FIFTH TECHNICAL CONFERENCE ON MANAGEMENT OF METEOROLOGICAL AND HYDROLOGICAL SERVICES IN REGIONAL ASSOCIATION II (ASIA)

OPPORTUNITIES AND CHALLENGES FOR DELIVERY OF WEATHER, CLIMATE AND WATER SERVICES

(DAEGU, REPUBLIC OF KOREA, 29 NOVEMBER TO 3 DECEMBER 2010)

Final Report

WORLD METEOROLOGICAL ORGANIZATION

Participants in the Fifth RA II Technical Conference (Daegu, 29 November 2010)

1. OPENING OF THE CONFERENCE

1.1 At the kind invitation of the Government of the Republic of Korea, the Fifth Technical Conference on Management of National Meteorological and Hydrological Services (NMHSs) in Regional Association II (Asia) was held in Daegu, Republic of Korea, from 29 November to 3 December 2010, with the theme of "Opportunities and Challenges for Delivery of Weather, Climate and Water Services".

1.2 The Conference was attended by 39 Directors or senior officials of National Meteorological and Hydrological Services (NMHSs) representing 20 Members in the Region, two invited lecturers and nine invited experts. The list of participants is given in Annex I.

1.3 Dr Byung-Seong Chun, Administrator of the Korea Meteorological Administration (KMA) and Permanent Representative of the Republic of Korea with WMO, welcomed the participants and extended the warmest greetings and welcome of the Government of the Republic of Korea. Recalling the increased frequency of occurrence of weather-related disasters associated with a changing climate, Dr Chun emphasized the need for a more active role of NMHSs to assess the impacts of climate change and variability, and take necessary measures. He pointed out that Region II (Asia) faces a number of challenges in fulfilling the NMHSs' mission of mitigating damage from severe weather and improving human welfare through timely forecasts and warning. Dr Chun underlined the growing gap between the developing and developed countries, and the deterioration of upper-air observation networks in remote areas but noted that the enhanced satellite observing networks and improved NWP capabilities in developing countries, among others, would provide unprecedented opportunities for delivering weather, climate and water services in the Region. In assuring KMA's commitment to continuing its contribution to WMO Programmes and cooperation with WMO Members, Dr Chun wished that the Conference would draw a number of recommendations for enhancing the management of NMHSs in RA II. He hoped that the participants would take this opportunity to enjoy Korean culture.

1.4 The opening address of Professor Victor Chub, president of Regional Association II (Asia) was delivered by Dr Sergey Myagkov, Deputy Director of the Hydrometeorological Service of Uzbekistan. In his address, Prof. Chub expressed his gratitude to the Government of the Republic of Korea for extending this invitation to Members in Asia and thanked KMA for their efforts to organize this Conference. He noted the observed increase in the number of hazards caused by water and other meteorological variables and the associated threats it poses to social, economic and environmental spheres of society. Prof. Chub called for improved cooperation among NMHSs to reduce transboundary weather-related disasters and threats. He concluded by wishing that the Conference would produce excellent outcomes for the development of NMHSs in the Region and would be emulated by other WMO Regions.

1.5 Speaking on behalf of Mr Michel Jarraud, Secretary-General of WMO, Dr Tokiyoshi Toya, Regional Director for Asia and the South-West Pacific, welcomed all the participants and expressed his appreciation to the Government of the Republic of Korea for hosting the Fifth Technical Conference. He extended his gratitude to Dr Chun, Permanent Representative of the Republic of Korea with WMO, and his staff for the warm welcome and hospitality and for the excellent arrangements made to ensure the success of the Conference. In referring to the progress in the development of the draft RA II Strategic Operating Plan (2012-2015), Dr Toya noted that this Technical Conference would provide an excellent opportunity for deliberations on the challenges and opportunities for RA II in improving the quality and delivery of weather, climate and water services. He stressed the need for strengthening the capacity of NMHSs to engage in dialogue and exchange of information with collaborating partners and users of the services. In ensuring WMO's continued support to Members' efforts to contribute to national and regional sustainable development, Dr Toya wished the participants a very successful Conference and a pleasant stay in Daegu.

2. SUMMARY OF DISCUSSIONS

2.1 The lectures and case studies were presented by Directors or senior officials of NMHSs, invited lecturers and experts, and staff of the WMO Secretariat. The presentations covered the following topics of the Conference:

- Topic I: Strategic planning and management of NMHSs (including: social and economic benefits of weather, climate and water services; strategic partnership; and regional cooperation) [corresponds to new WMO Strategic Plan (SP) Expected Results 7 & 8]
- Topic II: Capacity development in NMHSs (including human resources development) [corresponds to new WMO SP Expected Result 6];
- Topic III: Improving climate services (including GFCS activities; and adaptation to climate variability and change) [corresponds to new WMO SP Expected Result 3];
- Topic IV: Improving service quality and service delivery, with new technologies in meteorology and hydrology (including Quality Management; sand and dust storms; and SWFDP) [corresponds to new WMO SP Expected Result 1];
- Topic V: Role of NMHSs in disaster risk reduction including emergency response [corresponds to new WMO SP Expected Result 2]; and
- Topic VI: Implementation of WIS/WIGOS [corresponds to the new WMO SP Expected Result 4].

The programme of the Conference is given in Annex II.

2.2 Following extensive discussions and deliberations, the Conference came to the conclusions and recommendations as given below.

3. STRATEGIC PLANNING AND MANAGEMENT OF NMHSs (INCLUDING: SOCIAL AND ECONOMIC BENEFITS OF WEATHER, CLIMATE AND WATER SERVICES; STRATEGIC PARTNERSHIP; AND REGIONAL COOPERATION) [CORRESPONDS TO NEW WMO SP EXPECTED RESULTS 7 & 8] (Topic I)

3.1 Professor J. Snow (USA) delivered a keynote lecture entitled “When Weather Matters: Science and Services to meet Critical Social Needs”. He noted that, in the USA, the past 15 years have seen marked progress in observing, understanding, and predicting weather, especially on the mesoscale. At the same time, there is a sense that the national weather enterprise has not fully realized the full potential of operational numerical weather prediction; as a result, the nation is neither mitigating weather impacts to the extent possible nor gaining economic advantages in the global market place. Prof. Snow presented the consensus view of a broad group of research and operational meteorologists on the most pressing weather-focused research challenges and research-to-operations/operations-to-research needs, and made corresponding recommendations. He addressed the continuing need for R&D and the transition to operations of 3D mesoscale observations, global non-hydrostatic coupled modelling, data assimilation, probabilistic forecasting, and quantitative precipitation and hydrologic forecasting. He also presented three emerging issues - predictions of very high impact weather, urban meteorology, and renewable energy development - that need urgent attention. He emphasized that, perhaps most importantly, cutting across the continuing and new R&D challenges is a set of socioeconomic issues, such as determination of the true economic value of weather forecasts, whose importance has heretofore been undervalued but which have now become critical to the advancement of meteorological research and operations.

3.2 Dr T. Toya (WMO) presented the Top-level Objectives (TLOs), Strategic Thrusts (STs) and Expected Results (ERs) of the WMO Strategic Plan (2008-2011) and the on-going approach to develop the next Strategic Plan 2012-2015, which will focus on five STs and eight ERs that address three Global Societal Needs. Dr Toya, in reviewing the regional strategic and operational planning processes in RA II with reference to those in RA I and RA V, introduced to the Technical Conference a draft RA II Action Plan (Strategic Operating Plan for 2012-2015) and a new RA II Survey Questionnaire developed by the RA II Task Team on Strategic Planning, for discussion on the way forward.

3.3 The Technical Conference recalled that the Strategic Plan for the Enhancement of NMHSs in Regional Association II (Asia) (2009-2011), adopted at its fourteenth session in Tashkent, Uzbekistan, in December 2008 (XIV-RA II), was developed on the basis of its related survey results on capacity needs of NMHSs for the period of 2005-2008. The survey also provided analyses of the likely trends, developments, evolving needs and deficiencies in Region II. It also assisted with the identification of 201 deliverables under 41 Regional Expected Results. The Conference further recalled that XIV-RA II authorized its president, in consultation with the RA II Management Group and working groups, to develop a related Action Plan in consultation with Members.

