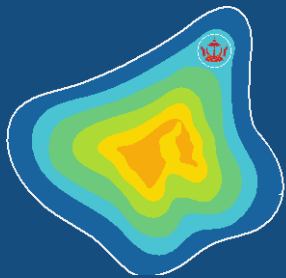




# FIRST STEERING COMMITTEE MEETING (SCM 1) SOUTHEASTERN ASIA-OCEANIA FLASH FLOOD GUIDANCE SYSTEM (SAOFFGS)

10<sup>th</sup>-12<sup>th</sup> July 2017  
Jakarta, Indonesia

Overviews of existing flash flood forecasting and warning tools  
and hydrometeorological data of Brunei Darussalam

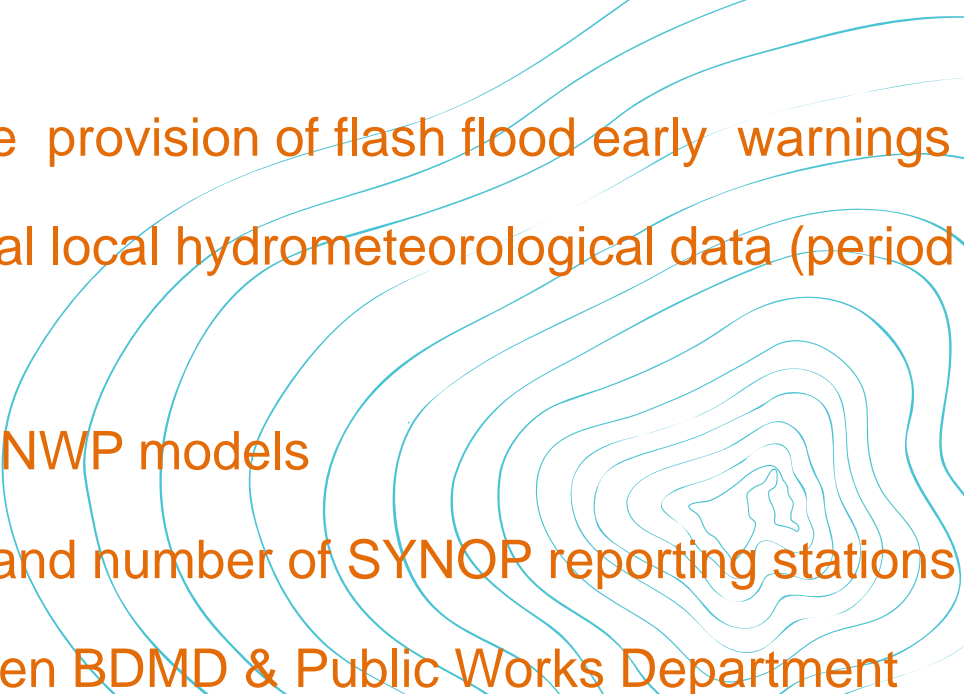


**BDMD**

Brunei Darussalam  
Meteorological  
Department

Presented by:  
Rokiah Haji Angas and Ng Swee Moi  
Brunei Darussalam Meteorological Department  
Ministry of Communications  
Brunei Darussalam

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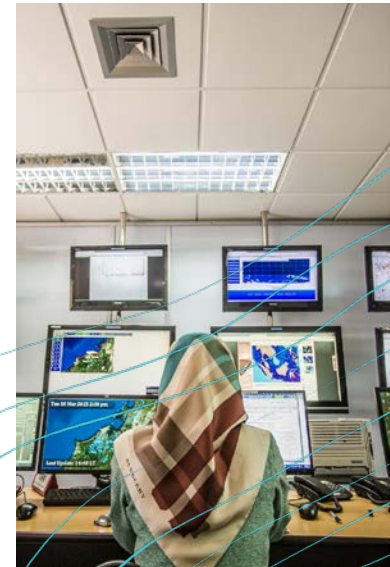
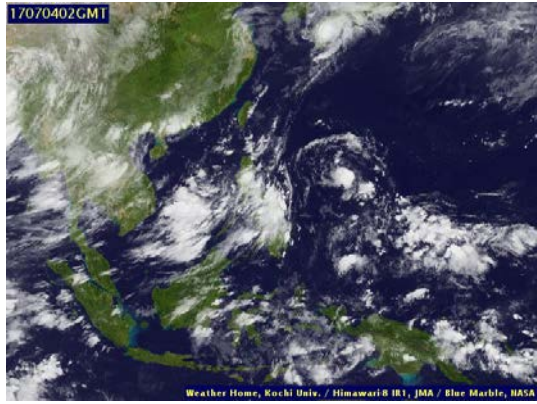
- Introduction
  - Local capacity for the provision of flash flood early warnings
  - Availability of historical local hydrometeorological data (period and frequency)
  - Available mesoscale NWP models
  - Accessibility to GTS and number of SYNOP reporting stations
  - Collaborations between BDMD & Public Works Department
- 

