mentoring programme might be devised which would focus on a small group of neighbouring countries, and which would draw on the expertise available through the OPAG PWS Expert Teams as well as that provided through the WMO Secretariat. The focus of the pilot project would be on “Learning Through Doing” and the aim would be to work with the staff of

the relevant NMHSs in assisting them to improve their communication with users in a defined range of sectors, and to develop and deliver an improved range of products and services. RA II Members are encouraged to join the pilot project to enhance their PWS.

(iv) International Symposium on PWS. The International Symposium on PWS – A Key to Service Delivery would be held on 3-5 December 2007 in Geneva, Switzerland. It is expected that NMHSs in RA II would be represented in the Symposium.

## 4. REGIONAL ASPECTS OF GOS

There is considerable progress in the implementation of GOS in RA II during the past four years. In the surface-based subsystem, the availability of the report from both RBSN and RBCN has increased, and some new observing systems have been developed. There were, however, some problems that still existed in performance of the GOS in RA II.

### 4.1 Regional Basic Synoptic Network (RBSN)

Thirteenth session of the Regional Association II (Asia), Hong Kong, China, 7 – 15 December 2004 approved a total of 1315 surface synoptic stations in RBSN. As per Annual Global Monitoring (AGM) period in October 2006, 1313 stations were functioning, out of which 111 (85 in 2004) are Automatic Weather Stations (AWS), a significant increase of 31 % during the intersessional period. However, the number of upper-air stations in the RBSN has remained unchanged at 321 stations, 282 radiosonde stations and 39 rawin stations. The RBSN (upper-air) consists of 321 stations out of which 3 (none in 2004) are autosonde launching stations.

There is a fall in the number of stations reporting 8 observations per day to around 88 % in 2006 compared to 90 % prior to the approval of a revised RBSN in 2004. The percentage of silent stations increased to 3 % (45 stations) in 2006 compared to 2 % (18 stations) in 2004. This needs particular attention of the concerned Members. Any one of the following reasons may lead to a silent station: unsettled conditions in the country like Afghanistan(13 surface, 1 upper-air) and Iraq(11 surface);, lack of resources, costly sondes, lack of trained manpower, non-availability of equipment, lack of allocation of funds to NMS, poor communications infrastructure. Sometimes, members do not update information of station change timely.

The level of implementation of upper-air stations making 2 soundings per day has remained consistent at around 76 % (radiowind) and 82 % (radiosonde) during the period 2004 - 2006.

The October 2006 annual monitoring results showed that the availability of RBSN in RA II was 96% for SYNOP reports and 89% for TEMP reports. It is thus evident that the availability of SYNOP reports from the Region II is generally satisfactory whilst the availability of TEMP reports is not satisfactory from northern, southeastern and western parts of the Region.

XII-RA II (Seoul, September 2000), approved a new RBSN list. The selection criteria were also reviewed by RA II members and approved. In order to maintain the stability of the RBSN network, the main framework of the RBSN network should be kept unchanged. Minor changes may only be made in accordance with the request of the RA II Members. The Rapporteur recommends to maintain the current RBSN list of 1313 stations and take it as the initial proposed RSSN list for next RA II session.

### 4.2. RBCN and GCOS (GSN and GUAN)

The number of climatological stations in the RBCN has remained unchanged during the inter-sessional period and consists of 663 CLIMAT and 182 CLIMAT TEMP reporting stations as approved by XIII-RA II (2004). The level of implementation of stations reporting CLIMAT has shown a positive increase up to 87 % in 2006 compared to 82 % prior to the approval of a revised RBCN in 2004. Stations reporting CLIMAT TEMP has increased up to 76 % from 64 % during the same period.

Both the GUAN and the GSN in Region II work generally very well. All 31 GUAN stations in the Region are working. Most operate on a two soundings per day basis (the GCOS target requirement) and 4 operate on a single sounding per day (the GCOS minimum requirement). All GUAN stations in the Region meet the GCOS minimum requirement making this one of the best performing Regions. However, some improvement is desirable.