3.4 The Conference expressed appreciation for the extensive work carried out by the RA II Task Team on Strategic Planning for the development of a draft Action Plan and relevant survey questionnaire to monitor the implementation of the draft strategic Action Plan. The Task Team identified 100 priority deliverables, which were mapped into the eight Expected Results of the draft WMO Strategic Plan 2012-2015, for the RA II Action Plan. The Conference recognized that the draft Key Performance Indicators/Targets (KPIs/KPTs) were updated, and additional Activities for deliverables were proposed, such as training courses, workshops, mission visits and exchange of know-how among Members. It agreed that, with reference to the WMO framework for results-based strategic planning for 2012-2015, Regional Key Outcomes (RKOs) should be formulated based on the RA II Expected Results to complete the Action Plan; and considered that the Action Plan should be called “Strategic Operating Plan (SOP)” for the period 2012-2015, in alignment with the period of the next WMO Strategic Plan (2012-2015).

3.5 The Conference also noted the development of a new RA II Survey Questionnaire (2010-2011). All the deliverables in the draft Action Plan were incorporated into the Questionnaire as capability indicators. Two new sections on “Hydrological forecasts and assessments” and “Partnership” were added to the Questionnaire. A column on the survey result for 2008 was added for ease of reference. The Conference agreed on the timeframe for the implementation of the survey on the basic capability of NMHSs in RA II, proposed to be carried out in January-February 2011 using the proposed Questionnaire. RA II Members were encouraged to send the completed questionnaire to the Secretariat by the end of February 2011.

3.6 In this connection, case studies were presented by representatives of Japan, Lao People’s Democratic Republic (PDR), Tajikistan and Viet Nam on the strategic planning and management of NMHSs.

3.7 Dr M. Hatori (Japan) explored the strategic management of NMHSs to achieve the mission of NMHSs, in particular to respond the increasing requirements from users. He emphasized that the building blocks of NMHSs is intrinsically based on the international activities, and showed some JMA projects mainly targeting capacity building in RA II. Then he discussed the positive feedback cycle with user community to provide useful and effective services, with illustrating JMA’s efforts, such as assessments of user satisfactions, and concluded that it is important for NMHSs to enhance the collaboration with disaster-related authorities and user communities including the public to strategically promote the total management of disaster prevention and mitigation.

3.8 Mr Singthong Pathoummady (Lao PDR) delivered a presentation on the strategic planning and role of Lao NMHS in disaster risk management. After a description of the structure, organization and the status of operational facilities in the Department of Meteorology and Hydrology (DMH) in Lao PDR, he informed that DMH has set up its five-year Strategic Plan to be harmonized with 2011-2015 Strategic Plan of the Water Resources and Environment Administration (WREA) and also in line with WMO's RA II Strategic Plan. DMH has been mandated to act as key implementing agency for the WREA's Programme called "Meteorology, Hydrology and Climate Risk Management" including Early Warning Systems. This is one component of the Cluster on National Integrated Water Resources Management. He acknowledged that a lot of big challenges would be encountered in fulfilling the mandates, especially in improving quality and delivery of accurate meteorological and hydrological services, as well as efficient climate services.

3.9 Mr Nguyen Van Tue (Viet Nam) described the development strategy for the National Hydro-Meteorological Service of Viet Nam. The strategy focuses on modernization, technology and human resources as the key for development of NMHS in Viet Nam. The Programme "Modernization of forecasting technology and hydro-meteorological observation system for the period 2010-2015" aims at strengthening the observation network; providing equipment and upgrading computing facilities for the Central Hydro-Meteorological Forecasting Center; upgrading telecommunication system from central down to local level; improving forecasting technology; and transferring forecast specialized software to regional and provincial centers.

3.10 Mr A. Homidov (Tajikstan) introduced the state and development of NMHS in Tajikstan (Tajikhydroment). The Strategy of NHMS focuses on: modernization of the National Hydrometeorological Service; development of the system and the introduction of new methods of short-term and seasonal weather forecasts and river flow; enhancing the information technology platform and services; institutional strengthening; improvement of personnel and financial sustainability of NMHS, improving the quality of meteorological services; and improvement of monitoring, evaluation and climate change. He further described the basic approaches in selecting investment areas as the following: institutional strengthening of Tajikhydromet, improving its organizational, personnel and financial stability; creating the conditions for consumers with reliable predictions, especially for the prediction of severe weather events and to assess water resources; and ensuring compliance with international obligations of the Government.

3.11 The Conference acknowledged that strategic management of NMHSs is needed especially for disaster prevention/mitigation and disaster risk management. NMHSs are expected to issue more accurate prediction, user-oriented products, enlightenment of users and more collaboration with other organizations. It emphasized the importance for NMHSs to make every effort to realize a desirable positive feedback cycle composed of: (1) enhancement of user-oriented services with proper understanding of users' requirements; (2) increasing support for the services from the public and governments; and (3) capacity strengthening of NMHSs with the increased resources. For promotion of international cooperation, the Conference agreed on the need to take good opportunities for NMHS enhancement with the interest by governments and other partners in climate issues, disaster management, etc.; and to exchange practices in user-oriented services.

3.12 The Conference recognized that, although various opportunities are provided, some NMHSs in RA II still face a lot of challenges in fulfilling the mandates, especially in improving the quality and delivery of mandated services.

3.13 The Conference noted with satisfaction that several Members have set up the Strategic Development Plans for the enhancement of NMHSs, which includes: enhancing information technology platforms and services; improving the quality of services; promotion of scientific research and technological development; capacity building and human resources development; and international cooperation.

3.14 Taking the above into consideration, the Technical Conference made a series of recommendations on ways to improve the regional strategic planning process and, through it, the capacity of Members, to better respond to their own needs and expectations and those of other stakeholders. Among others, it underlined the need to:

(a) formulate the regional expected results into the regional key outcomes (RKOs);

(b) highlight the RA II-specific features (e.g., natural disasters) in the text part of the Strategic Operating Plan (SOP) 2012-2015;

(c) request the Chairs of RA II Working Groups to review and make comments on the draft SOP 2012-2015 to enable its finalization by the Task Team and the Secretariat;

(d) implement the RA II survey on the basic capability of NMHSs in RA II in January-February 2011 using the proposed Questionnaire;

(e) request the WMO Secretariat to continue to provide guidance and assistance to Members on development of their NMHSs' Strategic Plans; and

(f) urge Members to mobilize resources from their governments and development partners, including developed Members to implement the RA II Strategic Operating Plan (2012-2015);

(g) list and enumerate public activities which are susceptible to weather; assess and measure the impact and effect of weather and climate on different types of public activities; and develop a methodology to classify such effects in qualitative and quantitative terms.

4. CAPACITY DEVELOPMENT IN NMHSs (INCLUDING HUMAN RESOURCES DEVELOPMENT) [CORRESPONDS TO NEW WMO SP EXPECTED RESULT 6] (Topic II)

4.1 Dr Y. Adebayo (WMO) made a presentation on "Development of human resources for contemporary meteorological and hydrological services." He noted that NMHSs as a fundamental part of national infrastructure face a huge challenge nowadays in ensuring that they are well equipped with adequate human resources that would enable them to put their services on a sound footing for delivery of quality service for the benefit of society. Furthermore, it was emphasized that there is a need for NMHSs to ensure that they attract, train and motivate their staff to ensure that they have an adequate team of staff that would enable them to deal with wide ranging societal challenges beyond weather forecast. In this respect, he emphasized that the process of modernization of a typical NMHS should also take into consideration the human resources needed for delivery of quality service.

4.2 The second part of his presentation concentrated on the activities of the WMO Education and Training Programme (ETRP), in supporting NMHSs in the area of capacity building, through short- and long-term training activities. He underscored the fact that WMO ensures that adequate levels of competencies are met at national and internal levels through its various coordinating and training activities. He drew the attention of the Conference to the need to ensure that they work towards an acceptable level of manpower in compliance with requirements for aeronautical meteorological forecasters and by 2016 all aeronautical meteorological forecasters must also be WMO meteorologists. The Conference was informed about the review process of the WMO publication number 258 entitled "Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology", and advised about the need for Members to cooperate with WMO in the finalization of this important exercise.