# INTRODUCTION

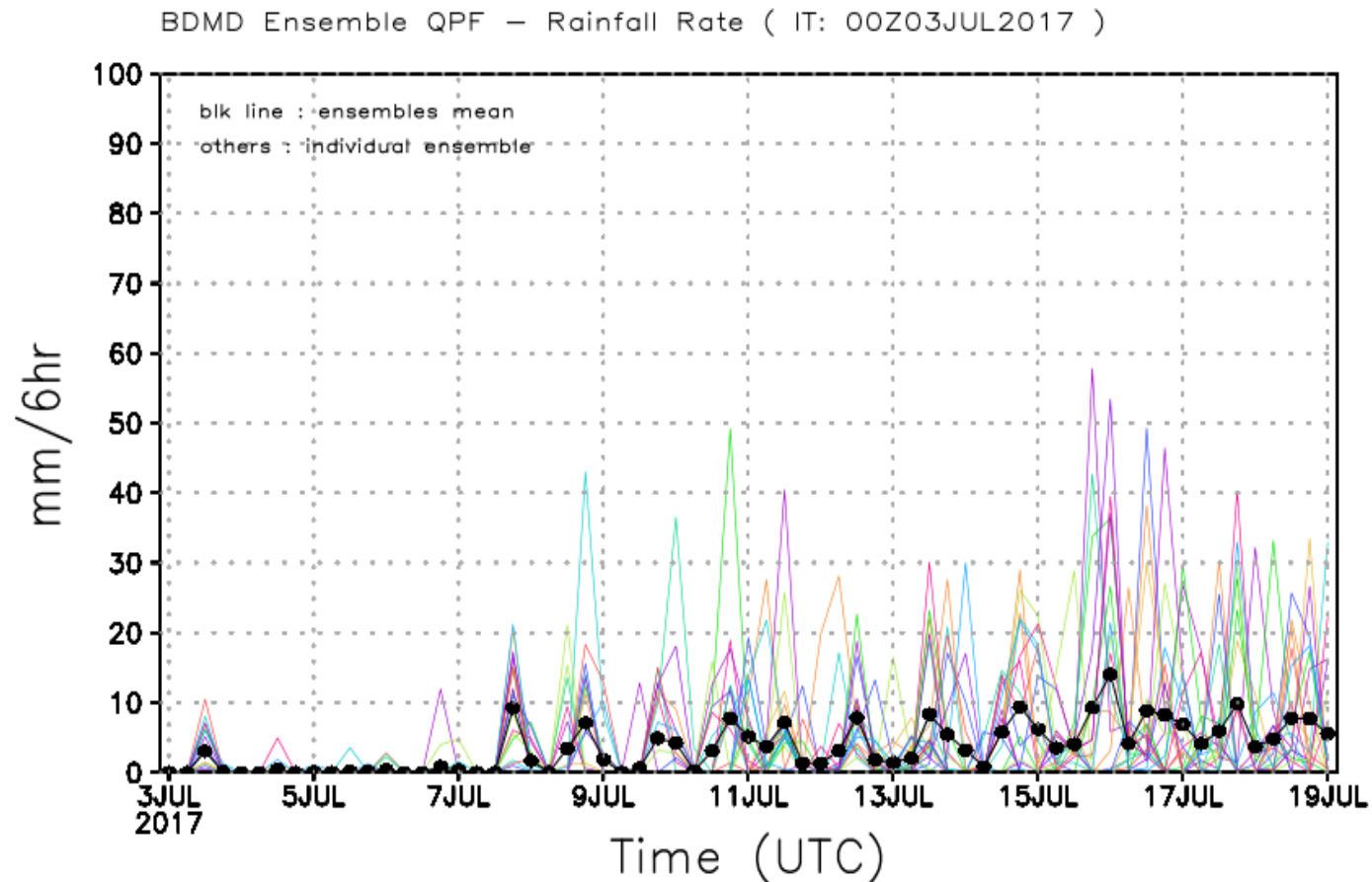


- Consistent and continuous observation of the weather of Brunei Darussalam
- Data collection, processing and analysis
- Provision of weather services such as forecast, advisory and warnings to the aviation sector and generally to the community at large
- Accurate long-term national climate record for research, planning and design and monitoring of climate variability

