

**WMO Regional Seminar on
Strategic Capacity Development of National Meteorological and Hydrological
Services (NMHSs) in the RA II (Asia)
(Doha, Qatar, 11-12 December, 2012)**

Final Report



WORLD METEOROLOGICAL ORGANIZATION

1. OPENING SESSION

1.1 At the kind invitation of the Government of the Qatar, the WMO Regional Seminar on Strategic Capacity Development of National Meteorological and Hydrological Services (NMHSs) in the RA II, was held at Courtyard by Marriott Doha City Center Hotel, Doha from 11 to 12 December, 2012.

1.2 The Seminar was attended by 51 Directors and senior officials of National Meteorological and Hydrological Services of 27 Members in Region II and four representatives from regional organizations. The list of participants is given in Annex I.

1.3 Professor Victor Chub, president of Regional Association II (Asia) welcomed the participants and wished them success in their deliberation. Professor Chub expressed his gratitude, on behalf of RA II, to the Government of Qatar and thanked the Qatar Meteorological Department for their hospitality and for the great efforts put and the excellent arrangements made to organize this Seminar. Professor Chub recalled that the purpose of the Regional Seminar is to determine the main directions in the building of strategic capacity of the NMHSs and to establish solid basis for defining the demand for further capacity building and for improving of quality of meteorological, hydrological and climate servicing of the users of NHMSs production in RA II. He iterated that the enhancement of NHMSs capacity will provide for increase of economic productivity, and in the cases of occurrence of weather-related disasters and the changing climate, it enables significant reduction of risks and damage caused by severe hydrometeorological phenomena. Professor Chub expressed his confidence regarding that NHMSs will do their best to deepen the cooperation between the users and suppliers of climate production which will put the stable basis for the practical realization of programme on capacity building. He further noted that significant achievements on the improvement of quality of output production in RA II are recorded.

1.4 On behalf of the Government of Qatar, Mr Ahmad Abdulla, Permanent Representative of Qatar with WMO welcomed the participants and wished them a fruitful and enjoyable stay in Doha. Since many economic sectors in Region II are sensitive to weather, climate and water and thus dependant on services provided by NMHSs, Mr Abdulla stressed on the role of this Seminar in developing capacities of the hydrometeorological services in the Region to help them improve their capabilities and meet growing users' requirements.

1.5 The representative of WMO Secretary-General, Dr Elena Manaenkova, Assistant Secretary General of WMO welcomed the participants and expressed gratitude to the Government and people of Qatar for hospitality. Dr Manaenkova thanked Mr Abdulla and the staff the Qatar Meteorological Department for their tireless efforts and for the superb logistics and excellent arrangements made to host this Seminar. Dr Manaenkova was pleased to note that many delegations attending COP18, held in Doha a week before, have representatives from NMHSs reflecting the growing national and international recognition of the role of meteorology in global issues. She underlined the importance of this Seminar, preceding the upcoming RA II session, as the first regional meeting held following Cg-16 (2011) and Cg-Ext (2012) sessions.

1.6 Dr Tokiyoshi Toya, Regional Office for Asia and the South West Pacific, presented a briefing on the organizational arrangements related to the Seminar. He urged participants to use this Seminar as a forum to exchange views and experiences on common issues such as

strategic planning for developing capacity, challenges and opportunities in RA II, disaster risk reduction and socio-economic issues.

2. TOPICS OF THE SEMINAR

2.1 Presentations and case studies were delivered by participants representing Members, WMO Secretariat, and representatives of international/regional organizations. The presentations focused on the following 4 topics (Programme of the Seminar, including names of chairs and rapporteurs of each session, is given in Annex II):

- Topic 1: Development and Implementation of Regional Strategic Operating Plan and Challenges of NMHSs in RA II;
- Topic 2: Capacity Development and Strategic Partnerships (including Role and operation of NMHSs);
- Topic 3: Implementation of WIGOS/WIS;
- Topic 4: Improving Climate Services.

2.2 Summaries of presentations under each topic are listed in the following paragraphs. All presentations, as submitted by authors, are published in full on WMO web site: <http://rai-15.wmo.int/regional-seminar>.

3. DEVELOPMENT AND IMPLEMENTATION OF REGIONAL STRATEGIC OPERATING PLAN AND CHALLENGES OF NMHSs IN RA II (TOPIC 1)

3.1 Dr Elena Manaenkova (WMO) delivered a keynote presentation on WMO Strategic and Operational Planning. Dr Manaenkova gave an account of the evolution in the WMO planning process over the years. She highlighted the importance of setting strategic priority in executing the WMO Strategic Plan 2012-2015 and in streamlining voluntary funding for implementing deliverables in the WMO Strategic Plan based on the strategic priority. Dr Manaenkova went on to describe the latest decision of the WMO Congress and Executive Council in respect of enhancing the linkage between Strategic Plan, Operating Plan and Result-based Budgeting. She emphasized that the development of WMO Strategic Plan 2016-2019 would be driven by the needs and priorities set by the Members. In particular, she highlighted the evolving societal and economic needs in the future, making reference to the likely scenario in 2016-2019. She also emphasized the potential priority areas in the WMO Strategic Plan 2016-2019.

3.2 Dr Dong-Eon Chang (WMO) presented on an evaluation of the progress in implementing the RA II Strategic Plan 2009-2011 based on a survey conducted in 2010-2011. Dr Chang recalled that the survey aimed at identifying the basic capacity of NMHSs in implementing RA II Strategic Plan 2009-2011, which formed the basis in setting baselines and targets of deliverables in the RA II Strategic Operating Plan 2012-2015. He noted that there had been overall improvements of weather, climate and water services by Members of RA II, including service delivery capability, infrastructure for observation, telecommunication and forecast products during the past intersession period. He, however, expressed concerns about insufficient observational infrastructure and capacity to produce and provide reliable and timely forecast and warning services. He further pointed out that many LDCs cannot afford to have

qualified maintenance technicians for observation instruments or the communication infrastructure for real-time delivery of observations.