4.3 Mr H. Koide (Japan) introduced the current status and action plans of RA II Pilot Projects contributed by JMA experts as self-efforts for the enhancement of capacity development within the Region. For the Pilot Project to Enhance the Availability and Quality Management Support for NMHSs in Surface, Climate and Upper-air Observations, the questionnaire survey was conducted in the Region and reported in the Workshop on Quality Management of Observations in RA II held in July 2010 in Tokyo, Japan (http://www.jma.go.jp/jma/en/Activities/qmws_2010/qmws_2010.html). The importance of full utilization of Regional Instruments Centres (RICs) and enhancement of data quality and availability in the Region were discussed at the workshop. Another Pilot Project to Develop Support for NMHSs in Satellite Data, Products and Training developed its web page (http://www.wmo.int/pages/prog/sat/RAII-PilotProject.html) and issued the newsletters periodically to share the information of satellite operators and user requirements. The next phase of this Project will be discussed during the Coordinating Group meeting to be held in Tokyo, Japan in February 2011. In this regard, the Conference encouraged Members to actively participate in and use the outcomes of the RA II Pilot Projects.

4.4 Dr W.-T. Yun (Republic of Korea) introduced the education and training activities of KMA. The goal of the human resources development in KMA is to realize advanced meteorological services. This would be achieved by enhancing capabilities of KMA personnel, and by popularizing weather-related knowledge to the public. The ETRP of KMA is designed to develop their career in conjunction with career development programmes. KMA has established a meteorological college in KMA, which offers courses for KMA staff and the public, and awards bachelor's degrees in science upon completion of the programme. KMA fully realizes the importance of capacity building and is planning to expand its on-line and off-line education and training programmes. KMA has been conducting international programmes for developing countries for several years, and hopes to make a substantial contribution to the WMO capacity building activities. KMA suggests close collaboration in the area of ETRP between NMHSs and WMO.

4.5 Mr Z. Itibaev (Kyrgyzstan) overviewed hydrometeorological services in Kyrgyzstan including the administrative structure, observation network, public weather services and some hydrometeorological projects. An example of such projects is “Improving Water Resources Management” funded by the World Bank. The main objective of this project is to strengthen the capacity of Kyrgyzhydromet through upgrades and replacement of appliances and equipment of hydrometeorological stations and posts of the Agency on Hydrometeorology under Ministry of Emergency Situations of Kyrgyzstan.

4.6 Dr Sung Kim (Republic of Korea), Co-Chair of the RA II Working Group on Hydrological Forecasts and Assessment (WGH), introduced the Work Plans and Recommendations of WGH, which held its meeting in Seoul from 22 to 26 November 2010 prior to the Technical Conference, as follows:

(a) The Working Group reviewed and revised the work plans in view of the short time available to produce tangible results until March 2012 when the final reports need to be available for documentation for the upcoming fifteenth session of the Regional Association for the five themes: (1) Improving Institutional Capacity including the Implementation of the RA II Strategic Plan for NHSs; (2) Disaster Mitigation - Implementation of the WMO Flood Forecasting Initiative including Flash Flood Forecasting Capabilities Strategic Plan for NHSs; (3) Water Resources Assessment, Availability and Use (Surface water and groundwater); (4) Hydrological responses to climate variability and change and promotion of the use of climate information by water managers; and (5) Regional exchange of hydrological data and information including WHYCOS and contributions of regional aspects of INFOHYDRO.

(b) The Group also adopted joint activities that would benefit the Members of RA II and the ESCAP/WMO Typhoon Committee for the following areas: (1) Urban Flood Risk Management; (2) Flash Flood/Debris Flow/Landslide Occurrence and Warning; (3)

Assessment of the Variability of Water Resources in a Changing Climate; and (4) Drought Monitoring and Forecasting based on Space-based Information. Participants agreed that the final draft report would be circulated to participants and the final endorsement of the report should be sought from the Co-chair of the Working Group before dissemination of the report.

(c) The Group felt that, as a matter of urgency, the new Hydrological Advisor to the president of RA II should be nominated to fill the vacant position. The Group also urged the president of RA II to nominate the current Co-chair of the WGH to serve as Chair of the Working Group for the remainder of the current inter-sessional period.

4.7 Mr Arif Mahmood Rana (Pakistan) introduced the flood forecasting and warning system of the Pakistan Meteorological Department (PMD). The Flood Forecasting Division (FFD) in Lahore is a specialized unit of PMD which is responsible for flood forecasting of the country. This Division uses hydrometeorological data, prognostic weather charts, statistical models, hydrometeorological models, different NWP products, satellite imagery, radar data, etc. for issuing flood forecast, advisory and warning to all concerned government agencies, public and media. PMD is capable of forecasting riverine floods but still needs to upgrade and modernize its FFD. PMD needs more stream-gauge stations, more telemetric rain gauge stations in the catchment areas of all five major rivers, and more radar coverage. There is an urgent need for a flash flood guidance system and calibration and upgrade of already available hydrometeorological models.

4.8 Dr W.-T. Kwon (Republic of Korea) introduced the regional characteristics of climate change over the Republic of Korea; global/regional climate projection (WCRP); and regional capacity building. Regional changes in extreme events, such as heavy rainfall, prolonged drought, heat wave, and typhoon, will significantly change the socio-economic system and also natural ecosystems. These impacts have more severely hit the least developed regions and also more vulnerable groups even in the developed regions. Asia is the largest and most populated region in the world with large climate variability. To enhance the adaptation capacity, it is necessary to strengthen a competent community of physical scientists to use and build a new generation of regional information products and to better communicate between the physical sciences and the V&A (vulnerability and adaptation) community. She proposed to build a regional collaboration network to further understand regional climate system, to produce and share future projection data, and to organize a regional workshop including climate scientists and impact community in RA II.

4.9 The Conference agreed that there is a need to strengthen human resources in NMHSs in many RA II Members, both at the level of sustaining a critical mass of staff to run effective Service, and within the framework of ensuring that high level of competences prevail. In this respect, NMHSs should embark on continuous renewal of their manpower needs in order to enable them to sustain an acceptable level of needed human resources. Both short- and long-term training activities should be given appropriate priorities so as to ensure sustainable renewal of the number and quality of staff needed to run a modern service. Given the fact that many NMHSs lack adequate resources to meet their human resources development plan, the Conference strongly requested WMO to increase its level of support to needy Members in the area of fellowships.

4.10 Internally NMHSs need to negotiate with the appropriate authorities with the aim of securing, on a predictable basis, resources to meet up to their needs. It is also necessary for NMHSs to cooperate among themselves in the Region on training and staff exchange. The Services that are relatively more endowed with resources are encouraged to give support to those who need to develop their human resources. The Conference appreciated the support which some NMHSs are currently providing to those needy ones by way of training and material assistance for upgrading of infrastructure, and urged the concerned Services to continue to give as much support as they can, as a way of promoting delivery of quality services in the Region and beyond.

4.11 The Conference appreciated the activities of WMO in the area of education and training, and recommended that Members should continue to support WMO in its endeavour, as a way of promoting international cooperation and quality assurance on education and training. In this respect, the Conference recognized the need for Members to work towards ensuring that by November 2013 they have acceptable level of manpower in compliance with requirements for aeronautical meteorological forecasters and by 2016 all Aeronautical Meteorological Forecasters must also be WMO Meteorologists. The Conference urged all Members to cooperate with WMO in the review process of the WMO publication number 258 "Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology".

4.12 The Conference, noting that it is very important for NMHSs to strengthen their human resources capacity in all areas related to weather, climate and water, agreed on the need:

(a) for WMO to ensure that adequate levels of competencies are met at national and international levels through its various coordinating and training activities;

(b) for Members to actively participate in and use the outcomes of the RA II Pilot Projects;

(c) to develop and enhance close collaboration in the area of ETRP between NMHSs and WMO;

(d) for WMO to provide assistance to PMD for the US Flash Flood Guidance system with training following the 2010 Pakistan floods;

(e) to build a regional collaboration network to further understand regional climate system, to produce and share future projection data, and to organize a regional workshop including climate scientists and impact community in RA II.