# Weather Observation



# Ensemble Rainfall Forecast for Brunei Darussalam

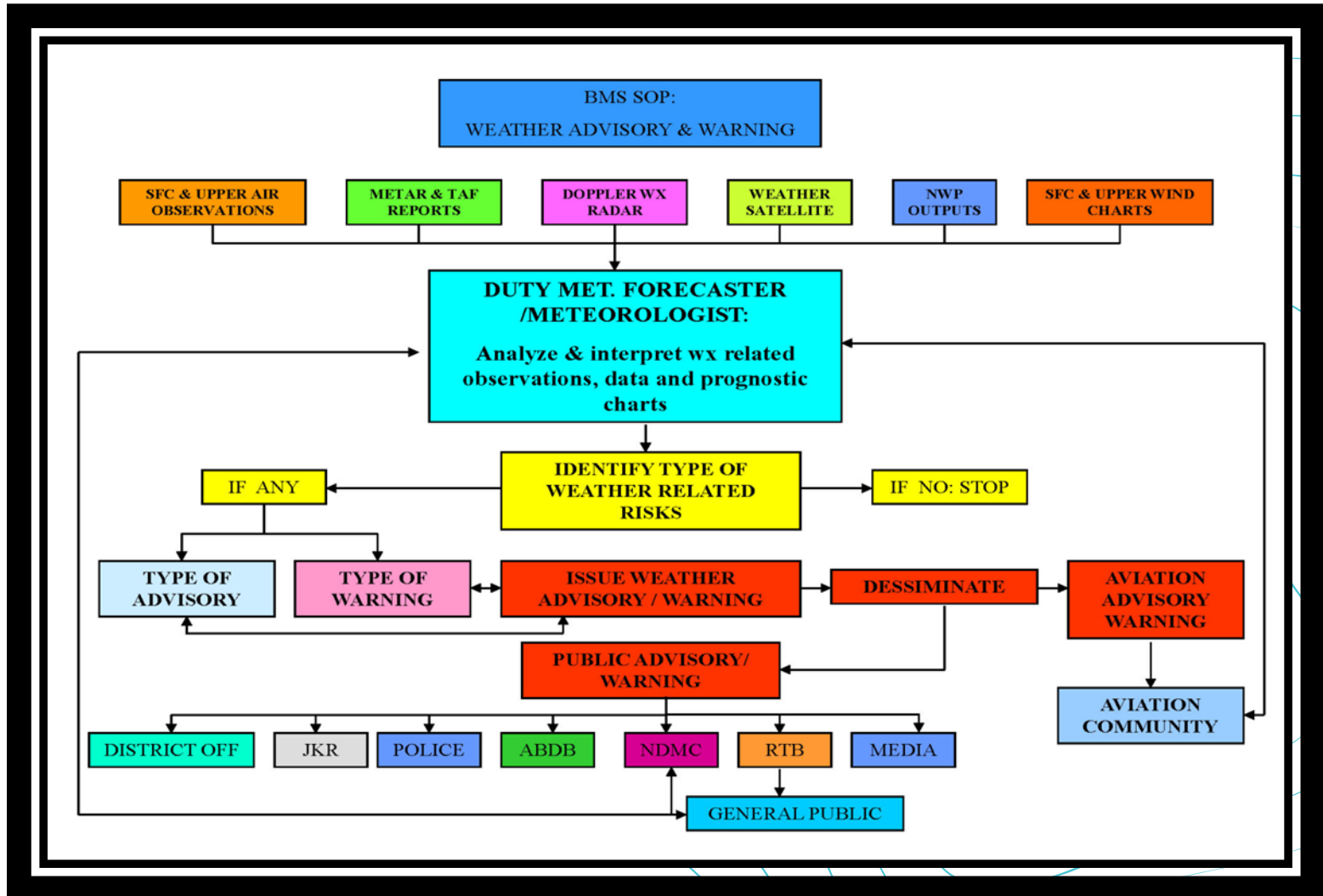




# Available mesoscale NWP models

- 📍 We refer to the following models
1. European Center for Medium range Weather Forecasting (ECMWF)
  2. Global Forecast System(GFS)
  3. Global Spectral model(GSM)
  4. Weather Research and Forecasting (WRF)