A large gap in the GUAN in RA II is the lack of GUAN stations in India. The GCOS Secretariat and the Indian Meteorological Department (IMD) have been discussing a project that would allow some of the Indian upper air stations to use alternate radiosondes. There are 261 GSN stations in the region and all but about 25 routinely report, the level of implementation being 96 %. The most common problem is that the monthly CLIMAT reports are not received in time. This problem is addressed through working with the national GCOS focal points. Members where additional improvement is needed include India, Turkmenistan, Myanmar, and Viet Nam. Many Members have not yet submitted historical daily and monthly data to the GCOS archive and this remains the largest single deficiency in the usefulness of GSN in RA II.

Further measures should be taken to make RA II Members aware of the importance of the RBCN for the climate prediction and research so that all Members make efforts to provide timely CLIMAT and CLIMAT/TEMP reports from RBCN stations to GTS. The list of RBCN stations proposed by the Rapporteur in his report is to be discussed by the group and finalized.

### 4.3 Marine observations

VOS programmes are operated by a number of Members in RA II. Hong Kong, China, India, Japan, Malaysia, and Singapore have submitted input for the 2006 Ship Observations Team (SOT) annual report. ASAP operations continue to be concentrated mainly over the Northern Atlantic (5153 launches in 2006). However, an important contribution is also made by Japanese research ships operating primarily in the North Western Pacific areas and seas adjacent to Japan (938 launches in 2006).

A number of RA-II Members are participating in the Data Buoy Cooperation Panel (DBCP) and some of its Action Groups. India is maintaining a network of about 25 moored buoys in the Arabian Sea and the Bay of Bengal, is participating in the International Buoy Programme for the Indian Ocean (IBPIO) and is contributing to the DBCP Trust Fund. Japan provides for 18 TRITON buoys deployed in the Western Tropical Pacific and Eastern Tropical Indian Oceans as a contribution to the Tropical Moored Buoy Implementation Panel (TIP). DBCP Action Groups where RA-II Members are particularly active include: Tropical Moored Buoy Implementation Panel (India, Japan), Global Drifter Programme (India, Japan, Republic of Korea), OCEAN Sustained Interdisciplinary Time series Environment observation System (OceanSITES) (Japan, India), International Buoy Programme for the Indian Ocean (IBPIO) (India), WCRP-SCAR International Programme for

Antarctic Buoys (IPAB) (Japan) and International Arctic Buoy Programme (IABP) (China, Japan, Russian Federation).

The ARGO profiling float network is now nearing completion with 2856 floats operational in July 2007 for a target of 3000. Participating RA-II Members include China, India, Japan, the Republic of Korea, and the Russian Federation.

### 4.4 AMDAR issues

The global AMDAR programme continues to make progress on implementing national and regional AMDAR programmes and to improve AMDAR coverage in data sparse areas. The AMDAR Programme now exchanges approximately 220,000 to 250,000 observations per day on the GTS.

RA II, AMDAR Program is operational in Saudi Arabia (limited), China, Japan, Hong Kong China and Korea. Hong Kong China has six reporting aircrafts with approximately 900 observations per day. The E-AMDAR Programme, as part of its contribution to the WWW programme, is providing AMDAR data from European airlines to Members in the RA II, users including the Middle East, China and eventually India.

A regional AMDAR panel should be established in RA II to develop a regional programme and its implementation plan. This may be considered by the WG.

### 4.5 Review of the Manual on GOS (Regional Aspects for Region II)

The new version of the manual on the Global Observing System, Volume I - Global Aspects was issued as a regular Supplement in 2003. CBS Rapporteur on Regulatory Material has invited Regional Rapporteurs to start action in reviewing and updating the Volume II and send their suggestions and comments. Regional Rapporteur has sent his proposal for revision of the manual to the Rapporteur in 2003 concerning the criteria for selection of RBSN network, include concept of RBCN and GCOS surface and upper-air observing stations, reflect regional arrangement on AMDAR project. Details of his proposals for revision of the volume II of the manual are given in his report to this session.

### 4.6 Effective Focal Points

The current mechanism of focal points is not effective enough for getting full and timely information. Members may be requested to update their list of focal points on RBSN annually or whenever the position of the focal point is changed with the terms of reference and responsibilities well defined for him. Contact information like telephone, E-mail address should be provided.