5. IMPROVING CLIMATE SERVICES (INCLUDING GFCS ACTIVITIES, AND ADAPTATION TO CLIMATE VARIABILITY AND CHANGE) [CORRESPONDS TO NEW WMO SP EXPECTED RESULT 3] (Topic III)

5.1 Dr R.K. Kolli (WMO) delivered a presentation on the Global Framework for Climate Services (GFCS). He outlined the pre-requisites for climate services; the flow of the climate information system; the WMO's strategy for supporting societal response to climate variability and change; and the current climate-related operational activities including Regional Climate Centres (RCCs) and Regional Climate Outlook Forums (RCOFs). Dr Kolli informed the Conference of the outcomes of the World Climate Conference-3 (WCC-3) held in Geneva in August/September 2009 and introduced a global framework for climate services with the timeline towards the deliberation at the WMO Sixteenth Congress in May/June 2011. He concluded that: (a) there is limited use of climate information and it is important to find ways for all countries to cope with climate variability and change through improved access to climate information and prediction/projection products and the use of risk management techniques; (b) climate adaptation and climate-related risk management require multi-disciplinary/ international collaborations and cross-disciplinary/international exchange of information; and (c) WMO is looking forward to the GFCS as a major step forward in systematically providing climate information for decision making at various levels of climate-sensitive sectors.

5.2 Dr K. Takano (Japan), Coordinator of RA II Sub-Group on Climate Applications and Services (WGCAA-CAS), provided the current status of climate information system in RA II in relation to the GFCS. It was emphasized that NMHSs should play an important role in the GFCS, especially in the Climate Services Information System (CSIS), one of components of

the GFCS. Dr Takano also highlighted the importance of regional cooperation for effective climate services of NMHSs. Various ongoing efforts in RA II were reported to the Conference, such as the establishment of new RCCs in addition to the existing RCCs, i.e., the Beijing Climate Centre (BCC) and the Tokyo Climate Centre (TCC), and activities of Regional/Sub-regional Climate Outlook Forums (RCOFs). In conclusion, he stressed that these activities should be further strengthened.

5.3 Dr Zhang Zuqiang (China) reported on the status of climate application and services in China, including the monitoring on the basic climate condition and the climate hazard, the application of climate information to some key eco-societal sectors, e.g., agriculture, water resources, transportation and human health. The efforts of Beijing Climate Centre (BCC), a designated Regional Climate Centre for RA II by WMO, on disseminating its routine climate products to the NMHSs of RA II, hosting the FOCRA-II annually since 2005 and providing the training opportunities through the visiting scholarship programme to the relevant Members in RA II were also presented. In recent two years, BCC has made some noticeable progress on its own capacity building. An objective identification technique for regional extreme weather and climate events has been developed and applied to the drought monitoring of China. Progress on the establishment of the second generation of climate system models has been achieved in BCC and is applying in the IPCC AR5.

5.4 Dr C.-K. Park (Republic of Korea) made a presentation on advances in climate information services of KMA. He introduced the climate products and services of KMA which employs advanced information technology. He further underscored the role of KMA in promoting international cooperation in the domain of climate information and services.

5.5 Dr S.M. Mohalfi (Saudi Arabia) delivered a presentation on climate change and extreme events in the Arabian Peninsula. He described the weather patterns and systems prevailing in the Arabian Peninsula. He further described the main meteorological hazards and gave a few examples of climate change induced water- and weather-related disasters affecting this region.

5.6 Mr A.K. Srivastava (India) introduced the history, structure and climate services of the India Meteorological Department. He further described the initiatives taken by India to promote its leading role in providing weather and climate forecasts in the Region.

5.7 Dr V. Khan (Russian Federation) introduced the activities of the North Eurasia Climate Centre (NEACC), which was recently established with the aim to provide climate-related services for NMHSs of CIS countries. It was designated to have function of an RCC in RA VI as a LRF node provider. NEACC also intends to be an RCC in RA II fulfilling all necessary requirements. She emphasized that for fulfilling all mandatory functions as RCC for CIS countries, NEACC should develop additional activities to improve climate services for NMHSs.

5.8 Dr V. Kryzhov (Russian Federation) reported the current status and future plans of the Climate Information and Prediction Services (CLIPS) in RA II. He described the mathematical approach for generating long-range climate prediction. He asserted poor predictability in a combination with large uncertainty (confidence intervals) in estimated verification scores because of too short verification series.

5.9 The Conference, in reviewing the outcomes of the meeting of the RA II Sub-Group on Climate Applications and Services (WGCAA-CAS), which was held conjointly with the Technical Conference, made the following conclusions and recommendations:

(a) As the establishment of the Global Framework for Climate Services (GFCS) was decided at WCC-3 (2009),

- NMHSs should play an important role in the GFCS, especially in the Climate Services Information System (CSIS) since NMHSs are the closest to users;

(b) To support NMHSs' services,

- RCCs are encouraged to improve their products to meet NMHSs' requirements;
- RCCs are encouraged to contribute to the information exchange not only between NMHSs and RCCs but also among NMHSs through websites and training activities;
- All RCC candidates are encouraged to join the pilot phase of RA II RCC group to demonstrate their capabilities as soon as possible;
- Further establishment of sub-regional RCOFs is encouraged to target different sub-regions having similar climate information/outlook needs;

(c) For the provision of tailored climate information from NMHSs to users,

- Dialogue with users is encouraged in national and regional levels using the opportunity of RCOF and National COF. A session of user interface is recommended to be set up at RCOF;
- Dialogue with users will be focused on agriculture and hydrology as a first step. For this purpose, WGCAA-CAS proposes to establish an appropriate coordination mechanism with the Sub-Group on Agrometeorology (WGCAA-AgM) and the Working Group on Hydrological Forecasts and Assessments (WGH);
- It is encouraged to exchange good practices in the application of climate information and to strengthen user-provider interaction. RCOF and RCC-homepage may be used for this purpose;

(d) To promote cooperation with research communities,

- A joint workshop with research communities at RCOF is encouraged.

6. IMPROVING SERVICE QUALITY AND SERVICE DELIVERY, WITH NEW TECHNOLOGIES IN METEOROLOGY AND HYDROLOGY (INCLUDING QUALITY MANAGEMENT; SAND AND DUST STORMS; AND SWFDP) [CORRESPONDS TO NEW WMO SP EXPECTED RESULT 1] (Topic IV)

6.1 Ms H. Kootval (WMO) delivered a presentation on the WMO Strategy for Service Delivery. The WMO Strategy for Service Delivery will assist NMHSs in the provision of weather-, climate- and water-related services to the public and decision makers. The strategy, which reflects the high priority given by WMO to Service Delivery and is based on the WMO Strategic Plan (2012-2015), incorporates assessment of user needs and the application of performance metrics. She emphasized that while there is no prescriptive way to provide services, the strategy serves as a foundation to improve service delivery by sharing best practices and by increasing user engagement throughout the delivery process, recognizing the many differences in cultures, structures, operational practices, resources and development levels across NMHSs. This strategy is broad yet flexible and seeks to serve as: (1) a tool for evaluating current service delivery practices; and (2) high-level guidance for developing more detailed methods and tools for better integrating users into the service delivery process.

6.2 Ms Kootval underlined that, to be effective, services should possess the attributes shown below:

- Available and timely: at time and space scales that the user needs;
- Dependable and reliable: delivered on time to the required user specification;
- Usable: presented in user specific formats so that the client can fully understand;
- Useful: to respond appropriately to user needs;

- Credible: for the user to confidently apply to decision-making;
- Authentic: entitled to be accepted by stakeholders in the given decision contexts;
- Responsive and flexible: to the evolving user needs;
- Sustainable: affordable and consistent over time; and
- Expandable: to be applicable to different kinds of services.

She further emphasized that the WMO Strategy for Service Delivery defines six elements:

- Strategy Element 1 - Evaluating User Needs and Decisions;
- Strategy Element 2 - Linking Service Design and Development to User Needs;
- Strategy Element 3 - Evaluating and Monitoring Service Performance and Outcomes;
- Strategy Element 4 - Sustaining Improved Service Delivery;
- Strategy Element 5 - Developing Skills Needed to Sustain Service Delivery; and
- Strategy Element 6 - Sharing Best Practices and Knowledge.