# ISSUANCE OF WEATHER WARNING



# Colour-Coded Severe Weather Warnings

BDMD uses colour-coded severe weather warnings to warn the public and relevant agencies of **severe or hazardous weather** which has the potential to cause damage to properties and major disruption to people's daily activities.



**Hujan Sekali-Sekala Lebat dan Berangin**  
*Occasional Heavy and Gusty Showers*

Dikeluarkan pada:  
*Issued at:*  
**04.45 PM**  
31/05/2017

Mansuh pada:  
*Ends at:*  
**10.00 AM**  
02/06/2017

Catatan | Remarks :  
Potensi keadaan cuaca aktif: bermula malam ini, Rabu (31/05/2017), sehingga pagi Jumaat (02/06/2017). Hujan kadangkala lebat dan berangin, dijangka sekali-sekala menjejaskan kawasan darat dan perairan negara. Risiko banjir kilat jika hujan lebat, terutama di kawasan rendah dan mudah banjir. Kelajuan angin dijangka meningkat sehingga 50 kmsj semasa hujan lebat atau berpetir. Ketinggian ombak paras Sederhana mencapai 2.0 m semasa hujan lebat, adalah berbahaya kepada pengguna bot kecil.

*Potential active weather conditions: starting tonight (31/05/2017) until Friday morning (02/06/2017). Showers, heavy and gusty at times, are expected to occasionally affect the land and water areas in the country. Risk of flash flood in heavy downpour, especially at low-lying and flood prone areas. Wind speed of up to 50 km/h is expected in heavy or thundery showers. Sea state of Moderate at up to 2.0 m in heavy downpour, is dangerous to small vessels.*

BIL NABSHAF: HCA/06/2017

KEMASKINI MAKLUMAT AMARAN CUACA UNTUK ORANG RAMAI

**HUJAN LEBAT DAN BERANGIN**  
*HEAVY AND GUSTY SHOWERS*

Dikeluarkan pada:  
*Issued at:*  
**7.30 PM**  
11/06/2017

Mansuh pada:  
*Ends at:*  
**2.00 AM**  
12/06/2017

Catatan | Remarks :  
Hujan di kawasan perairan Negara, kadang-kala lebat dan berangin, dijangka akan bergerak dan menjejaskan kawasan darat di Negara ini. Kelajuan angin dijangka meningkat sehingga 40 kmsj semasa hujan lebat atau berpetir. Risiko banjir kilat jika hujan lebat, terutama di kawasan rendah dan mudah banjir. Jarak pandangan berkurangan bagi pengguna jalan raya.

*Showers at sea, heavy and gusty at times, are expected to move and affect the land area. Wind speed of up to 40 km/h is expected in heavy or thundery showers. Risk of flash flood in heavy showers, especially at low-lying and flood prone areas. Reduce visibility for road users.*

**Peringkat Stage:**  
Kuning (Berwaspada)  
Yellow (Be Alert)

Dikeluarkan oleh: Pusat Ramalan Cuaca  
Talian Cuaca Tel. No:  
**114 2345567**  
Web [www.met.gov.bn](http://www.met.gov.bn) IG [bruneiweather](https://www.instagram.com/bruneiweather)  
FB: [facebook.com/bruneiweather](https://www.facebook.com/bruneiweather)

BIL AMARAN: ACA/066/2017

KEMASKINI MAKLUMAT AMARAN CUACA UNTUK ORANG RAMAI

**Hujan Lebat Berpetir**  
*Heavy Thunderstorms*

Dikeluarkan pada:  
*Issued at:*  
**06.00 PM**  
11/05/2017

Mansuh pada:  
*Ends at:*  
**9.00 PM**  
11/05/2017

Catatan | Remarks :  
Hujan, lebat dan berpetir, dijangka menjejaskan terutama kawasan Brunei Muara sebelum merebak ke daerah-daerah lain. Risiko banjir kilat semasa hujan lebat berterusan, terutama di kawasan rendah dan mudah banjir. Kelajuan angin dijangka meningkat sehingga 45 kmsj semasa hujan lebat atau berpetir. Jarak pandangan berkurangan bagi pengguna jalan raya.