The focal points on RBSN should be assigned the responsibility to report to the rapporteur on regional aspects of GOS in RA II about the status of their observing system annually, especially any improvements in their observing system like AWS, Radar, wind profiler, so that the rapporteur can make analysis and suggestion to the improvement of observing system for the whole region. When the information of stations in their RBSN is changed, the concerned member's focal point on RBSN should inform the rapporteur on regional aspects of GOS in RA II timely. Coordination meetings may also be held if any important issues like implementing plan for the GOS of the Region is to be discussed.

## 5. GLOBAL DATA PROCESSING AND FORECASTING SYSTEMS IN RA II

### 5.1 Status of GDPFS

5.1.1. There was continued enhancement of facilities and improvement in forecasting capabilities at the GDPFS centres in the Region during the intersessional period. Eighteen of the thirty-five Members of Region II are now running NWP systems ranging from global models along with EPS for extended and long range forecasting to regional models for operation. Five centres run non-hydrostatic models. Improvement of data assimilation is still performed. Two centres are using operationally 4-D VAR data assimilation system, three centres use 3 D-VAR, but work for the development of 4 D-VAR system. There is still a wide technological gap in Region II among Members in terms of capacity to access, process and use the models output for application to weather forecasting and to implement and operate an NWP forecasting system, although substantial progress has been observed during the years. The transfer of technology from advanced centres to developing centres is still a priority issue in the Region. To that end, several training courses were organized by China, Republic of Korea and also by WMO.

5.1.2. The three RSMCs designated for the provision of transport model products in case of nuclear emergencies (Beijing, Obninsk and Tokyo) have implemented the regional and global arrangements for the provision, upon request, of specialized transport / dispersion / deposition information. Tokyo is also a Volcanic Ash Advisory Centre and provides ash clouds trajectories and dispersion forecast for aviation. WMO Fifteenth Congress supported extending the programme to include response to non-nuclear incidents or hazards, such as chemical incidents, smoke from large fires, gas and ash emissions from volcanic eruptions, or other airborne hazards.

5.1.3 The two RSMCs designated for tropical cyclone forecasting: New-Delhi and Tokyo run Typhoon Track Models. Ensemble global models show that they can be used by providing useful tropical cyclone forecast tracks and strike probabilities.

### 5.2. Issues for consideration

5.2. 1. The horizontal resolution of models has been enhanced constantly over the last few years. Since some products of global models with 25 km resolution are now available, Limited Area Model (LAM) should have at least a higher resolution to be potentially useful. The last WMO Congress recommended that Centres running global NWP models facilitate the acquisition of boundary conditions required by NMCs to enable them to run Limited Area Models matching their operational requirements. Congress also emphasized the need for NWP Centres (e.g., RSMCs) to disseminate their products to NMHSs of countries covered by their models' domains and to work in consultation with NMHSs to further develop and propagate the benefits of NWP systems into neighboring regions. Congress also endorsed the organizing concept of a "consortium" of participating Centres; Members should systematically consider using this approach to share expertise, knowledge and resources, building upon a common regional NWP model to accelerate progress in improvements of the model and the use of products, in a sustainable way.

5.2. 2. The development and improvement of ensemble forecasting has continued. It is also the main method to perform long-range forecasting. Given the large amount of NWP and EPS output products, Members need more capability than ever before to deal with post-processing. Most Members rely on direct output from leading NWP and EPS centres. It is recalled that the last WMO Congress encouraged EPS-producing centres to provide to Members access to as many as

possible of their EPS products relevant to severe weather forecasting such as probabilistic charts of meteorological parameters, “EPS-grams” (time series) of EPS outputs, or indices such as the “Extreme Forecast Index (EFI)” developed at ECMWF. Congress had expressed appreciation for the provision of location-specific products such as the EPSgrams by ECMWF to WMO Members. Congress encouraged Members to use these products and requested them to provide feedback to the producing centres.