In view of the increasing importance of delivering usable and adequate services to user communities as part of the mandates of NMHSs, the Conference urged Members in RA II to adopt this Strategy and take the steps necessary to implement it, using guidelines provided by WMO.

6.3 Mr L.S. Lee (Hong Kong, China) reviewed the recent experience of Hong Kong Observatory in service delivery. This included the use of latest technologies such as Geographic Information System, mobile communication platform, location-based service and social network to disseminate weather information and warning. As the Acting Chairperson of the Working Group on Disaster Risk Reduction and Service Delivery (WGDRS) in RA II, Mr Lee also briefed the Conference on the past and planned activities of the Working Group.

6.4 The Conference agreed that NMHSs in RA II should further utilize new and existing resources/services on the Internet such as NWP output for weekly/seasonal/typhoon forecasts for public weather services or disaster prevention and mitigation.

6.5 Ms Ye Ye Nyein (Myanmar) reviewed services, needs and development efforts of the meteorological and hydrological services in Myanmar. Improving its early warning systems, modernizing its infrastructure and building human resources capacity represent major challenges to Myanmar.

6.6 Ms H. Kootval (WMO) introduced the Severe Weather Forecasting Demonstration Project (SWFDP). The Conference noted that the vision of SWFDP is to enable NMHSs in developing countries to implement and maintain reliable and effective routine forecasting and severe weather warning programmes through enhanced use of NWP products and delivery of timely and authoritative forecasts and early warnings, thereby contributing to reducing the risk of disasters from natural hazards. The goals of SWFDP are to: improve severe weather forecasting; improve lead-time of warnings; and improve interaction of NMHSs with media and disaster management and civil protection authorities. The cascading process involved in SWFDP enables for: global products be cut to project window frame; RSMC guidance bulletin be issued in: short-range (d1-2), medium-range (d3-5) for NMCs; and NMCs use guidance, prepare and issue warnings to the public, media and disaster management.

6.7 The Conference further noted that currently SWFDP projects are being implemented in Southern Africa and South Pacific Islands, while three projects are under development in Southeast Asia (with the participation of Cambodia, Lao PDR, Thailand and Viet Nam), South Asia (for Bangladesh, India, Maldives, Myanmar, Sri Lanka and Thailand) and Eastern Africa. The success of SWFDP stems from the fact that it provides:

- Successful recipe - real benefits to developing countries;
- High impact, cost effective;
- Visible operational results in improved early warnings;
- Forecasters' increased confidence in their warnings; and

- Some NMHSs feel improving relations with civil protection authorities.

6.8 The Conference, noting the lessons learned and opportunities offered by SWFDP, urged NMHSs in RA II to actively seek and explore all opportunities to initiate similar SWFDP on sub-regional basis in order to increase their capabilities to provide credible meteorological services to user communities, hence enhancing their visibility and demonstrating their value to society.

6.9 Dr D.-E. Chang (Republic of Korea) made a presentation on the current status and plan of the KMA nowcasting and very short-range forecast service. He described the skill of the various forecasting models employed by KMA. MAPLE algorithm with KMA operational radar observation provided useful guidance up to 2-3 hours. Diabatic initialization of the Korea Local Analysis and Prediction System (KLAPS) showed promising results in the very short-range precipitation forecasts, and the information is now delivered to the public. He noted that in the future, a specialized NWP system for metropolitan area (~1 km resolution) and an application to the interactive wild fire model will be tested.

6.10 Dr Y.E.A. Raj (India) made a presentation on the existing observational network of India Meteorological Department (IMD) and on the various services in areas such as monsoon forecasting, cyclone warning, aviation, hydrology, agricultural meteorology and archival of data which are delivered by IMD to a large spectrum of users. IMD has been modernizing its observational network in recent years by installing automatic weather stations, automatic rain gauge stations, Doppler weather radars, satellite ground stations, etc. over India. The high-power computing systems which have been recently installed in the Regional and State Centres of IMD run NWP models for their respective areas and the output products have provided valuable guidance in issuing short- and medium-range forecasting. The service delivery aspect has substantially improved due to effective dissemination based on modern communication, through websites, which are continuously upgraded and by the use of various products of the Varsamana project executed in collaboration with Météo France. He also presented a case study of tropical cyclone 'Jal' which crossed the south east coast of India in November 2010, tracked accurately by IMD with the modern observing systems providing crucial data input.

6.11 Dr Sarantuya Ganjuur (Mongolia) gave a presentation on the structure and the human capacity of the National Agency for Meteorology and Environment Monitoring (NAMEM) and a detailed review on meteorological and hydrological networks in the country. Currently, NAMEM provides the public and some special users with weather and special forecasting mainly in the areas of agriculture, aviation and animal husbandry. It gives also warning and prevention of water-related disasters, based on data collected from their surface and upper-air stations and information received from satellite. In the end, the further needs of model optimization, model initialization of all surface and upper-air station data, assimilation of satellite and radar data, climate simulation and downscaling of climate scenarios under different GHG forcing, have been stressed.

6.12 Dr J. Rabadi (WMO) introduced the WMO Sand and Dust Strom Warning and Assessment System (SDS-WAS) initiative. SDS-WAS mission is to enhance the ability of Members to deliver timely and quality forecasts of sand and dust storms, observations of aerosols, sand and dust information and knowledge to users in order to reduce impacts through an international partnership of research and operational experts and users. SDS-WAS is led by the Commission for Atmospheric Sciences (CAS) largely as a research initiative but with strong collaboration with the Commission for Basic Systems (CBS) operational forecasting activities. WMO SDS has strong impacts in various sectors such as human health (asthma, infections, meningitis in Africa, valley fever in the America's), agriculture (negative and positive impacts), marine productivity, aviation (air disasters), traffic and surface transportation, industrial production, etc. The Conference further acknowledged the role and contribution of CMA, JMA and KMA in advancing this System. The Conference urged Members in RA II to be active partners in this system and fully utilize its products and

services.

6.13 Dr Y. Chun (Republic of Korea) introduced the regional collaboration for the establishment of SDS monitoring in East Asia. In his presentation, the current status of dust storms in the Republic of Korea and SDS-WAS activities were introduced. To forecast the Asian Dust and alert the Asian Dust's damage to people, KMA started to issue the special warning alert system in April 2002. In the cases where more than 400 $\mu g/m^3$ and 800 $\mu g/m^3$ of hourly average PM10 concentrations are expected to last for more than two hours, KMA issues Asian dust advisory and warning, respectively. SDS early warning procedure in the Republic of Korea is as follows: (1) Monitoring the Asian Dust episode in source regions with visual measurement and PM10 measurement using the Mongolia and China Joint Asian Dust Monitoring Networks: (2) Investigating the horizontal distribution of Asian Dust using weather charts and satellite images; (3) Estimating the movement of air parcel containing Asian Dust within 72 hours with 3-hour interval; (4) Simulating the trajectories, and concentrations of Asian Dust with a super computer; and (5) Identify the path and vertical distribution of Asian Dust with PM10 concentrations.

6.14 Dr S. Myagkov (Uzbekistan) presented dust storm in Uzbekistan. In Uzbekistan, there are two types of dust storms: local dust storms, if phenomena are not large; and frontal dust storms, when it can embrace vast regions, in some cases - 500-1000 km crosswise. Depending on the type of soil and wind speed the average multiyear annual number of days with dust storms varies from 3-5 to 30 and more on the plain territory of Uzbekistan. Strong wind is one of the most widely-spread dangerous meteorological phenomena in Uzbekistan. The speed of 15-25 m/sec is criterion of wind as a dangerous phenomenon; and wind stronger than 25 m/sec is especially dangerous. Under heavy winds buildings and industrial structures are damaged, the traffic of all means of transport becomes difficult, sowing and trees are also damaged.

6.15 Dr Xu Jing (China) introduced the Tropical Cyclone (TC) forecasting and warning system in CMA. With the support of the government, CMA has made great progress in observational network construction in the past decade, which contributed greatly to the improvement of the TC warning in China. The main achievements concerning the production delivery by the TC forecast and warning system in China include the following:

- TC warning systems in national, regional, provincial, prefectural and county levels have been established in China. The guidance issued from top level to bottom level guarantees the warning message consistency;

- Closer collaboration with the government at each level helps deliver the warning message with high efficiency. Local governments are responsible for taking measures for TC defending after receiving the TC warning. The central Government is directly responsible for DRR;

- Closer collaboration with media contributes to TC warning and TC alarming signal delivery to the public and for the public training.