*Heavy thunderstorms are expected to affect especially Brunei Muara before spreading to other districts later. Risk of flash flood during continuous heavy downpour, especially at low-lying and flood prone areas. Wind speed of up to 45 km/h is expected in heavy or thundery showers. Reduce visibility for road users.*

**Peringkat Stage:**  
Jingga (Bersedia)  
Amber (Be Prepared)

Dikeluarkan oleh: Pusat Ramalan Cuaca  
Talian Cuaca Tel. No:  
**114 2345567**  
Web [www.met.gov.bn](http://www.met.gov.bn) IG [bruneiweather](https://www.instagram.com/bruneiweather)  
FB: [facebook.com/bruneiweather](https://www.facebook.com/bruneiweather)

BIL AMARAN: ACA/053/2017





# AVAILABILITY OF HISTORICAL LOCAL HYDROMETEOROLOGICAL DATA BRUNEI DARUSSALAM

| DATA  | PERIOD                              | FREQUENCY     |
|---|-------------------------------------|---------------|
| Precipitation   | 1984 till present                   | Daily         |
| Temperature   | 1979 till present                   | Daily         |
| Soil type and texture                                     | Tutong District                     |               |
| Vegetation cover  | Tutong District                     |               |
| Stream network  | Brunei-Muara and<br>Tutong District |               |
| Relationship between<br>channel geometry and<br>catchment |                                     | Not available |