3.3 On behalf of the Task Team on Strategic Planning, Dr Cheng Cho-ming (Hong Kong, China) gave an overview of the Strategic Operating Plan for the enhancement of NMHSs in RA II (Asia) for 2012-2015. He presented the process in developing the Plan, in particular consultation with RA II Management Group, Members, Working Group chairs and RAP Office of the WMO Secretariat. Dr Cheng highlighted the Regional Key Outcomes and the deliverables of the Plan, and encouraged Members to adopt the Plan at the RA II-15 session. He also mentioned the importance of monitoring and evaluation to measure the performance of the Strategic Operating Plan, and encouraged Members to consider means to implement the deliverables of the Plan. He then highlighted a few potential areas for developing pilot projects, namely, in enhancing the provision of city forecasts on the World Weather Information Service (WWIS), the further growth in AMDAR implementation in RA II, and the standardization in the coding format for warning/advisories to foster exchange and development of products for the Severe Weather Information Centre (SWIC).

3.4 Dr Sergey Myagkov (Uzbekistan) delivered a presentation on Development and Implementation of the Strategic Operating Plan of Uzhydromet. Dr Myagkov outlined the main responsibilities of Uzhydromet in Uzbekistan which include, among other things, carrying out and improvement of the systematic hydrometeorological observations as well as of the observations of the environment pollution in the different ecological systems. He noted that the strategic priorities of Uzhydromet include improvement of capabilities to deliver and enhanced access to high quality weather-, climate- and water-related environmental predictions, information, warnings and services in response to users' needs. Dr Myagkov recalled that these objectives aim at: improving systems based on new technological developments; increasing automatic data reception and automatic data processing; improving adaptation capacity of water resources systems in a changing climate; improving in capacity for water-related disaster management; implementing Water Resources Assessment; developing monitoring and warning systems for Hydrological extremes; and improving hydrological and meteorological warnings capability through enhanced and effective cooperation with other NMHSs of RA-2. He also recommended further development of cooperation between NMHSs of the Regional Association within the WMO Programmes.

3.5 Ms Thuy Hang Nguyen (Viet Nam) gave a detailed account of the modernization of the hydrometeorological sector up to 2015, which was an important project contributing to the sustainable development in Viet Nam. She highlighted five key activities of the project, which will serve to achieve two main objectives: (a) developing a hydrometeorological forecasting system geared towards modernization and (b) improving human resources and innovating the servicing methodology of the NMHS. She also mentioned that implementation of the policy of modernizing the hydrometeorological sector in Viet Nam would help promoting the social-economic development in light of the country's accelerated industrialization, modernization and international economic integration.

3.6 Mr Zafar Mahmudov (Tajikistan) delivered a presentation on the Central Asia Hydrometeorology Modernization Project. Mr Mahmudov recalled that the aim of the project was to improve the national hydro-meteorological monitoring system in order to provide timely warnings on extreme events, support water management and build the evidentiary basis for climate variability and change; The project includes a major technical equipment of the observation networks and components for the strengthening of the data and information base. He emphasized that service delivery will be improved through expanded provision of

hydrometeorology products to consumers, and bolstering the national forecasting, warning, and response system. He further asserted that this component also addresses issues of institutional strengthening of the hydrometeorology services to improve its personnel and financial sustainability.

3.7 Mr Abdulla Al Mannai (Qatar) delivered a presentation on the implementation of Quality Management System in the Qatar Meteorological Department (QMD) with an introduction to the vision, mission and structure of, as well as the services provided by, QMD. He explained in details the process in establishing the Quality Management System in QMD, from gap analysis, training for internal and external audits, through to the final stage of certification. He concluded his presentation by highlighting the importance of a Quality Policy as a commitment of QMD to establish a Quality Management System.

3.8 In his presentation on the challenges encountered by the Maldives Meteorological Service (MMS) in improving the operational service, Mr Abdul Muhsin Ramiz (Maldives) gave an introduction to the geography of Maldives, highlighting the concerns in relation to the threat of rising sea water level due to climate change. After reviewing the meteorological infrastructure of MMS, Mr Ramiz described in details the challenges encountered by MMS, e.g. the lack of trained staff and other related human resources as well as the lack of financial resources to maintain the meteorological infrastructure in Maldives. He concluded his presentation by proposing the level of assistance needed to address the challenges that the MMS faced in the long-term.

3.9 Mr Kyaw Moe Oo (Myanmar) delivered a presentation on Current status in the Department of Meteorology and Hydrology of Myanmar. Mr Kyaw described the functions and responsibilities of DMH. He identified the following as the main priorities of his services: The improvement of forecasting and end-to-end early warning system and building capacity of human resources. Mr Kyaw acknowledged the valuable support and the close cooperation of WMO and its Regional office, RSMC, New Delhi, RTHs in providing early warning, training and other support for Myanmar disaster reduction activities.

4. CAPACITY DEVELOPMENT AND STRATEGIC PARTNERSHIPS (INCLUDING ROLE AND OPERATION OF NMHSs) (TOPIC 2)

4.1 Mr Robert Masters and Ms Mary Power (WMO) delivered a presentation on WMO Capacity Development Strategy and Implementation Plan. Mr Masters provided an overview of the WMO Capacity Development Strategy (CDS) requested by Cg-16 (2011) and approved by EC-64 (2012). His presentation addressed the need for a new approach to capacity development and the important role of NMHSs in the provision of weather, water and climate services that contribute to the safety and well-being of society. Mr Masters reviewed the CDS with emphasis on: (1) the eight-step capacity development process; (2) the four dimensions of the capacity development including human capacity, procedural capacity, infrastructural capacity and institutional capacity; (3) the relationship of the CDS to the WMO Strategic and Operational Plans (SP and OP 2011-2015) and the WMO Programmes; (4) the complementing roles of constituent bodies, the WMO Secretariat, Members and partners in capacity development; (6) Quality Management; and (7) the WMO Strategy for Service Delivery. Mr Masters recalled that the vision of the CDS is “Stronger NMHSs to meet society’s need for information on weather, water and climate for the safety and well-being of people throughout the world” and its mission is “To facilitate a holistic and integrated approach to sustainable Capacity Development of NMHSs especially in developing countries, LDCs and SIDS through: advocacy,

