MEMBER REPORT (SINGAPORE)

ESCAP/WMO Typhoon Committee
13th Integrated Workshop
Chiang Mai, Thailand
5-9 November 2018

CONTENTS

I. Overview of tropical cyclones which have affected/impacted Member's area since the last Committee Session

1. Meteorological Assessment (highlighting forecasting issues/impacts)

The development of Tropical Storms over the Indian or western Pacific Oceans can at times influence the winds over the surrounding regions of Singapore and in turn, have an impact on the weather in Singapore. Depending on the location of the storm as it tracks over the large water bodies and/or the extension of the tropical storm's rain bands over the southern South China Sea close to the Equator, the presence of these tropical storms could either bring fair and dry weather conditions or heavy thundery showers to the Island State. In case of the latter, lines of thunderstorm or squalls accompanied by occasional strong gusty winds are often induced under the influence of the storms, resulting in widespread heavy rainfall over Singapore and the surrounding vicinity.

During the 2018 Pacific Typhoon season, there were a few occasions in which tropical storms had an indirect influence on the weather in Singapore.

In early June 2018, the development of Tropical Storm Ewiniar over the South China Sea triggered widespread thunderstorms over Singapore and the surrounding region on 2 June 2018 and a squall line on 4 June 2018.

In mid-July 2018, Tropical Storm Son-Tinh first developed to the east of the Philippines on 15 July 2018. It intensified and tracked westwards into the South China Sea, before making landfall over Vietnam on 18 July 2018. Around the same time as Tropical Storm Son-Tinh was making landfall, Severe Tropical Storm Ambil started to develop in the western Pacific Ocean, east of the Philippines. It tracked northwestwards, and eventually made landfall over China. In addition, tropical depression 13W developed over the South China Sea on 20 July 2018. Under the influence of the three storms during this period, mesoscale convergence of winds was observed in the surrounding region of Singapore. Between 19 and 21 July 2018, squall lines developed to west of Singapore and moved eastwards, bringing about widespread thundery showers across Singapore on three consecutive nights.

2. Hydrological Assessment (highlighting water-related issues/impact)

- Nil

3. Socio-Economic Assessment (highlighting socio-economic and DRR issues/impacts)

- Nil

4. Regional Cooperation Assessment (highlighting regional cooperation success and challenges.

- Nil

II. Summary of Progress in Priorities supporting Key Result Areas

1. Enhancement of Weather Observing Network

- **Identified opportunities/challenges, if any, for further development or collaboration**
- **Priority Areas Addressed**

MSS operates a comprehensive weather observation system which comprises a network of manned and automatic weather stations, an upper air station, a lightning detection network, 2 dual-polarization Doppler weather radars, a wind profiler, wind and aerosol LIDARs and various weather and environmental satellite reception and processing systems. MSS' observation network is continually enhanced to support operational needs as well as the requirements of other government agencies.

During the period of review, additional automatic weather stations were installed across the island, bringing the total number of stations to 100. All the 100 stations measure rainfall, with a number of the stations measuring other parameters, such as wind, pressure and temperature.

Information from the weather observation network is provided in near-real time to the public and government agencies and supports the provision of reliable and timely forecast and warnings of heavy rain events.

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2. ASEAN Climate Outlook Forum (ASEANCOF) and Southeast Asia Regional Climate Centre Network (SEA RCC-Network)

Background

The ASEAN Climate Outlook Forum (ASEANCOF) was established in 2013, following the strong support at the 35th Meeting of the ASEAN Sub-Committee on Meteorology and Geophysics (ASCMG) held in Manado, Indonesia (2-4 July 2013) for the proposal for a Regional Climate Outlook Forum (RCOF) in Southeast Asia. The national representatives present at the meeting also supported the offer by Singapore to host the first meeting at the Meteorological Service Singapore's Centre for Climate Research Singapore (CCRS). The RCOF concept was initiated by the WMO/Climate Information and Prediction Services (WMO/CLIPS) project, in collaboration with NMHSs, regional/international climate centres among many other partners. ASEANCOF aims to provide collaboratively developed and consensus-based seasonal climate outlooks and related information on a regional scale, including risk assessment of heightened tropical cyclone activities and the associated atmospheric circulation anomalies. These activities support decision-making to manage climate-related risks and support sustainable development. ASEANCOF sessions are coordinated by the local hosts and MSS, as host of the ASEAN Specialised Meteorological Centre (ASMC).

The Southeast Asia Regional Climate Centre Network (SEA RCC-Network), as an operational platform for delivery of climate services, complements the ASEANCOF, which is primarily a discussion platform. The SEA RCC-Network entered demonstration phase in November 2017.

It was first proposed at the WMO RA V 16th Session (Jakarta, May 2014), straddling ten Southeast Asian countries in two WMO Regional Associations (RA), RA II and RA V.

Following a series of meetings in 2015 and 2016, the Implementation Plan was drawn up by Meteorological Service Singapore (MSS) with contributions from regional partners Badan Meteorologi, Klimatologi dan Geofisika (BMKG), Indonesia and Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), which was then endorsed by the RA V Management Group on 24 March 2017. As a group of centres (nodes), the SEA RCC-Network collectively fulfils the four mandatory functions of an RCC, namely long-range forecasting led by MSS, climate monitoring led by PAGASA, operational data services led by BMKG, and training led by all three partners. MSS is the coordinator of the Network. Within the monitoring and long-range forecasting functions, assessments of tropical cyclone activities are included as deliverables by either the lead node or a contributing consortium member.

Recent Developments

ASEANCOF

The Ninth ASEANCOF (ASEANCOF-9) was hosted by the National Center for Hydro-meteorological Forecasting, Vietnam. It was conducted in November 2017 in Hanoi ahead of the December-February (DJF) boreal winter monsoon season of 2017-18.