The following items are recommended: improvement on TC forecast skill; development on more suitable and relevant TC warning products; and closer collaboration with the government and media.

6.16 Ms I.K. Manandhar (Nepal) presented the state of river water quality in Kathmandu valley and the environmental challenges. Main polluting factors for Kathmandu Valley Rivers are: the population growth, industrialization and urbanization exerted an unending pressure on the quality of this natural resource; the effluents resulting from municipal, industrial and agricultural wastes have alarmingly polluted the river and ground water; Individual and municipal dumping of garbage; the squatters living in and around the river banks contributing river water polluted; diversion of upstream for drinking water supply reducing the river water

flow; flourishing industries along the bank of rivers; causing a rampant development of residence without proper sanitation provision. She highlighted that: (1) the upstream sites of rivers are slightly polluted due to low human interference: (2) as it enters highly populated urban area, the rivers are heavily polluted and nearly ecologically wrecked; (3) the use of river water for washing of person and animals, cleaning of vegetables and for irrigation purposes create a negative impact in the health of the population; (4) the pipelines of drinking water and sewage are laid close to each other thus increasing the risk of drinking water contamination; (5) threat to human health and development of the Valley; and (6) environmental problem. She presented several steps needed to be taken in order to reach the acceptable conditions for improvement of River environment of Kathmandu Valley.

6.17 Mr Majed Al Shekaili (UAE) delivered a presentation on challenges and opportunities in meteorological services in UAE. He described recent development in which all meteorological services in UAE have merged in one federal Service. Meteorological hazards in UAE are mainly fog, SDS, flash floods and heat waves. Public weather services include weather forecasts, SMS messages, iPhone application (UAE Weather Radar), public awareness activities and website cooperating with stakeholders.

7. ROLE OF NMHSs IN DISASTER RISK REDUCTION INCLUDING EMERGENCY RESPONSE [CORRESPONDS TO NEW WMO SP EXPECTED RESULT 2] (Topic V)

7.1 Dr M. Golnaraghi (WMO) delivered a video presentation on the role of NMHSs in DRR within a changing climate: Development in South East Asia. She informed the Conference that the adoption of the Hyogo Framework for Action (HFA) in 2005 has led to a new paradigm in disaster risk management with the focus on prevention and preparedness through risk assessment, risk reduction and risk transfer. She introduced that the first Early Warning System (EWS) publication entitled “Guidelines on Institutional Partnership and Cooperation in Multi-Hazard Early Warning System” which is the synthesis of seven good practices including Bangladesh, Japan and Shanghai, is to be published by the end of 2010. By outlining the national and regional disaster risk management and adaptation projects with the World Bank, UN-International Strategy for Disaster Reduction (UN-ISDR) and UNDP which focus on development of national capacities and regional cooperation, she invited RA II Members to support the project for five Members in Southeast Asia, i.e., Cambodia, Indonesia, Lao PDR, Philippines and Viet Nam.

7.2 Dr Somsri Huntrakul (Thailand) introduced lessons learned from the recent flooding in Thailand. She first noted the keen interest of His Majesty King Bhumipol Adulyadej to support the Thai Meteorological Department. The King expressed concern about the recent 2010 severe floods in Thailand and urged the authorities to thoroughly study irrigation systems so they do not affect people adversely. Lessons learned from the 2010 severe floods include: (a) disaster prevention and relief need a proper approach; (b) too many stakeholders participating in flood warning is counter-productive; (c) social network is essential in DRR approach; and (d) political unrest can greatly hamper efforts to reduce risk of natural disasters.

7.3 Mr Wang Zhihua (China) introduced the practice and progress of the meteorological disaster prevention and mitigation (DPM) in China. China is one of countries which is the most severely affected by meteorological disasters. CMA placed great emphases on enhancing the mesoscale and microscale monitoring, nowcasting, early warning system. The multi-mean meteorological disaster warning information delivery system has been developed in China and plays an important role in the mitigation system. In China, governments at different levels made laws and regulations to ensure stakeholders participating more in DPM, to mobilize more social resources to support DPM. It proved to be successful and valid. Disaster risk evaluation and forecast is very important to meteorological disaster prevention and mitigation, but due to lack of the relevant skills,

NMHSs should put special emphasis on changing this situation. Since the warning information is vital for DPM, NMHSs should devote to extending the spread coverage of warning information in rural areas.

7.4 Dr W.-J. Lee (Republic of Korea) introduced the lessons from recent episodes on public perception on weather forecast and warning. He explored several examples of interaction with public after the occurrence of severe weather conditions including heavy rain and snow, landfalling tropical cyclone, and identified areas for improvement: (a) regular assessment on climate variability and social vulnerability, (b) advancement of prediction of high-impact weather and user education and awareness, (c) warning coupled with adequate local preparedness planning and effective coordination and cooperation between responsible agencies, and (d) legislation and adequate normative framework.

7.5 Mr S.O. Soknara (Cambodia) made a presentation on the role of NMHSs in disaster risk reduction including emergency response. He reviewed structure, functions and challenges in his Service. To overcome some of these challenges he concluded that: human resources development is needed especially for weather forecasters; new instruments have to be installed; and cooperation with neighbouring NMHSs, especially in DRR and emergency response, has to be improved.

7.6 Dr O. Pokrovsky (Russian Federation) gave a review of decision-making techniques related to numerical weather prediction. He considered case studies on catastrophic river floods in Siberia and droughts in various parts of the Russian Federation. He concluded the following: (a) Decision-making approach based on mathematical programming found a wide application area in many branches of economical sciences; (b) It is helpful in decision making related to multidimensional target function constrained by many linear cost restrictions; and (c) Similar problems arisen in many meteorological areas might be efficiently solved by the described approach.

7.7 Mr G. Samarasinghe (Sri Lanka) delivered a presentation on the role of National Meteorological Centre (NMC) in DRR and improving climate and meteorological services. He detailed strengths of NMS in early warning, DRR and emergency response mechanism/commitments of NMS and DRR and emergency response responsibilities/ strategies of NMS. Future strategies of NMC to assist improving DRR in Sri Lanka include: more frequent awareness and media briefing sessions on impending disasters; empowerment of the community with adequate information and skills to have their own DRR plans and decisions by providing information and training (controlled background); acquisition of a Doppler weather radar in near future, to cover most of the country; and facilitating nowcasting to reduce lightning fatalities and fully establish AWS network system to provide real time disaster information at NMC.

7.8 Mr Arif Mahmood Rana (Pakistan) delivered a presentation on Super Flood 2010 in Pakistan. He described climate and weather conditions associated with the flood. In reviewing weather and flood forecasts issued by PMD, he highlighted the role of PMD in alerting disaster management authorities in Pakistan, which helped greatly in reducing loss of lives and damage of property.

7.9 Dr T. Toya (WMO) introduced WMO actions following the 2010 Pakistan floods. WMO has organized a fact-finding and needs-assessment mission to Pakistan from 4 to 8 November 2010 to make assessment of the damage to hydrometerological infrastructure and the needs for priority activities of PMD and to evaluate and design the implementation plan for the development of effective flood early warning systems and integrated flood management practices. The WMO Office for West Asia was relocated for a one-month period to Islamabad in October/November 2010 to provide technical support to PMD and to facilitate communication with WMO Secretariat. WMO organized coordination meetings with various UN and international agencies (UNESCO, ESCAP, UNDP and others). Key findings of the WMO mission include the following:

- The 2010 floods were exceptional and beyond historical design capacities;
- The forecasting services of PMD significantly contributed to reduction of loss of lives and property that otherwise could be expected from a flood disaster of that magnitude;
- Loss of observing infrastructure has severely limited the forecasting capabilities of PMD;
- Two very different hydrometerological phenomena (riverine flood and flash flood) contributed to the flood disaster and need to be recognized in rehabilitations, reconstruction and flood forecasting activities;
- Riverine floods attributed primarily to extensive damages while flash floods were largely responsible for the loss of lives;
- In flood forecasting and management, riverine and flash floods need to be treated differently.