education and training, outreach, partnerships and resource mobilization, demonstration and pilot projects, service delivery and research”. Also discussed is the important role played by the regional centers and the need for National agreement/commitment to ensure sustainable development of the NMHSs. Derived from a SWOT analysis carried out by the WMO Executive Council Working Group on Capacity Development (EC-WG/CD) in December 2011, the following Strategic Objects were approved by EC-64: Strategic Objective 1, Define Required Capacities and Identify Deficiencies; Strategic Objective 2, Increase Visibility and National Ownership; Strategic Objective 3, Optimize Knowledge Management; Strategic Objective 4, Reinforce Resource Mobilization and Project Management; Strategic Objective 5, Strengthen Global, Regional and Sub-Regional Mechanisms; Strategic Objective 6, Increase Education and Research Opportunities. The EC-WG/CD will continue its work on the CDS Implementation plan for presentation to EC-65 in 2013. As the second part of the presentation, Ms Mary Power reviewed the funding mechanisms available for capacity development as well as the status of voluntary contributions to the WMO. She recalled that Capacity Development is implemented through a range of financing modalities: Regular budget under Expected Results 6; Voluntary Cooperation Programme (VCP); Emergency Assistance Fund; Voluntary Contributions, i.e External financing for regional and national development projects; and Leveraging on strategic partnerships with United Nations developing banks and other development partners. Ms Power explained that WMO has experienced steady increase in Voluntary Contributions (excluding VCP Programme). In 2011 contributions were some CHF 33.4M (Audit Report) or approximately 30 % total of annual income and in 2012 projected to be 2012 greater than CHF 40M (receipts) and approximately 45 % of total annual income, which is a strong indication of donor confidence in WMO in a difficult funding environment. The VCP also includes about CHF 25 M of support globally through various VCP mechanisms (including the VCP Trust Fund, VCP supported and coordinated activities) and delivered bi-laterally by WMO Members. Additionally, WMO has a strong focus on leveraging support through funding and activities of other UN and partner agencies.

4.2 Mr Chi Ming Shun (Hong Kong, China) delivered a presentation on Top priorities of Aeronautical Meteorology Programme (AeMP) to be implemented in RA II. As the president of CAeM, Mr Shun highlighted top priorities of CAeM, including the current status of implementation by Members in the Region and progress made by the Commission, as follows: (a) Implement QMS (deadline: 15 Nov 2012); (b) Implement Aeronautical Met Personnel (AMP) Competence Standards (deadline: 1 Dec 2013); (c) Improve SIGMET issuance; (d) Develop Met Services for ATM & Met Info Exchange (M&M); (e) Improve Met response to Volcanic Ash, and other large-scale, high-impact events (e.g. space or nuclear incidents). Furthermore, Mr Shun urges members to: (a) provide as soon as possible the required inputs to the CAeM Benchmarking Survey, if not already, as requested by the President of RA II in July 2012; (b) participate in twinning and mentoring arrangements to provide the necessary assistance on QMS and AMP competency standard implementation to Members in need; (c) utilize available online resources and guidance material on QMS and AMP competency assessment; (d) improve SIGMET issuance and consider arranging temporary transfer of SIGMET responsibility to another capable Member through ICAO coordination if necessary; (e) keep abreast of the latest development in new weather services for ATM and ICAO's Aviation System Block Upgrades (ASBUs) initiatives and be prepared for the upcoming conjoint WMO CAeM / ICAO MET Divisional Meeting which will take place in 2014.

4.3 Mr Singthong Pathoummady (Lao PDR) delivered a presentation on Capacity Development, Role and Operation of NMHS of Lao PDR. Mr Pathoummady noted that Lao PDR has been facing various challenges including human resource development and has set up National Socio-Economic plans to address these issues. He further noted that the NMHS of

Lao PDR plays its mandated roles and operation and capacity development to be harmonized with WMO Strategic Plan 2012-2015, focusing on relevant priority areas of the Three Global Societal Needs, Five Strategic Thrusts and Eight Expected Results with particular focus on the third and fourth Thrusts. He emphasized that DMH will implement, in collaboration with other NMHSs or Advanced Regional Centers, for further improvements, taking into account priority areas for National Planning and Action Plans.

4.4 Mr Ahmed Al Harthi (Oman) delivered a presentation on Status and progress of Oman NMS activities including the implementation of Tsunami Early Warning System within the Framework of Multi-Hazard Approach. Mr Al Harthi described how Oman decided to establish a state-of-the-art National Multi Hazard Early Warning Center with the assistance of IOC. He further noted that RA II lacks Multi Hazard Early Warning training center for meteorologists and stressed on the importance of creating such one. He further stressed on the need to identify and standardize the requirements for the meteorologists that will be working in the Multi Hazard Early Warning Centers.

4.5 Dr Hee-Sang Lee (Republic of Korea) delivered a presentation on the Role and Responsibility of KMA's Meteorological Satellite in RA II. Dr Lee introduced KMA's satellite programme, its applications, and its international activities. He recalled that KMA's satellite related activities started in 1978 and ended up with the establishment of the National Meteorological Satellite Center in 2009 and successful launch of its own satellite called COMS (Communication, Ocean, and Meteorological Satellite). Dr Lee noted that plans to launch its second generation satellite called GEO-KOMPSAT-2A in 2017 and LEO satellite in 2020. He further mentioned that NMSC/KMA has been carrying out various international activities such as conducting training programme for COMS users, participating WMO space programme through CGMS, satellite data exchange, and so on. In particular, WMO-KMA RA II VLAP High profile training event held in October this year in Jeju could be a good example of WMO-KMA co-sponsored training activity. Finally he briefly introduced JMA-KMA co-coordinated RA II pilot project on satellite and proposed its continuation with its involvement into WMO RA II WIGOS project.

4.6 Ms Arjumand Habib (Bangladesh) delivered a presentation on strategic partnership with WMO and other regional organizations. Ms Habib described the challenges and difficulties facing Bangladesh Meteorological Department and hampers its active participation in meeting the growing needs of users for advanced meteorological and climate services. Ms Habib acknowledged with appreciation the support her country receives from regional and international donors through bilateral agreements. She further stressed on the importance of meaningful cooperation between developed countries and developing countries, particularly LDCs and SIDs.

4.7 Mr Arjunapermal Subbiah (RIMES) delivered a presentation on Strategic Partnership between WMO-RIMES. Mr Subbiah underscored the importance of the agreement signed between WMO and RIMES on enhancing capacities of National end-to-end early warning systems. He noted that while WMO was to build capacities of NMHSs to generate locally relevant hazard risk information, RIMES will build capacities of local level user agencies to interpret, translate and communicate science based risk communication to communities at risk to enable them prepare for and respond to natural hazard risks.