5.2. 3. Since the ensemble prediction outputs and long-range products are available on the WEB, the instruction for the interpretation of the product and associated standard verification scores are recommended to be provided along with the products. EPS outputs are mostly used at the producing centre, and still only few products are available to other Members in the region. The EPS products from other regions (for instance, ECMWF; NCEP, NOGAPS) can also be used in the region mostly through Internet. The needs and requirements for the education and training are high for the promotion and application of EPS. Particularly, the users of ensemble prediction system have to be well aware of the value of probability forecasts for the risk management. The education need to be focused in part on the interpretation of probabilistic forecasts for the high impact weather.

5.2. 4. The last WMO Congress noted with satisfaction the significant development and progress of the Severe Weather Forecasting Demonstration Project (SWFDP) implemented in the south-eastern region of Africa in 2006, focusing on heavy precipitation and strong winds, and involving 3 global products centres (ECMWF, Met Office UK, NCEP (USA)), 2 RSMCs and 5 NMCs. The role of the RSMCs is revitalised in such project. In RA II, RSMCs should perform these tasks as these are part of the functions normally expected from them as defined in the GDPFS Manual. It was emphasized that while warnings are improved from more effective use of all supporting data and data-processing and forecasting systems, the international exchange of warning information, especially among neighbouring countries increases the benefits to the safety and security of populations. Congress, noting the importance of accurate and timely severe weather warnings for Members, recommended that the concept of SWFDP be expanded and implemented throughout other Regions of WMO especially in developing countries.

5.2. 5. CBS-Ext.(06) (Seoul, November 2006)) recognized nine official GPCs including Beijing, Tokyo and Seoul. Moscow has also expressed officially its intention to request recognition as GPC. GPCs have to meet a set of requirements, including an agreed minimum list of global LRF products. Congress requested these products be made available to as many RCCs and NMCs as possible for the purpose of enabling them to perform their tasks. Congress requested collaboration between CBS and CCl to develop the minimum set of functions and services required of RCCs, in order to support their official designation and inclusion in the GDPFS Manual (Global Aspects, Volume I). As well, ongoing coordination is required to ensure that operational products from the GPCs meet the requirements for seasonal forecasting services provided by RCCs and NMHSs. The Working Group is invited to consider the recognition of RCCs in RA II and make appropriate recommendations for that purpose.

5.2. 6.Given the anticipated improvements in skill of LRF by using a multi-model ensembles (MME) approach, the last Congress agreed that some GPCs of LRF could serve as collectors of global LRF data to build MMEs, and requested standards for MME products be developed. Congress noted that GPC Seoul and GPC Washington have agreed to explore the use of MME for LRF. A workshop on WMO/KMA GPC Workshop on Lead Center for Long-range Forecast Multi-Model Ensemble will take place, at the kind invitation and support of Republic of Korea, in Busan from 18

to 20 September 2007. This workshop will focus on refinement and clarification of the functions of Lead Centre for LRF MME with particular emphasis on: standardization of data, formats and access/distribution of LRF MME products and reporting of progress of GPCs and Lead Centre activities.

5.2. 7. Needs for training in RA II on use of NWP and EPS products and probabilistic forecasting is certainly a priority, especially with a view to help disaster reduction. Facilities and opportunities with distance-training such as the COMET (USA) programme, EUMETCal modules, and the WMO Space Programme's Virtual Laboratory High Profile Training Event concept is to be considered. The last WMO Congress encouraged the Secretariat to organize various NWP training and capacity building initiatives into a WMO coordinated strategy. Events organized or co-sponsored by the Secretariat should be coordinated, as much as possible, with initiatives coming directly from NMHSs (in particular those with RSMCs) or other agencies, that were or could be opened to participants from other NMHSs and in particular from neighboring NMCs.

## 6. REGIONAL ASPECTS OF THE GLOBAL TELECOMMUNICATION SYSTEM AND DATA MANAGEMENT

6.1. Experts from the Region attended several regional and inter-regional meetings relevant to GTS and Data management during the period.

6.2. Status of the improvement of the RMTN - Implementation of circuits
According to Resolution 5 at the thirteenth session of Regional Association II (Hong Kong, China, 7-15 December 2004), the following regional circuits were officially included in the RMTN:

- RTH Jeddah – NMC Abu-Dhabi (United Arab Emirates)
- RTH New Delhi – NMC Thimpu (Bhutan)
- RTH Bangkok – RTH New Delhi
- RTH Beijing – RTH New Delhi

and the interregional circuit RTH Bangkok – NMC Singapore.