Dr Toya indicated that WMO, together with UNESCAP and UNESCO would further assist Pakistan with focus on: network rehabilitation, and improved forecasting services including flash floods; Integrated Flood Management; capacity building; and regional cooperation and sharing of knowledge. The potential donor Members in RA II were requested to consider possible assistance to Pakistan under the Voluntary Cooperation Programme and the Emergency Assistance Fund scheme.

7.10 The Conference realized the vulnerability of many Members of RA II to natural disasters. It expressed its sympathy and support to Members that suffered heavy losses in human lives and economic damage caused by weather- and water-related hazards in recent history. It further called for improved cooperation to reduce the technological gap in disaster risk reduction capacity between developed and developing Members in RA II.

7.11 The Conference recognized that the role of Regional Association in DRR is to provide input on the needs and priorities of Members and the Region and facilitate collaboration and partnerships with national and regional disaster risk management organizations, stakeholders and partners for implementation of DRR projects. In this respect, Members were encouraged to actively participate in the WMO-World Bank-UNISDR-UNDP initiative of a regional disaster risk management and adaptation programme in Southeast Asia.

7.12 The Conference noted with acknowledgement actions taken by the Secretary-General of WMO to provide support to Members affected by natural disasters in RA II. The Conference recognized the merits of the temporary relocation of the WMO Office for West Asia to Islamabad, Pakistan; sending fact-finding missions and the provision of emergency assistance to many Members in RA II affected by recent natural disasters.

7.13 The Conference urged NMHSs in RA II to continue to improve its capacity in the DRR domain, particularly riverine flood forecasting and flash flood forecasting, as well as flood forecasting and warning services area.

7.14 The Conference recommended that NMHSs in RA II should define more clearly their national role in DRR by identifying the specific products and services being provided to manage the risks associated with water-and weather-related disasters in their respective countries;

7.15 Building on good practices/experiences, lessons learned from previous disasters, and reports of WMO fact-finding missions to disaster-affected Members, the Conference agreed on the following:

(a) In developing national programmes to improve flood forecasting and warning services in countries recovering from recent disasters, such programmes must be fully integrated into the programme of reconstruction and socio-economic development;

(b) Enhanced institutional coordination and communication from central to local is crucial for timely implementation of activities and their field effectiveness;

(c) Enhancement of local NHMSs services and human resources development needs to be encouraged;

(d) The Integrated Flood Management needs to be carried out on a river basin approach including a regional and transboundary scope with all relevant sectors involved;

(e) There is a need to develop Standard Operating Procedures (SOP) within the WMO Secretariat and Members to quickly respond to the events and effectively implement emergency assistance. The SOP developed by Members should be shared with other Members;

(f) There is a need to promote collaborative research across disciplines to develop effective translation of the probabilistic nature of forecasts into action words, with periodic assessment of vulnerabilities of society under a changing climate.

8. IMPLEMENTATION OF WIS/WIGOS [CORRESPONDS TO NEW WMO SP EXPECTED RESULT 4] (Topic VI)

8.1 Mr Arif Mahmood Rana (Pakistan), Chairperson of the RA II Working Group on WMO Integrated Observing System and WMO Information System (WG-IOS/WIS), briefly introduced the composition of the Working Group and the outline of the WMO Integrated Observing System (WIGOS) and the WMO Information System (WIS).

8.2 Mr H. Ichijo (Japan), Coordinator of the Sub-Group on WMO Information System (SG-WIS) within WG-IOS/WIS, after introducing WIS, presented the progress on the implementation in RA II, documentation, and WIS support activities including the WIS VPN Pilot Project in RAs II/V and capacity building, and GISC/DCPC Designation Process. Noting that there are still centres isolated from GTS, the Conference requested responsible RTHs to facilitate the establishment of the GTS links concerned.

8.3 Dr J.-G. Won (Republic of Korea) introduced the KMA’s standardization programme of domestic observation network in the Republic of Korea regarding the methodology of measurement, data quality management, and data exchange, which is the basis of the WIGOS demonstration project in RA II. He stressed the importance of inter-comparison activities for improving data quality of the conventional in situ and the state-of-the-art remote sensing measurement. In this regard, KMA's activities and plans for operating the standard observatories supporting the WIGOS were presented, which were submitted as candidates for WMO CIMO Lead Centre and Test Bed.

8.4 The conference agreed and recommended the following:

(a) WG-WIS/WIGOS would collect and summarize requirements of the Region on:

  (i) required GTS bandwidth considering operational data exchange of NWP and satellite products;

  (ii) acceptable delay-time for urgent information such as tsunami warning messages;

  (iii) capacity building activities such as metadata workshops and training on TDCF migration;

(b) More guidance for observation technology and data management methodology need to be produced through the enhanced regional inter-comparison as the WIGOS

Vision calls for an integrated, coordinated and comprehensive future observing system;

(c) More regional observation inter-comparison campaigns should be organized to support the WIGOS;

(d) The increased data exchange and the enhanced utilization based on the WIS shall support the evolution of WIGOS from 'Test of Concept Phase (2007-2011)' to 'Implementation Phase (2012-2015)'.

9. CLOSURE OF THE CONFERENCE

9.1 The Conference reviewed and adopted the draft Report, and agreed on the process to finalize the Report by the end of 2010.

9.2 The participants, the representative of the president of Regional Association II and the representative of WMO expressed their appreciation to the Government of the Republic of Korea for the successful hosting of the Conference. They also expressed gratitude to Dr Chun and his staff for the warm hospitality and excellent arrangements made.

9.3 The Conference closed at 10:15 hours on 3 December 2010.

Annex I

Fifth Technical Conference on Management of National Meteorological and Hydrological Services in Regional Association II (Asia)

Opportunities and Challenges for Delivery of Weather, Climate and Water Services (Daegu, Korea, 29 November – 3 December 2010)

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Annex II

Fifth Technical Conference on Management of National Meteorological and Hydrological Services in Regional Association II (Asia)

Opportunities and Challenges for Delivery of Weather, Climate and Water Services (Daegu, Korea, 29 November – 3 December 2010)

PROGRAMME

Monday, 29 November

Morning

09:00-10:00 Registration at Hotel Inter-Burgo Daegu

10:00-10:30 **Opening Ceremony**

Dr Byung-Seong Chun (Permanent Representative of the Republic of Korea with WMO)
Dr Sergey Myagkov (Representative of Prof. Victor Chub, president of RA II)
Dr Tokiyoshi Toya (WMO Representative)

Group Photo

10:30-11:00 *Refreshment*

11.00-11:10 **Introduction to the Technical Conference and Working Arrangements**
Dr Tokiyoshi Toya (WMO)

SESSION 1 - STRATEGIC PLANNING AND MANAGEMENT OF NMHSs

Chair: Dr Byung-Seong Chun (Republic of Korea)
Rapporteur: Dr Yesudhas Eben Aruma Raj (India)

11:10-12:10 **Keynote lecture**
When Weather Matters: Science and Services to Meet Critical Societal Needs
Prof. John Snow (University of Oklahoma, United States of America)

12:10-12:30 Discussion

12:30-14:00 *Lunch break*

Afternoon

SESSION 1 - STRATEGIC PLANNING AND MANAGEMENT OF NMHSs (continued)

Chair: Mr Gunavi Samarasinghe (Sri Lanka)
Rapporteur: Dr Yesudhas Eben Aruma Raj (India)

14:00-14:45 1-1 Regional Strategic and Operational Planning
Dr Tokiyoshi Toya (WMO)

14:45-15:00 Discussion

15:00-15:30 1-2 Strategy and Management for the Better Meteorological Services in Asia
Dr Mitsuhiko Hatori (Japan)

15:30-16:00 *Coffee break*

16:00-16:15 1-3 Strategic Planning and Role of Lao NMHS in Disaster Risk Management
Mr Singthong Pathoummady (Lao PDR)

16:15-16:30 1-4 Development Strategy for National Hydro-Meteorological Service of Viet Nam
Mr Nguyen Van Tue (Viet Nam)

16:30-16:45 1-5 NMHS of Tajikistan: State and Development Prospects
Mr Anvar Homidov (Tajikistan)