4.8 Dr Mandira Singh Shrestha (ICIMOD) delivered a presentation on building partnerships through HKH HYCOS. Dr Shrestha introduced the project "Establishment of a regional flood information system in the Hindu Kush Himalayan region (HKH HYCOS) which has been

implemented by ICIMOD in partnership with WMO and regional member countries of Bangladesh, Bhutan, China, India, Nepal and Pakistan. She recalled that the HKH HYCOS is one of the regional components of WMO's global framework of WHYCOS which seeks to strengthen regional and international cooperation in sharing hydrometeorological data. The project aims to exploit the emerging communication technologies to make information accessible faster, cheaper and with increased reliability. Dr Shrestha emphasized that aim of the project is to have a functional end-to-end flood information system which can serve as a decision support tool for decision makers to alert vulnerable communities in a timely fashion. She further emphasized that the regional and national flood information systems are internet centric and web-based systems which will integrate WMO GTS stations as well as satellite rainfall estimation products to support flood forecasting in the countries. Dr Shrestha stressed that strong partnership with WMO, regional member countries, international organizations, research organizations, private sector and the development partner has been established to foster cooperation.

5. IMPLEMENTATION OF WIGOS/WIS (TOPIC 3)

5.1 Dr Wenjian Zhang (WMO) delivered a presentation on future observation of the earth and its environment: The WIGOS imperative. Dr Zhang discussed following issues through his presentation. WIGOS will promote synergies among the existing WMO Global Observing Systems, i.e., the Global Observing System (GOS) developed in the past 50 years under World Weather Watch (WWW), the observing component of Global Atmosphere Watch (GAW), and the World Hydrological Cycle Observing System (WHyCOS), and newly developed Global Cryosphere Watch, with the purpose to establish an integrated, comprehensive and coordinated observing system that aims to address, in the most cost-effective and sustained manner, the evolving observing requirements of WMO Members for weather, climate, water and related environmental services. At its simplest, WIGOS is about: Implementing best practice in making and sharing observations; Coordination and collaboration for efficiency and effectiveness; Integrated design and sustainable delivery; and Delivering observations that meet user needs. The Sixteenth World Meteorological Congress (2011) decided to implement WIGOS as one of the Organizational priorities during the financial period 2012-2015, and EC-64 (2012) approved the WIGOS framework Implementation Plan. Congress also tasked the Regional Associations to develop regional WIGOS Implementation Plan, coordinate WIGOS implementation activities with WIS in their operating plan and work programmes, and promote capacity building and outreach activities to assist Members in the implementation of WIGOS within the Region. Regional Association II Working Group on WIGOS/WIS has developed the RA II WIGOS Implementation Plan, together with a list of WIGOS projects which will undertake the specific development and implementation aspects of WIGOS for the session to approve. The presentation also addressed that the decisions of this Regional Association session on WIGOS and an effective working mechanism are vital for the WIGOS implementation during the implementation phase (2012-2015). Every day National Meteorological and Hydrological Services around the world collectively measure the atmosphere, land surface and oceans through surface weather stations, upper-air stations, commercial aircraft and ships, drifting ocean buoys and ocean profiling floats, weather radars, profilers and a robust constellation of satellites. WIGOS is a strategic initiative intended to optimize the efficiency and effectiveness of these various observation networks, and services derived from these networks, so that national and international investments are leveraged to the greatest extent possible resulting in improved decision making at multiple levels. In that regard, linkages with development and implementation efforts of all WMO priorities, like the Global Framework for Climate Services

(GFCS), Disasters Risk Reduction, Aeronautical Meteorology and Capacity Development are also being made.

5.2 Mr Kuniyuki Shida (WMO) delivered a presentation on Development of RA II WIGOS Implementation Plan (R-WIP-II). In response to the request from the Sixteenth World Meteorological Congress (2011), RA II initiated the development of a Regional WIGOS Implementation Plan for RA II (R-WIP-II) at the meeting of the RA II Working Group on Integrated Observing System (IOS) and WMO Information System (WIS) held in Seoul, Republic of Korea in November/December 2012. The Task Team on R-WIP-II, established at the meeting, developed its first draft Implementation Plan with nine Tasks/Subtasks. After the review of the first draft by the RA II Management Group, the Task Team met in September 2012 during the fifteenth session of CBS and revised the R-WIP-II using the common template with deliverables, timeline and responsible bodies for 10 Key Activity Areas. The Task Team finalized the draft with seven RA II WIGOS Projects. The final draft R-WIP-II was submitted to the fifteenth session of RA II (Doha, Qatar, 13-19 December 2012) for review/adoption by RA II Members.

5.3 Mr Arif Mahmood Rana (Pakistan) delivered a presentation on Implementation status of WIS in RA II. The WMO Information System (WIS) is the single coordinated global infrastructure responsible for the telecommunications and data management functions. This ensures the extension of WMO's policy on the free and unrestricted international exchange of meteorological and related data. As per congress approval, there are six candidates Global Information System Centre (GISC) and 15 candidates Data Collection or Production Centre (DCPC) in RA II. GISC Beijing and Tokyo are in operation. Some DCPC are linked with existing GISCs. Afghanistan, Bhutan and Iraq are still out of GTS. Existing bandwidth of many circuits is 64 kbps but it is proposed that minimum bandwidth may be 128 kbps and target bandwidth may be 512 kbps. Different satellite operating countries like China, India, Japan and Republic of Korea are sharing satellite data and their products to different countries of the region. Notable progress has been noticed about migration of SYNOP data into Table-Driven Code Form while nearly 90% of RBSN stations engaging in upper air observations are stably reporting TAC messages. Progress in migration of marine observation is not satisfactory. Four WIS workshops and Training Seminars have been arranged by different GISCs for further implementation and strengthening of the WIS operational coordination among member countries. Regional WIS Implementation Plan in RA-II (R-2-WIS-IP) is under preparation and tentative draft will be finalized sharply and then it will be submitted to the RA II president in early 2013. Efforts are being made to revise the "Regional Aspect of the Manual on the GTS".