6.3. In addition, the number of additional circuits by bilateral agreements has been increasing with expansion of the Internet use in NMHSs. As there is not a precise definition of additional circuits, the number in the status is based on independent reports from centers concerned. Out of the 88 circuits in RMTN plan, 77 are in operation, namely the latest implementation rate is 88 percent. However, NMCs Baghdad, Kabul and Thimpu are isolated from the GTS, and that 29 percent of all circuits are still required to increase their speed. NMC Phnom Penh established a GTS connection for the first time in cooperation with RTH Bangkok in January 2007.

6.4. Generally, TCP/IP migration is making satisfactory progress. About 67 percent are operating on pure TCP/IP. It is expected that the achievement rate would be over 70 percent in 2008.
6.3. Migration to cost-effective cloud based circuits has been making steady progress since 2000. Currently 19 circuits have introduced data managed network services such as IP-VPN (Virtual Private Network) with MPLS (Multi Protocol Label Switching) and Frame Relay with the progress of the Improved MTN project. The migration will be accelerated as long as administrative issues are coordinated well. There are 14 Internet based RMTN circuits. 2 of them are operating through the VPN of IPsec. Introducing VPN techniques to their Internet circuits is recommended for security reason. In addition, Internet connection is often used for GTS backup.

6.5 Satellite broadcasting systems. Satellite broadcasting systems are used for complements to the GTS, backup sources and cost-effective alternatives to HF radio broadcasts.

- A VSAT-based broadcasting network by China Meteorological Administration has been fully operating since January 1998. It covers China and some neighbouring countries and is integrated into the RMTN as well as METEOSAT-MDD. CMA-PCVSAT receivers are installed in Dhaka, Hanoi, Ulaan Baatar Yangon and Pyongyang and are used for obtaining GTS data, CMA's NWP products and CMA's FY satellite data as complements of the low speed GTS circuits.

- CMA is developing a new satellite-based broadcasting system, DVB-S system, for replacing the current CMA-PCVSAT system.

- Russian satellite broadcasting system (TV-Inform-Meteo) was replaced by a new DVB multicast satellite system named "Meteoinform". Multi-address Information Transmission technology is used. The broadcasting at high-speed (up to 56 Mbps) is carried out in the C-band through 4 Russian satellites (Expres AM1, Expres AM3, Expres AM11 and Yamal-200) providing the coverage of the whole territory of the Russian Federation and a number of adjacent countries. More than 100 terminals including terminals in Kazakhstan, Kyrgyz, Tajikistan have already been connected to it. The programmes over various channels are also different and depend on the users' requirements in the area of reception.

- RTH New Delhi operates INSAT-MDD which is used for complements to the GTS in NMCs Dhaka, Male and Colombo. MDD, which is analogue in nature, is being replaced with Digital MDD to improve the quality of operational data received at the outstations, and to shorten the time of transmission. In the first phase 40 Digital MDD receivers will be installed by the end of year 2007.

- RTH New Delhi switched their data serving for users including marine vessels from HF radio broadcasts to a satellite-based DAB (Digital Audio Broadcast) by World Space through Asia Star Satellite in August 2003. This is a very cost-effective solution. The approximate cost for distribution of 1 Mbytes through the satellite is US$ 12. A user receives required data using a commercial radio receiver with a small L band antenna and a PC card adapter, which is manufactured by several companies at an approximate cost of US$150.

- METEOSAT-MDD service has been discontinued as from 14 June 2006. The MDD data stream itself is now embedded in the EUMETCast dissemination, and the same user-terminal can receive EUMETSAT images as well as MDD data and products. Oman (C and Ku bands) and Uzbekistan (Ku) already implemented EUMETCast receivers.

- WAFS (ISCS, SADIS) broadcasting is regularly used for operation in most of RTHs/NMCs.

- Many RTHs already discontinued HF radio broadcasts because of its high recurrent cost, its obsoleteness and emerging of standard satellite broadcast services. RTHs Bangkok, Tehran and Tokyo are still operating HF broadcast.