The meeting was attended by representatives from the ASEAN NMHSs, the WMO's Global Producing Centres of Long-Range Forecasts (GPCs), end-user communities, as well as experts from WMO Lead Centre for Long Range Forecast Multi-Model Ensemble (WMO LC-LRFMME) and the APEC Climate Centre (APCC). Apart from the regular forum proceedings to generate consensus rainfall and temperature outlooks, a two-day workshop themed "Applications to the agricultural community – impacts, user requirements and forecast communications" was held to discuss how seasonal predictions of rainfall mean and extremes can be useful to the agricultural sector.

The most recent ASEANCOF-10 meeting was conducted via email correspondence and online meeting, and was coordinated by Malaysian Meteorological in collaboration with ASMC for the June-August (JJA) summer monsoon season of 2018. The Consensus Outlook from ASEANCOF-10 for the region was published in early June 2018. The next ASEANCOF-11 is planned to be hosted by the Malaysia Meteorological Department in November 2018 in Kuala Lumpur.

Detailed meeting reports are available at: http://asmc.asean.org/asmc_asean_conf_about/.

SEA RCC-Network

Following the start of the demonstration phase for the SEA RCC-Network, the 3 nodes have since provided pilot products for long-range forecast, climate data services, and monitoring through their respective portals. These sites can be accessed from the main page of the SEA RCC-Network (http://ccrs.weather.gov.sg/sea-rcc-network). During the demonstration phase, monitoring and outlook products for tropical cyclone activity will be explored by the responsible node or consortium member of the node.

Identified opportunities/challenges, if any, for further development or collaboration:

ASEANCOF is focused on seasonal predictions, but the SEA RCC-Network, in demonstration phase, can serve as complementary platforms to deliver both seasonal (long-range) and sub-seasonal (shorter range) monitoring and outlook products, in particular for risk of tropical cyclone related activity. These products will be contributed by its Climate Monitoring Node led

by PAGASA and its Long-Range Forecast (LRF) Node led by MSS with contributions from PAGASA as a consortium member of the LRF Node.

Priority Areas Addressed:

Improved capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

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3. Collaborations with the National Water Agency to Manage and Maintain Adequate Water Supply

The National Water Agency of Singapore, manages the water supply, water catchment and used water in Singapore. Intense thunderstorms, prolonged rainfall, and dry spell events can have an impact on the water levels in the water catchment areas. Therefore, it is crucial for the National Water Agency to receive reliable and as accurate as possible extended- and long-range forecasts on the timescale of weeks to months ahead so as to make informed decisions to manage the level of water in the reservoirs. Rainfall patterns on this timescale are influenced by planetary- and synoptic-scale climate drivers and processes, including tropical cyclones, that change the atmospheric circulation patterns over Singapore and the nearby region.

MSS provides a 7-Day quantitative precipitation forecast to the National Water Agency. It is an outlook of the total rainfall amount expected for critical water catchment areas for the next several days. This enables the National Water Agency in their manpower management to prepare for heavy rainfall events, and to maintain adequate water supply for the nation. MSS has also been providing a 3-month probabilistic rainfall outlook to the Agency and are exploring ways to improve these services, including providing quantitative estimates of rainfall and it linkages to reservoir water levels and streamflow.

Identified opportunities/challenges, if any, for further development or collaboration:

Nil

Priority Areas Addressed:

Minimize and mitigate the potential negative impact of heavy rainfall and extended dry period events.

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4. Hydrological Achievements and Results

Over the past decades, Singapore has been improving the drainage infrastructure. The flood-prone areas have been reduced from 3200 hectares in the 1970s to about 29.2 hectares today.

Singapore continuously reviews and upgrades her drainage infrastructure to ensure an effective drainage network for flood alleviation and prevention.

Identified opportunities/challenges, if any, for further development or collaboration:

Nil

Priority Areas Addressed:

The rain band associated with typhoons occasionally induce intense thunderstorms over Singapore. The constant effort to review and upgrade the drainage infrastructure can help to minimize the impact of flash floods on business and everyday life.

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5. Participation in Training Workshops, Conferences and Meetings

Singapore participates in several meteorological training workshops, conferences and meetings each year, and each time, officers found the training workshops/meetings educational and beneficial in their course of work. The list of relevant workshops, conferences and meetings attended in 2017/2018 are as follows:

- ESCAP/WMO Typhoon Committee 12th Integrated Workshop, 30 Oct–3 Nov 2017, Jeju, Republic of Korea
- 6th International Workshop on Monsoons (IWM-6), 13–17 Nov, Singapore
- ASEAN COF-9, 15 - 17 Nov 2017, Ha Noi, Vietnam
- TCC Training Seminar on Seasonal Forecast, 29 Jan–2 Feb 2018, Tokyo, Japan
- WMO/ASEAN Training workshop on Weather Radar Data Quality and Standardization, 5–13 Feb 2018, Bangkok, Thailand
- 50th Session of the Typhoon Committee, 28 Feb–3 Mar 2018, Ha Noi, Vietnam
- SCMG-40, 2 - 4 May 2017, Singapore
- ASEAN Workshop on Weather Modification 2018, 6-9 Sep 2018, Chiang Mai, Thailand
- China-ASEAN Meteorological Forum, 12–13 Sep 2018, Nanning, China.

Identified opportunities/challenges, if any, for further development or collaboration:

The workshops provided opportunities for officers to expand their knowledge and develop projects within the Service to better improve our services to users.

Priority Areas Addressed:

Attending meetings and workshops can help to ensure that Singapore as with other Members are working towards the improving international and regional collaboration.

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