5.4 Mr Tatsuya Kimura (Japan) delivered a presentation on "Integration of meteorological observing systems in Japan: A model for WIGOS implementation at national level". More accurate, timely and pertinent information are required by national and local disaster management agencies to effectively and efficiently deal with torrential rains, which lead to devastating sediment disasters and flooding. The Japan Meteorological Agency (JMA) has elaborated its observing and forecasting system in order to fulfill its own mission and to meet expectations especially from local governments that are in charge of evacuation orders and execution other disaster-related counter measures. As one of the means to further contribute to local governments, JMA started issuing city-specific warnings and advisories in 2010. To materialize city-specific warnings and advisories, JMA needed to further (i) integrate its observing data with those obtained from relevant agencies, (ii) develop higher-precision Quantitative Precipitation Estimate (QPE) and Quantitative Precipitation Forecast (QPF), and (iii) improve Soil Water Index and Run-off Index, both of which will be indicators for risks arising from sediment disasters and flooding. Among the above necessity, the foundation is the

integration of observing data of radars and Automated Weather Stations (AWSs) of JMA and other organs, including sufficient quality control, to realize higher precision QPE. The presentation gave an outline of JMA's activities on the integration of observing data.

5.5 Mr Yong Qing Chen (China) delivered a presentation on progress on implementation of WIGOS in China. China is one of countries with a variety of topography and climate type, and suffers all sorts of meteorological disasters. Several kinds of meteorological observing networks were established and operated in different times by CMA to meet specific needs. CMA initialized the concept of Integrated Observation in the early 2000's. Disaster prevention and mitigation, urban meteorological service, and other service needs arising from social and economic sectors, called for a coordinated, comprehensive, and sustainable observation systems. In 2010, the development plan of China Integrated Observing System from 2010 to 2015 is issued by CMA, which aim to adapt the observing systems to different meteorological service requirements, involve in redesigning and evolving observing systems driven by meteorological service needs, exploring the mechanisms for integrating observing system, intensifying data management and data delivery systems. Some progress has been made recently. As a first step to redesign observing network, CMA finalized the redesign of National Climate Reference Network, which is more homogenous than before. The observing capacity such as surface observations, upper-air observations, weather radars and satellite observations has been improved a lot in recent years. The resource needed for development of observing network has been mobilized in different ways, both from central or local government and partners. Management of observing systems and institutions for data management were also improved. In order to promote the process of standardizing of observation, the Meteorological Facilities and Observing Environment Standard Law was issued by the government in 2011. The National Technical Standardization Committee on Meteorological observation instruments and methods and the National Technical Standardization Committee for Satellite meteorology and space weather observation are also established. CMA plans to develop China WIGOS Implementation Plan on the basis of WIGOS framework implementation plan and the Regional Implementation Plan in the next year.

5.6 Mr O-Ung Kwon (Republic of Korea) delivered a presentation on WIS implementation and open WIS consortium. Mr Kwon noted that KMA joined the WIS project at the early stage, and participated in developing Open WIS software in 2010. Open WIS is versatile, fully interoperable, modular, portable and adaptable software, satisfying all of 15 WMO Technical Specifications for WIS implementation. He emphasized that GISC Seoul was successfully audited by ET-GDDP in May 2012, and endorsed in the WMO EC-64 in June 2012. For the settlement of WIS operation, KMA held the first GISC Seoul International WIS Workshop in Jeju, Republic of Korea, from 6 to 9 November 2012. It was a valuable opportunity to review the progress on management of endorsed GISCs and to share the WIS technologies and regional implementation plans. It was agreed in the workshop that human resources development are the most essential in WIS, and these kinds of workshops should be continued. Mr Kwon noted that GISC Seoul is going to be normally operational in the beginning of 2013 as well as a DCPC, National Meteorological Satellite Center of Korea. Other Korean DCPCs will be operational in 2014; Support for DCPC and NCs in the area of responsibility of GISC Seoul will be continued.

5.7 Ms Xiang Li (China) delivered a presentation on WIS service in China. Beijing was designated as WIS GISC at the 16th WMO Congress and has started its formal operation since August 2011. And, in addition to that RTH Beijing was designated as DCPC at the 16th WMO Congress, 4 centres in CMA, such as RCC Beijing, RSMC Beijing, RSMC-ERR Beijing and the National Meteorology Satellite Centre (NMSC), were designated as DCPC at the 64th session of

WMO Executive Council. Those 4 DCPCs will start operation by the end of 2012. Currently, CMA has implemented all functional and technical requirements of the WIS. The metadata services of metadata generation, metadata upload metadata online editor and metadata synchronization, as well as the data services of data cache, data request and data subscription will be introduced. CMACast is a Meteorological Data Broadcast System which is operated by CMA and has started formal operation since June 2012. CMACast is based on DVB-S2 technology with both file and multimedia transmission capability. It uses an entire 36 MHz C-band transponder of AsiaSat-4 to distribute meteorological data and satellite sensing data to users in China and Asia-Pacific region at 70Mbps data rate, and provides one-stop data services which cover the stages from collecting data in CMA to direct application of data in receiving stations. As a data distribution component of GISC Beijing, CMACast service will also be introduced.

5.8 Ms Mina Jabbari (I. R. of Iran) delivered a presentation on introduction to GISC Tehran activities. On the IRIMO GISC capabilities, Ms Jabbari iterated that users can have access to 24 hours data easily and also all the countries which has defined user ID and password can work with metadata easily for example they can upload their metadata and edit them by IRIMO GISC. With regards to IRIMO solution Ms Jabbarie noted that, currently, WIS core network is based on the plan which is presented in WMO Seminar by Mr Kenji Tsunoda which is the best solution because each GISC is connected to other GISCs. She further emphasized that IRIMO solution is based on Hypercube solution which is a logarithmic plan and the number of connection decreases so the cost of the implementation plan is lesser and this plan is more sustainable.

5.9 Mr Hiroyuki Ichijo (Japan) delivered a presentation on WIS Application Pilot Project: RAs II & V collaboration activity. He emphasized that the most important point for sustainable WIS operation is to have both views of maintenance and development in totality, and regional initiative and inter-regional collaboration can be of great advantage to facilitate standardization and improvement for operation. He also underlined key factors for reforming WIS Pilot Project would be meteorological data visualization methods, data acquisition application, and near real-time monitoring application. Mr Ichijo introduced new JMA website for the pilot project, which is developed to make participants familiar with WIS applications.

