MEMBER REPORT

ESCAP/WMO Typhoon Committee
42nd Session

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Singapore

Meteorological Services Division
National Environment Agency
Singapore

CONTENTS

I. Overview of tropical cyclones which have affected/impacted Member's area in 2009

1. Meteorological Assessment (highlighting forecasting issues/impacts)

   For the period of assessment from 1 January 2009 to 24 November 2009, the rainfall for Singapore fluctuated from below normal to above normal for each quarter of the assessment period. During the typhoon season, several tropical cyclones that moved across the South China Sea had some indirect impact on the weather in Singapore.

   In January 2009, the northeast monsoon that traditionally brings high rainfall to Singapore was rather mild. As a result rainfall in Singapore was below normal during this "wet" phase of the northeast monsoon season. Another main feature of this monsoon season was that the "dry" phase of the monsoon became established rather early in Singapore. From early January to mid February 2009, the northeasterly wind flow became cross-equatorial, resulting in an extended period of windy and dry conditions. However, brief episodes of northeast monsoon surges did affect the region but the wet weather was not prolonged. On the monsoon surge event on 14th January 2009, strong winds felled several trees and the reinforced the high tide of 3.3 m that day which led to slightly elevated sea levels that encroached into some walkways along the eastern coastal areas.

   The below normal rainfall in January 2009 extended into February 2009 and our climate station recorded a dry spell of 42 days, surpassing the previous dry spell record of 40 days during the same period in 2005. In addition, a new record for the hottest day in February was established where the daily maximum temperature reported was 35.0 degrees Celsius on 15 February 2009.

   In the second half of the year, the influence of tropical storms around the Philippines and the South China Sea led to moderate westerly winds predominating over Singapore and the region instead of the characteristic typical light and variable winds during the transition from the NE to SW monsoon seasons.

   The indirect impacts of the tropical storms due to the strengthening and convergence of southwesterly winds resulted in 19 line squalls affecting Singapore, 16 of which generated surface wind gusts above 20 knots. The maximum gust recorded was 45 knots on 22-23 April 2009. The storms that had an indirect impact on Singapore's weather were Chan-Hom, Kujira, Aila.

   The early part of the Northeast Monsoon Season of 2009/2010 brought heavy downpour to the island. In particular, the heavy rainfall on 19 November 2009 resulted in severe flooding in some parts of Singapore resulting in damage to property as well as in disruption to traffic flow and business.

2. Hydrological Assessment (highlighting water-related issues/impact)
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3. Socio-Economic Assessment (highlighting socio-economic and DPP issues/impacts)
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4. Regional Cooperation Assessment (highlighting regional cooperation successes and challenges)

   Under the auspices of the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), Singapore assisted in the rescue efforts from Typhoon Ondoy in Manila, Philippines between September and October 2009. Assessments on the population, structures, medical and food supplies, sanitary and transport affected by the disaster were conducted. Singapore also supported the United Nations Disaster Assessment and Coordination (UNDAC) efforts in providing communications and information technology coverage for On-site Operations Coordination Centre (OSOCC) to the National Disaster Coordinating Council (NDCC) premises.

II. Summary of progress in Key Result Areas (For achievements/results which apply to more than one Key Result Area, please describe them under the most applicable Key Result Area. Then, at the end of the description, place in parentheses ( ) the other applicable Key Result Areas)

1. Progress on Key Result Area 1: Reduced Loss of Life from Typhoon-related Disasters. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

   a. Meteorological Achievements/Results

      (i) Singapore will be installing a new 2.4m X/L-band satellite reception system to receive not just the NOAA and EOS MODIS data, but also from new satellites – METOP(EUMETSAT), FY3 and NPP (NASA-NOAA). The new system will be commissioned in 2010.

      (ii) To help alleviate the impact of storms such as squalls, or tropical cyclones, Singapore provides heavy rain and strong winds advisory and warning to various government agencies for enhancing preparedness for expected heavy rain and strong winds. The warnings are also issued to the public via the media.

   b. Hydrological Achievements/Results

      Over the past decades, Singapore has been improving the drainage infrastructure. The flood-prone areas have been reduced from 3200 ha in the 1970s to about 79ha in 2009. Singapore continuously reviews and upgrades her drainage infrastructure to ensure an effective drainage network for flood alleviation and prevention.

   c. Disaster Prevention and Preparedness Achievements/Results

      Singapore continued to enhance the national Tsunami Early Warning System (TEWS) with the addition of 2 new seismic sensors in 2009, completing the seismic network of a total of 8 sensors distributed over the island. Data from the seismic stations are transmitted to the central processing system in MSD and integrate with seismic data from regional seismic monitoring networks such as Malaysia, Indonesia and Australia for the automatic and continuous monitoring of seismic activities in the region. Data from seismic stations located over a much wider area enables MSD to enhance the accuracy and speed of detecting earthquakes in the region.

      Singapore provides water rescue and evacuation operations in the event of floods, resulting from typhoons and sustained rainfall and alerts the general public through the Public Warning System on the dangers of an impending flood.

   d. Regional Cooperation Achievements/Results

      As in (c) above.