16:45-17:30 Discussion and recommendations

Tuesday, 30 November

Morning

SESSION 2 - CAPACITY DEVELOPMENT IN NMHSs

Chair: Dr Sergey Myagkov (Uzbekistan)
Rapporteur: Mr Yu Jixin (China)

09:00-09:30 2-1 Development of Human Resources for Contemporary Meteorological and Hydrological Services
Dr Yinka Adebayo (WMO)

09:30-09:50 2-2 Enhancement of Capacity Development in RA II
Mr Hiroshi Koide (Japan)

09:50-10:10 2-3 KMA's Contribution to Capacity Building in RA II
Dr Won-Tae Yun (Republic of Korea)

10:10-10:30 2-4 Opportunities and Challenges for Delivery of Weather, Climate and Water Services
Mr Zarylbek Itibaev (Kyrgyzstan)

10:30-11:00 *Coffee break*

11:00-11:20 2-5 Work Plans and Recommendations of the RA II Working Group on Hydrological Forecasts and Assessment (WGH)
Dr Sung Kim (Republic of Korea)

11:20-11:40 2-6 Flood Forecasting and Early Warning Capabilities of Pakistan Meteorological Department (PMD)
Mr Arif Mahmood Rana (Pakistan)

11:40-12:00 2-7 Regional Climate Change and Capacity Building
Dr Won-Tae Kwon (Republic of Korea)

12:00-12:30 Discussion and recommendations

12:30-14:00 *Lunch break*

Afternoon

SESSION 3 - IMPROVING CLIMATE SERVICES

Chair: Mr Arif Mahmood Rana (Pakistan)
Rapporteur: Dr Won-Tae Kwon (Republic of Korea)

14:00-14:30	3-1	Global Framework for Climate Services *Dr Kumar Kolli (WMO)*
14:30-15:00	3-2	Climate Information System in RA II *Dr Kiyoharu Takano (Japan)*
15:00-15:30	3-3	Climate Application and Services of NCC (BCC) *Dr Zhang Zuqiang (China)*
15:30-16:00	*Coffee break*	
16:00-16:15	3-4	Climate Information Services of KMA *Dr Chung-Kyu Park (Republic of Korea)*
16:15-16:30	3-5	Climate Change and Extreme Events in Arabian Peninsula *Dr Saad Mohamad Mohalfi (Saudi Arabia)*
16:30-16:45	3-6	Climate Applications and Service in India *M Arvind Kumar Srivastava (India)*
16:45-17:00	3-7	North Eurasia Climate Centre: Climate Services to CIS Countries *Dr Valentina Khan (Russian Federation)*
17:00-17:15	3-8	CLIPS in RA II: Prediction Services *Dr Vladimir Kryzhov (Russian Federation)*
17:15-17:30	Discussion and recommendations	

Wednesday, 1 December

Morning

SESSION 4 - IMPROVING THE QUALITY AND DELIVERY OF THE METEOROLOGICAL AND HYDROLOGICAL SERVICES

Chair: Mr Singthong Pathoummady (Lao PDR)
Rapporteur: Ms Indra Kumari Manandhar (Nepal)

09:00-09:30	4-1	WMO Strategy for Service Delivery *Ms Haleh Kootval (WMO)*
09:30-10:00	4-2	Recent Experience of Hong Kong Observatory in Service Delivery/Activities and Milestones of the WGDRS *Mr Lap Shun Lee (Hong Kong, China)*
10:00-10:20	4-3	Meteorological and Hydrological Services in Myanmar *Ms Ye Ye Nyein (Myanmar)*
10:20-10:50	*Coffee break*	
10:50-11:10	4-4	Severe Weather Forecasting Demonstration Project (SWFDP): Lessons and Opportunities *Ms Haleh Kootval (WMO)*

11:10-11:30 4-5 Current Status and Plan for the KMA Nowcasting and Very Short-range Forecast Service
Dr Dong-Eon Chang (Republic of Korea)

11:30-11:50 4-6 Recent Modernization Initiative by India Meteorological Department Resulting in Rendering of Improved Weather, Climate and Water Services to User Community in India
Dr Yesudhas Eben Aruma Raj (India)

11:50-12:10 4-7 Meteorological Services in Mongolia
Dr Sarantuya Ganjuur (Mongolia)

12:10-12:30 Discussion

12:30-14:00 *Lunch break*

Afternoon

SESSION 4 - IMPROVING THE QUALITY AND DELIVERY OF THE METEOROLOGICAL AND HYDROLOGICAL SERVICES (continued)

Chair: Dr Somsri Huntrakul (Thailand)
Rapporteur: Dr Won-Tae Yun (Republic of Korea)

14:00-14:20 4-8 The WMO Sand and Dust Storm Warning Advisory and Assessment System (WMO SDS-WAS) Initiative
Dr Jaser Rabadi (WMO)

14:20-14:40 4-9 Regional Collaboration of the Establishment of SDS Monitoring in East Asia
Dr Youngsin Chun (Republic of Korea)

14:40-15:00 4-10 Dust Storms in Uzbekistan
Dr Sergey Myagkov (Uzbekistan)

15:00-15:30 *Coffee break*

15:30-15:50 4-11 Tropical Cyclone Forecasting and Warning system in CMA
Dr Xu Jing (China)

15:50-16:10 4-12 State of The Rivers in Kathmandu Valley and the Environmental Challenges
Ms Indra Kumari Manandhar (Nepal)

16:10-16:30 4-13 Meteorological Services in UAE – Opportunities and Challenges
Mr Majed Al Shekaili (United Arab Emirates)

16:30-17:30 Discussion and recommendations

Thursday, 2 December

Morning

SESSION 5 - ROLE OF NMHSs IN DISASTER RISK REDUCTION INCLUDING EMERGENCY RESPONSE

Chair: Dr Saad Mohamad Mohalfi (Saudi Arabia)
Rapporteur: Dr Valentina Khan (Russian Federation)

09:00-09:30 5-1 Role of NMHS in DRR within a Changing Climate: Development in South East Asia
Dr Maryam Golnaraghi (WMO)

09:30-09:45 5-2 Lessons learned from the November 2010 floods in Southern Thailand
Dr Somsri Huntrakul (Thailand)

09:45-10:00 5-3 Meteorological Disaster Prevention and Mitigation in China
Mr Wang Zhihua (China)

10:00-10:15 5-4 Public Perception on Weather Forecast and Warning: Lessons from Recent Episodes
Dr Woo-Jin Lee (Republic of Korea)

10:15-10:30 5-5 Role of NMHSs in Disaster Risk Reduction including Emergency Response in Meteorological Department Of Cambodia
Mr Sam Oeurn Soknara (Cambodia)

10:30-11:00 *Coffee break*

11:00-11:15 5-6 Decision Making in More Frequent Drought and Flood Events under Climate Change
Dr Oleg Pokrovsky (Russian Federation)

11:15-11:30 5-7 Role of National Meteorological Centre in Disaster Risk Reduction
Mr Gunavi Samarasinghe (Sri Lanka)

11:30-11:45 5-8 Super Flood 2010 in Pakistan
Mr Arif Mahmood Rana (Pakistan)

11:45-12:00 5-9 WMO Actions Following the 2010 Pakistan Floods
Dr Tokiyoshi Toya (WMO)

SESSION 6 - IMPLEMENTATION OF WIS/WIGOS

Chair: Dr Mitsuhiko Hatori (Japan)
Rapporteur: Dr Sarantuya Ganjuur (Mongolia)

12:00-12:20 6-1 Working Group on WMO Integrated Observing System and WMO Information System (WG-IOS/WIS)
Mr Arif Mahmood Rana (Pakistan)

12:20-12:50 6-2 WMO Information System (WIS) Implementation Status
Mr Hiroyuki Ichijo (Japan)

12:50-13:10 6-3 WIGOS Demonstration Project: KMA's Activities and Plans in RA II
Dr Jae-Gwang Won (Republic of Korea)

13:10-16:30 *Break*

16:30-17:30 Consideration of conclusions/recommendations
Chairs and rapporteurs

Friday, 3 December

Morning

09:00-10:30 **SESSION 7 - SUMMARY OF DISCUSSIONS AND CONCLUSIONS/ RECOMMENDATIONS**

Chair: Dr Woo-Jin Lee (Republic of Korea)

10:30-11:00 **Closure of the Technical Conference**