6. IMPROVING CLIMATE SERVICES. (TOPIC 4)

6.1 Dr Elena Manaenkova and Dr Bruce Stewart (WMO) delivered a presentation on the Global Framework for Climate Services. The Framework aims to enable society to manage the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable. The Framework will be built upon five components; namely, User Interface Platform, Climate Service Information System, Observations and Monitoring, Research, Modelling and Prediction, and Capacity Building. The Framework's priority areas are closely aligned to the needs and goals addressed by the Millennium Development Goals, the Hyogo Framework for Action and the United Nations Framework Convention on Climate Change. The WMO Extraordinary Congress (October 2012) established the Intergovernmental Board on Climate Services as a body accountable to the Congress and the respective Terms of Reference and Rules of Procedure, and approved the specific functions of the Secretariat in support of the Framework. It also adopted the Implementation Plan of the Global Framework for Climate Services for the subsequent further consideration by the Intergovernmental Board on Climate Services. The Implementation Plan has involved an extensive consultative and review processes. Draft Guidelines on Frames for Climate Services at the National Level have been written and an initial workshop on the Guidelines held in Bangkok in late 2012. A step-by-step

guidebook to conduct national workshops for Climate Services has also been compiled and tested in three African countries during 2012. This guidance material will be tested further during 2013 and a joint document prepared to assist NMHSs in this process. Immediate actions for NMHSs include: Designate representative(s) to serve as members(s) of the Intergovernmental Board; Promote the GFCS Plan to relevant stakeholders at national level; Convene user and pillar specific fora; and Facilitate coordination and collaboration among various institutions, including intermediary institutions at the nexus between climate information providers and climate services.

6.2 Dr S. D. Attri (India) delivered a presentation on Climate services in India. Dr Attri described the importance and the historic developments which led to the creation of a Global Framework for Climate Services (GFCS). He noted that in India, climate/environment related observations are being taken, both on regular and campaign mode by various institutions, university departments, research institutions and some non-governmental agencies. He further noted that efforts are required to bring all these sources of climate system related observations into a single national network for use by research community and climate service delivery. Dr Attri emphasized that GFCS will address need for: (i) Tailored products and services; (ii) Public and private services; (iii) Applications services like agriculture, water resources, health, disaster management, environment, and so on. India will continue to provide capacity building of developing countries in general and of RA II Members, in particular and will support new demonstration project. He stressed that increasing climate variability and severity of extremes are posing major challenge in RA II region. He concluded that IMD is augmenting its observational and forecasting mechanism in a major way and it is generating climate products and information in different spatial and temporal domains for various sectors.

6.3 Ms Mina Jabbari (I. R. of Iran) delivered a presentation on Climate modeling and forecast activities in the Mashad Climate Centre on behalf of Iman Babaeian. During the recent decades, we have been witnessing disasters such as heavy floods, unexpected warm or cold weathers, repeated droughts, plant blights, storms and hails. Strategic plans should be considered to reduce the effects of above mentioned events. In this regard, the National Centre for Climatology (Mashad Climate Centre) was established in 1995 in order to meet the needs of applied researches of the country in the fields of climatology, climate change, its effects, adaptation techniques, climate disasters, as well as updating and promoting seasonal forecasts and drought warnings. This centre aims to develop international cooperation related to climate in order to strengthen our country's position at international levels and this is in alignment with the country's long-term outlook. The centre consists of three groups of applied climatology, weather and climate disasters, and climate change and seasonal forecast and drought early warning program. Two types of activities are being done in this centre: regional and national levels.

6.4 Dr Saad Mohalfi (Saudi Arabia) delivered a presentation on Mechanisms of implementing climate services in arid and semi-arid regions. Dr Mohalfi summarized the important roles of users towards implementation of climate services in the following: Creating awareness of the importance of climate services in their business and its sustainability; Providing more information on the effect of climate on their sectors; Contributions from scientific communities and relevant experts; and Preparing the society for responding and insuring support of decision makers toward climate agenda. He listed the large number of users for climate data in Saudi Arabia and briefed on interactive approach followed to gain their trust and meet their growing demands and requirements.

6.5 Mr Wirat Waranuchit (Thailand) delivered a presentation on climate service for agriculture in Thailand. Mr Waranuchit described the weather-related hazards and their adverse impact on agricultural sector in Thailand. He further described the various warnings and advisory bulletins issued by his service to meet the growing needs and requirements of farmers and other users. He further emphasized the importance of training and interaction with the users in order to improve delivery of climate services for agriculture.

6.6 Mr Karma Tsering (Bhutan) delivered a presentation on enhancing climate services development in Bhutan. Mr Tsering recalled that the influence of weather, climate, water and related environmental conditions continues to shape the cultures, traditions and development paths of societies nationwide. He further recalled that challenges of climate variability and change will require efficient provision and application of weather, climate, water and related environmental services to enable societies to reduce the associated risks. Mr Tsering described how do functions and operations of DMHS form the foundation for the monitoring and prediction of weather, climate, water and related environmental conditions, as well as the issuance of warnings and alerts in Bhutan. He emphasized that DHMS requires meteorological, hydrological and environmental data and products not only from within Bhutan, but also from outside its borders. He reaffirms that for sharing information in a common format, DHMS must also contribute to the international system coordinated by WMO in exchanging observed data and information products to the mutual benefits of all member countries. He noted that it is also expected to engage in the regional cooperative arrangement like SAARC and relevant mechanisms thereof.

6.7 Mr Kamal Prakash Budhathoki (Nepal) delivered a presentation on status of climate service in Nepal. In describing the operation of Nepal Department of Hydrology and Meteorology (DHM), Mr Budhathoki noted that most of Nepal's hydrological and meteorological system relies on manual data collection with few near real time data transmission and visualized through internet. He emphasized that from a service delivery perspective, there is no system in Nepal for issuing authoritative warnings of weather and weather extremes to government authorities and key user groups, nor a system for issuing timely and targeted warnings to communities at high risk. He warned that the present status of climate service in Nepal is very limited and only provides the basic set of climate services such as weekly, monthly and annual climate reports and special reports in case of extreme weather situation. Mr Budhathoki noted that with the help of new automated weather observations, with near real time data transmission make it possible to process the data remarkably in shorter time and provide the services to the users fast. Therefore with relatively small efforts the services can be improved to fulfil the demands of modern climate service of a country.

6.8 Dr Yasir Elginaid Mohieldeen (Qatar) delivered a presentation on heat wave modeling in Qatar. Dr Mohieldeen mentioned that he has modeled, mapped and predicted heat wave hazard in the State of Qatar for two and five years using Geographic Information System (GIS) and Remote Sensing techniques. GIS was used to carry out multi-parameters, multi-layer analysis by combining parameters that influence and determine heat wave in the region. He used the results of his study to estimate the proportion of population vulnerable age groups that will be affected by heat wave events in Qatar. Dr Mohieldeen concluded that more than 87% of the children aged 4 and less are at very high risk to heat waves, while more than 86% of elderly people who are above 65 years are at the same level of risk. He noted that the model developed in this study can be used by decision makers and planner to make informed decisions on locations of new hospitals and schools and build them in low heat wave risk areas. Furthermore, the model gives a good indication of future electric energy consumption for air-conditioning and cooling of built-up areas.