      Singapore's Civil Defense Force provided assistance to Manila, Philippines between Sep and Oct 2009 to mitigate and reduce the consequences of typhoon-related floods and increase the survivability of the people.

   e. Identified Opportunities/Challenges for Future Achievements/Results

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2. Progress on Key Result Area 2: Minimized Typhoon-related Social and Economic Impacts. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

   a. Meteorological Achievements/Results

      As in KRA 1(a)

   b. Hydrological Achievements/Results

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c. Disaster Prevention and Preparedness Achievements/Results
As in KRA 1(c).

d. Research, Training, and Other Achievements/Results

Singapore's Civil Defense Academy provides disaster rescue and mitigation courses to the international community.

e. Regional Cooperation Achievements/Results

Under the ambit of the United Nations Environment Programme/Office for the Coordination of Humanitarian Affairs (UNEP/OCHA) Joint Environment Unit (JEU)), Singapore provides international assistance for Hazardous Materials emergencies (HazMat) that may arise from typhoon-related incidents.

f. Identified Opportunities/Challenges for Future Achievements/Results

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3. Progress on Key Result Area 3: Enhanced Beneficial Typhoon-related Effects for the Betterment of Quality of life. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

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b. Hydrological Achievements/Results

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c. Disaster Prevention and Preparedness Achievements/Results

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d. Research, Training, and Other Achievements/Results

(i) Singapore participated in training workshops/conferences/meetings during the year. Some were sponsored/organized by the Typhoon Committee. Singapore would like to express her thanks and appreciation to the Typhoon Committee for giving us the opportunity to participate in the workshops which our officers have found very useful and beneficial in their course of work. The list of relevant workshops/conferences are as follows:

- Remote Sensing for Disaster Management in SE Asia, 4 – 6 Feb 09, Bangkok, Thailand
- ICG/IOTWS-VI Meeting, 4 – 9 April 2009, Hyderabad, India
- 1st Training and Research Coordination Group (TRCG), 12 – 15 May 09, Jeju, Korea
- Tokyo Climate Conference: Better Climate Information for a Safe & Sustainable Society, 6 – 8 July 2009, Tokyo, Japan
- ESCAP/WMO Typhoon Committee Integrated Workshop "Building Sustainability and Resilience in High Risk Areas of the Typhoon Committee:Assessment & Action", 14 – 18 Sept 2009, Cebu, Philippines
- Training Workshop on Climate Applications in ASEAN, 2 – 9 October 2009, Kuala Lumpur, Malaysia

(ii) Singapore hosted the 5th APEC Climate Symposium on 12 - 15 July 2009 in conjunction with the 5th APEC Climate Center (APCC) Working Group Meeting and the 5th APCC Science Advisory Committee Meeting. The symposium also included a tutorial session on empirical downscaling for regional adaptation and a hands-on session using the Climate Information Kit. The event was attended by 60 participants from 21 National Meteorological and Hydrological Services (NMHSs) and institutions, including the APEC Secretariat and the co-chair of the Task Force on Emergency Preparedness (TFEP) also attended the event.

e. Regional Cooperation Achievements/Results
As in KRA 3(d)

f. Identified Opportunities/Challenges for Future Achievements/Results
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4. Progress on Key Result Area 4: Improved Typhoon-related Disaster Risk Management in Various Sectors. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results
As in KRA 1(a) and KRA 6(a)

b. Hydrological Achievements/Results
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c. Disaster Prevention and Preparedness Achievements/Results
As in KRA 1(c).

d. Research, Training, and Other Achievements/Results
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e. Regional Cooperation Achievements/Results
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f. Identified Opportunities/Challenges for Future Achievements/Results
As in KRA 2(e).

5. Progress on Key Result Area 5: Strengthened Resilience of Communities to Typhoon-related Disasters. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results
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b. Hydrological Achievements/Results
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c. Disaster Prevention and Preparedness Achievements/Results
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d. Research, Training and Other Achievements/Results
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e. Regional Cooperation Achievements/Results

Singapore joined 17 other countries around the Indian Ocean Rim to test the effectiveness of its tsunami warning system for the first time during Exercise Indian Ocean Wave 2009 (IOWave09) which took place on 14 October 2009. The Meteorological Services Division of NEA, as the tsunami watch centre of Singapore, coordinated with the other government agencies during the exercise to test their operational lines of communications. This exercise was also part of an on-going effort to test the national tsunami early warning system.

f. Identified Opportunities/Challenges for Future Achievements/Results
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6. Progress on Key Result Area 6: Improved Capacity to Generate and Provide Accurate, Timely, and understandable Information on Typhoon-related Threats. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

(i) Replacement of Weather Radar
The existing S-band Doppler weather radar at Meteorological Services Division (MSD), Singapore is an indispensable tool used for real-time surveillance of extreme weather

conditions (such as storms and wind shear) which can adversely affect the safety of airline and shipping operations as well as activities of the general public. The existing radar is in the process of being replaced with a new S-band dual-polarization radar. The new radar is expected to be installed and be operational by 2Q of 2010.

(ii) Message Switching System

The Message Switching System which handles the reception of information via GTS/AFTN (including TC advisories etc) is being replaced with a new system to enhance its reliability and capability. The international links to RTH-Melbourne, RTH-Bangkok, NMC-Kuala Lumpur, NMC-Jakarta and NMC-Manila (as part of the GTS) are also in the process of being migrated from Frame Relay to MPLS.

b. Hydrological Achievements/Results

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c. Disaster Prevention and Preparedness Achievements/Results

As in KRA 1(c)

d. Research, Training, and Other Achievements/Results

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e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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7. Progress on Key Result Area 7: Enhanced Typhoon Committee's Effectiveness and International Collaboration. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

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b. Hydrological Achievements/Results

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c. Disaster Prevention and Preparedness Achievements/Results

As in KRA 2(e).

d. Research, Training, and Other Achievements/Results

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e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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III. Resource Mobilization Activities

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IV. Update of Members' Working Groups representatives

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5. Resource Mobilization Group
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