RTH Jeddah discontinued HF broadcast in 2007. New installation of DVB broadcasting system is under process. The broadcasting coverage will cover national stations as well as neighbouring countries. The data will mainly be GTS and forecast charts.

6.5. The Fourteenth Congress urged Member countries to develop as soon as possible a national migration plan to Table Driven Code Forms (TDCFs), derived from the international plan, with analysis of impacts, costs, solutions, sources of funding (as necessary), national training, technical planning and schedule. To know current status of migration by Member countries in RA II, a survey was conducted in August 2006.

6.6. The CBS-Ext.06 agreed to move from the test phase to a pre-operational phase of the Integrated WWW Monitoring (IWM) as from October 2007. To implement the IWM, collaboration between RTHs and its associated NMCs are indispensable. Therefore it is desirable to invite the Secretariat to publish a list of contact persons on IWM so that each RTH can make necessary arrangements with associated NMCs to start IWM as soon as possible.

6.7. To promote regional contribution to the development of the WMO Information System (WIS), the VPN Pilot Project in Regions II and V has been making steady progress. The initial outcome was submitted to the third meeting of the Inter-Commission Coordination Group on WIS (Beijing, 5-8 September 2006) and also the CBS Technical Conference on the WIS (Seoul, 6-8 November 2006) preceding CBS-ext.2006.The Fourth Technical Conference on Management of Meteorological and Hydrological Services in Regional Association II (Islamabad, 5-9 February 2007) recommended the followings:

(1) The Permanent Representatives should pay more attention to this key project of WMO, and promote WIS at high-level meetings such as the upcoming WMO Congress;

(2) For the purpose of responding to requests of users, NMHSs in RA II have to further advance the domestic meteorological services in close cooperation with each other;

(3) NMHSs in RA II should participate in the VPN pilot project for RAs II and V and WMO should provide assistance for their participation.

6.8 Draft Format of “Status and Plans of RMTN in RA II”. A Format has been designed to depict Status and Plans of RMTN in RA II which contains information on Circuit ID, Type of GTS, Constitution, Access Port Speed [bps], Expected Trans Speed[bps], Types of Trans Data, Procedures, Number of Trans Connections, Allocation Scheme of Link Addresses, Routing Protocol, Backup Solutions, Remarks and Plans.

## 7. Acknowledgements

I would like to acknowledge the support I have received from the Rapporteurs and members of the working group in providing material for preparation of this report. They have made positive contribution to improve the performance of the WWW in RA II.

**Appendix A**

**Working Group on Planning and Implementation of World Weather Watch in RA II (WG-PIW)**

***Terms of reference:***

(a) To monitor the progress made in the implementation and operation of the WWW in the Region and advise on possible improvements and priorities for appropriate action to be carried out under the WWW and on the need for external support, where required;
(b) To keep under review the action taken under the Sixth WMO Long-term Plan with a view to updating and further developing the WWW relating to RA II;
(c) To develop proposals for the further development and full integration of the 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 keep abreast of new developments in the field of meteorological data processing, observing techniques, telecommunications and codes and to make recommendations for their application as appropriate in the Region;
(e) To identify and keep under review regional requirements for the exchange of observational data and processed products and to propose measures and procedures as appropriate to meet those needs for information from within and outside the Region;
(f) To promote implementation of the Public Weather Services Programme in the Region;
(g) To advise the president of the Association on all matters concerning the WWW

***Composition:***

(a) Chairman (A.K. Bhatnagar, India)
(b) Coordinator of the Subgroup on the GTS and DM (Mr. Hiroyuki Ichijo , Japan)
(c) Rapporteur on the GOS (Mr. CHEN Yongqing , China)
(d) Rapporteur on the GDP and Forecasting System (Dr. Heedong YOO , Republic of Korea)
(e) Co-Rapporteurs on the PWS (Mrs. Hilda Lam (Hong Kong, China and
Dr. Aleksei Lyakhov, Russian Federation)
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Ms. E. Farman (Iran, Islamic Republic of)
Ms .Farida R. Muratova (Kazakhstan)
Mr. Bukin Yuri (Russian Federation)
Ms. Duong Lien Chau (Viet Nam)
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Mr. Jun Shimazaki (Japan)
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Mr. Yuri Bukin (Russian Federation)