6.9 Dr Hyun-Suk Kang (Republic of Korea) delivered a presentation on the development of regional climate scenario in Asia. He explained that the purpose of Coordinated Regional Downscaling Experiment (CORDEX) is to provide common modeling framework designed to; 1) evaluate and improve regional climate downscaling models and techniques, 2) provide a coordinated set of RCD-based projections for regions worldwide, and 3) facilitate the communication with the IAV community and involvement of the research community from developing countries. In this context, Korea Meteorological Administration (KMA) has conducted several sets of regional downscaling experiments for the CORDEX-East Asia domain within the CORDEX framework using the HadGEM3-RA. In addition, KMA is leading domestic regional climate modeling groups to be involved with four other regional climate models. Large-scale forcing to drive the HadGEM3-RA is obtained from the CMIP5 experiment using the HadGEM2-AO. According to the evaluation for the current climate simulation, in general, the HadGEM3-RA is able to reproduce small-scale features better than global climate model (HadGEM2-AO). In summer, despite the skill scores in reproducing surface air temperature compared to the HadGEM2-AO have been improved, those in precipitation become worse than HadGEM2-AO, which might be associated with failure in capturing the abrupt northward jump of monsoon precipitation during May in southern China. Time series of daily precipitation reveals significant discrepancies particularly in southern China region. Compared to the current climate, the East Asian summer monsoon is expected to be stronger in the future. Because the warming in East Asia is much more significant in continental land than in ocean, the increase in thermal contrast between land and ocean plays an important role in strengthening southwesterly monsoon flow so that the precipitation increases with northwestward displacement compared to the current climate. All outputs obtained from this research are archived in CORDEX-East Asia Databank (<http://cordex-ea.climate.go.kr>), and uploading/downloading service will be started by the end of December 2012. Data from other groups and/or other regions are also very welcomed to be archived and redistributed through the Databank.

7. CLOSURE OF THE SEMINAR

7.1 The president of Regional Association II expressed his thanks and appreciation to the Government of Qatar and to Mr Ahmad Abdulla and his staff for the warm hospitality. He also extended his gratitude to the WMO Secretariat and local staff for their excellent arrangements made for the Seminar.

7.2 The Seminar closed at 16:30 hours on 12 December 2012.

**WMO REGIONAL SEMINAR ON STRATEGIC CAPACITY DEVELOPMENT
OF NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES (NMHSs)
IN REGIONAL ASSOCIATION II (ASIA)**

(Doha, Qatar, 11-12 December 2012)

LIST OF PARTICIPANTS

Members

Afghanistan

Mohd Ishaq Noori

Bahrain

Adel Daham

Anwar Al-Mulla

Bangladesh

Arjumand Habib

Bhutan

Tashi Samdup

China

Yong Qing Chen

Xiang Li

Hong Kong, China

Chi Ming Shun

Cho Ming Cheng

India

S. D. Attri

Iran, Islamic Republic of

Mina Jabbari

Iraq

Arkan Abdullah Mozan

Faten Rashid Hameed

Ali Abdulkhaleq Ali

Japan

Tatsuya Kimura

Yoshiaki Kanno

Hiroyuki Ichijo

Kuwait

Mohamad Karam

Nasser Alfadhli

Ali Almotawa

Lao PDR

Singthong Pathoummady

Maldives

Abdul Muhsin Ramiz

Mongolia

Enkhtuvshin Sevjid

Sarantuya Ganjuur

Myanmar

Kyaw Kyaw Moe Oo

Nepal

Kamal Prakash Budhathoki

Oman

Ahmed Al Harthi

Pakistan

Qamar-Uz-Zaman Chaudhry

Arif Mahmood

Qatar

Ahmad Abdulla Mohamed

Abdulla Mohamed Al-Mannai

Yasir Elginaid Mohieldeen

Abdulrahman Al-Ansari

Republic of Korea

Chung-Kyu Park
Hee-sang Lee
Se-won Kim
O-ung Kwon
Hyun-suk Kang
Sung Kim

Saudi Arabia

Saad Mohalfi
Mohammed Babidhan
Ayman Ghulam

Sri Lanka

Dayananda Malavige Don

Tajikistan

Zafar Makhmudov

Thailand

Wirat Waranuchit
Somchai Baimoung

United Arab Emirates

Mohamed Hassan Alharmoody

Uzbekistan

Viktor Chub
Sergey Myagkov
Malika Nazarova

Viet Nam

Thuy Hang Nguyen

International/Regional Organization**International Centre for Integrated
Mountain Development (ICIMOD)**

Singh Shrestha Mandira

**Regional Integrated Multi-Hazard Early
Warning System (RIMES)**

Arjunapermal Subbiah

**WMO/ESCAP Panel on Tropical
Cyclones**

Qamar-Uz-Zaman Chaudhry

**South Asian Association for Regional
Cooperation (SAARC) Meteorological
Research Centre (SMRC)**

Arjumand Habib

WMO Secretariat

Elena Manaenkova
Robert Masters
Wenjian Zhang
Bruce Stewart
Mary Power
Tokiyoshi Toya
Kuniyuki Shida
Jaser Rabadi
Dong-Eon Chang
Dolgorsuren Khuukhenbaatar

Local Secretariat

Abdulla Mohamed Al-Mannai
R. Monikumar
Mazen Mohd. Omari

**WMO REGIONAL SEMINAR ON STRATEGIC CAPACITY DEVELOPMENT
OF NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES (NMHSs)
IN REGIONAL ASSOCIATION II (ASIA)**

(Doha, Qatar, 11-12 December 2012)

PROGRAMME

Tuesday, 11 December

Morning

08:30- Registration at Courtyard by Marriott Doha City Center Hotel

09:00-09:15 **Opening Ceremony**

Prof Victor Chub (President of RA II)

Mr Ahmed Abdulla Mohammed (PR of Qatar with WMO)

Dr Elena Manaenkova (WMO Assistant Secretary-General)

09:15-09:25 *Group Photo and Break*

09:25-09:30 **Introduction to the Regional Seminar and Working Arrangements**

Dr Tokiyoshi Toya (WMO)

Topic 1: Development and Implementation of Regional Strategic Operating Plan and Challenges of NMHSs in RA II

Chair: Mr Ahmed Abdulla Mohammed (Qatar)

Rapporteur: Mr Cho Ming Cheng (Hong Kong, China)

09:30-09:50 1-1 WMO strategic and operational planning
Dr Elena Manaenkova (WMO)

09:50-10:10 1-2 Implementation of RA II Strategic Plan 2009-2011: Evaluation of the progress using the survey results 2011
Dr Dong-Eon Chang (WMO)

10:10-10:30 1-3 Development of RA II Strategic Operating Plan 2012-2015
Mr Cho Ming Cheng (Hong Kong, China)

10:30-10:45 1-4 Development and implementation of the Strategic Operating Plan of Uzhydromet
Dr Sergey Myagkov (Uzbekistan)

- 10:45-11:00 1-5 Modernization of the hydrometeorological sector to the year of 2015
Ms Thuy Hang Nguyen (Viet Nam)
- 11:00-11:15 1-6 Central Asia Hydrometeorology Modernization Project
Mr Zafar Mahmudov (Tajikistan)
- 11:15-11:35 *(Coffee break)*
- 11:35-11:50 1-7 Implementation of Quality Management Systems
Mr Abdulla Mannai (Qatar)
- 11:50-12:05 1-8 Challenges encountered by the Maldives Meteorological Service in improving the operational services
Mr Abdul Muhsin Ramiz (Maldives)
- 12:05-12:20 1-9 Current status in the Department of Meteorology and Hydrology of Myanmar
Mr Kyaw Moe Oo (Myanmar)
- 12:20-12:35 Discussion on Topic 1
- 12:35-14:00 *(Lunch break)*

Afternoon

Topic 2: Capacity Development and Strategic Partnerships (including Role and Operation of NMHSs)

Chair: Dr Saad Mohalfi (Saudi Arabia)

Rapporteur: Mr Se-Won Kim (Republic of Korea)

- 14:00-14:30 2-1 WMO Capacity Development Strategy and Implementation Plan
Mr Robert Masters (WMO)
- 14:30-15:00 2-2 Top priorities of Aeronautical Meteorology Programme (AeMP) to be implemented in RA II
Mr Chi Ming Shun (Hong Kong, China)
- 15:00-15:15 2-3 Capacity development, role and operation of Lao NMHS
Mr Singthong Pathoummady (Lao P.D.R.)
- 15:15-15:30 2-4 Status and progress of Oman NMS activities including the Implementation of Tsunami Early Warning System within the Framework of Multi-Hazard Approach
Mr Ahmed Al Harthi (Oman)

- 15:30-15:45 2-5 The role and responsibility of KMA's meteorological satellite in RA II
Dr Hee-Sang Lee (Republic of Korea)
- 15:45-16:05 *(Coffee break)*
- 16:05-16:25 2-6 Strategic partnership with WMO and other regional organizations
Ms Arjumand Habib (Bangladesh)
- 16:25-16:45 2-7 Strategic partnership between WMO-RIMES
Mr Arjunapermal Subbiah (RIMES)
- 16:45-17:05 2-8 Building partnerships through HKH-HYCOS
Dr Mandira Singh Shrestha (ICIMOD)
- 17:05-17:20 Discussion on Topic 2

Wednesday, 12 December

Morning

Topic 3: Implementation of WIGOS/WIS

Chair: Chi Ming Shun (Hong Kong, China)

Rapporteur: Mr Tatsuya Kimura (Japan)

- 09:00-09:30 3-1 Future observation of the earth and its environment: The WIGOS imperative
Dr Wenjian Zhang (WMO)
- 09:30-09:50 3-2 Development of RA II WIGOS Implementation Plan (R-WIP-II)
Mr Kuniyuki Shida (WMO)
- 09:50-10:10 3-3 Implementation status of WIS in RA II
Mr Arif Mahmood Rana (Pakistan)
- 10:10-10:25 3-4 Integration of meteorological observing systems in Japan: A model for WIGOS implementation at national level
Mr Tatsuya Kimura (Japan)
- 10:25-10:40 3-5 Progress on implementation of WIGOS in China
Mr Yong Qing Chen (China)
- 10:40-10:50 *(Coffee break)*

- 10:50-11:05 3-6 WIS implementation and open WIS consortium
Mr O-Ung Kwon (Republic of Korea)
- 11:05-11:20 3-7 WIS service in China
Ms Xiang Li (China)
- 11:20-11:35 3-8 Introduction to GISC Tehran activities
Ms Mina Jabbari (I. R. of Iran)
- 11:35-11:50 3-9 WIS Application Pilot Project: RAs II & V collaboration activity
Mr. Hiroyuki Ichijo (Japan)
- 11:50-12:00 Discussion on Topic 3
- 12:00-13:00 (*Lunch break*)

Afternoon

Topic 4: Improving Climate Services

Chair: Dr Qamar-Uz-Zaman Chaudhry (Pakistan)

Rapporteur: Dr S. D. Attri (India)

- 13:00-13:30 4-1 Global Framework for Climate Services
Dr Elena Manaenkova and Dr Bruce Stewart (WMO)
- 13:30-13:45 4-2 Climate services in India: Challenges and plans
Dr S. D. Attri (India)
- 13:45-14:00 4-3 Climate modeling and forecast activities in the Mashad Climate Center
Ms Mina Jabbari (I. R. of Iran)
- 14:00-14:15 4-4 Mechanisms of implementing climate services in arid and semi-arid regions
Dr Saad Mohalfi (Saudi Arabia)
- 14:15-14:30 4-5 Climate service for agriculture in Thailand
Mr Wirat Waranuchit (Thailand)
- 14:30-14:45 4-6 Enhancing climate services development in Bhutan
Mr Karma Tsering (Bhutan)
- 14:45-15:00 4-7 Status of climate service in Nepal
Mr Kamal Prakash Budhathoki (Nepal)
- 15:00-15:15 4-8 Heat wave modeling in Qatar
Dr Yasir Elginaid Mohieldeen (Qatar)

15:15-15:30 4-9 Development of regional climate scenario in Asia
Dr Hyun-Suk Kang (Republic of Korea)

15:30-15:40 Discussion on Topic 4

15:40 **Closure of the Regional Seminar**