Soil type

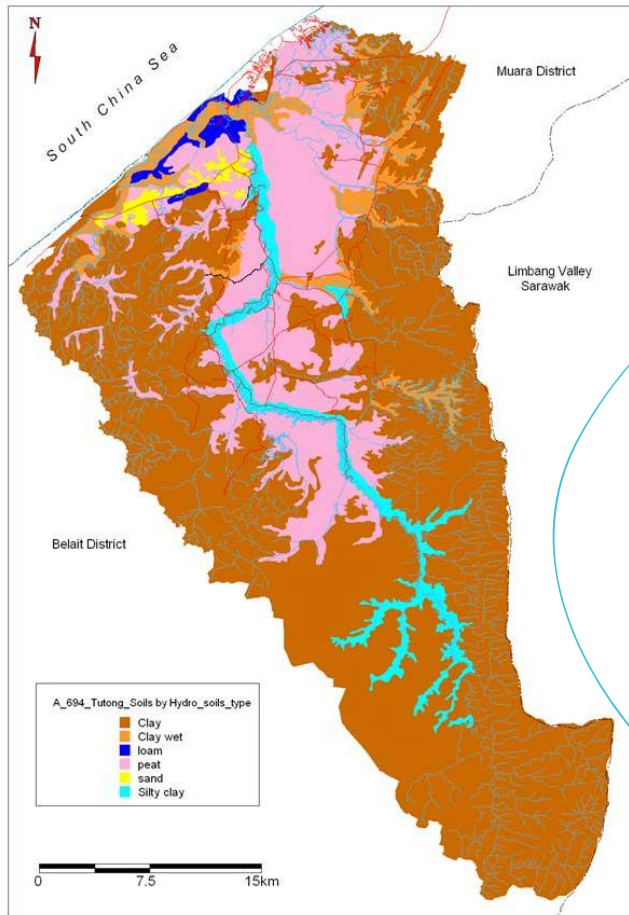


Figure: Soils

Vegetation cover

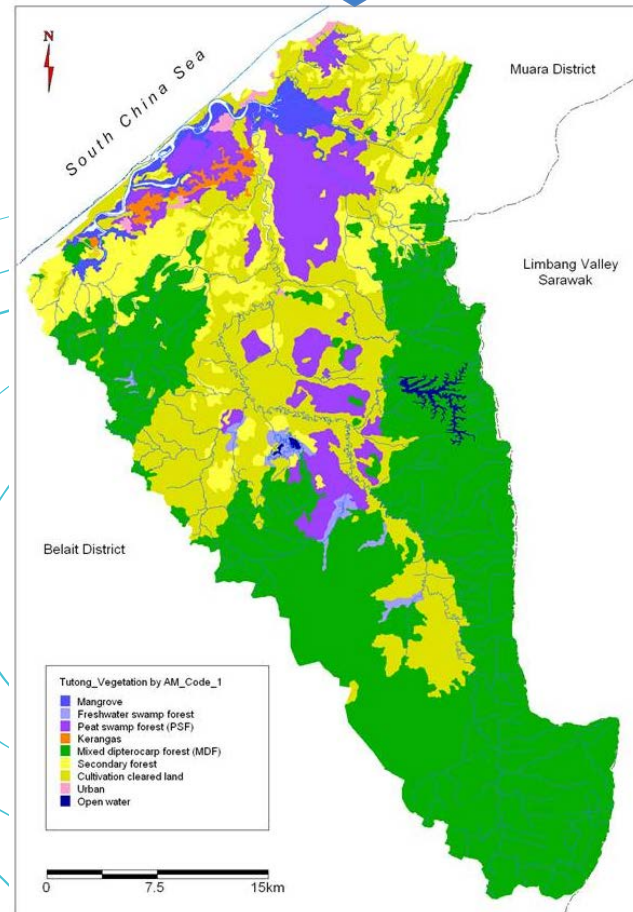


Figure: Vegetation

# AVAILABILITY OF DISCHARGE MEASUREMENT


| SITES                          | PERIOD                 | FREQUENCY                  |
|--------------------------------|------------------------|----------------------------|
| 1. Sungai Kedayan, Edinburgh   | May 2016 till present  | Collected every 15 minutes |
| 2. Jambatan Rambai, Sg Tutong  | Feb 2014 till present  |                            |
| 3. Bukit Puan, Belait District | Nov 2014 till present  |                            |
| 4. Bangar bridge, Temburong    | June 2012 till present |                            |



# Collaborations between BDMD & Public Works Department (MOD)

- Provide rainfall data to hydrology unit




  
 BDMDCSDFCFM07(01-2016-09-22)

**DAILY RAINFALL**

Station : Brunei International Airport  
Year : 2016

| DATE  | Urut : Millimeters |       |       |       |       |       |       |       |       |       |       | TOTAL | MAX    |       |
|-------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
|       | JAN                | FEB   | MAR   | APR   | MAY   | JUN   | JUL   | AUG   | SEP   | OCT   | NOV   |       |        | DEC   |
| 1     | trace              | NIL   | trace | NIL   | 2.5   | 11.7  | 5.8   | 3.3   | 32.4  | 25.0  | 12.4  | 1.4   | 94.3   | 32.4  |
| 2     | NIL                | NIL   | NIL   | trace | NIL   | NIL   | 1.0   | 1.7   | trace | 28.7  | 57.5  | 88.9  | 57.5   |       |
| 3     | NIL                | NIL   | 20.1  | NIL   | 13.9  | 10.0  | NIL   | 5.0   | 3.2   | NIL   | trace | 7.8   | 66.0   | 26.1  |
| 4     | 0.2                | 7.0   | trace | NIL   | 1.4   | 42.1  | NIL   | NIL   | 2.0   | trace | NIL   | 0.2   | 52.9   | 42.1  |
| 5     | 1.7                | NIL   | NIL   | trace | 0.1   | 0.4   | NIL   | 1.2   | 48.0  | NIL   | 29.3  | NIL   | 98.7   | 48.0  |
| 6     | 14.2               | trace | 1.0   | 1.2   | NIL   | NIL   | NIL   | trace | 6.9   | 7.0   | 19.1  | NIL   | 49.4   | 19.1  |
| 7     | trace              | 8.6   | 1.9   | NIL   | 0.3   | NIL   | NIL   | NIL   | 11.9  | NIL   | NIL   | trace | 22.7   | 11.9  |
| 8     | 58.4               | 19.6  | trace | NIL   | 60.0  | 0.4   | NIL   | trace | 8.0   | 0.7   | trace | 16.4  | 102.3  | 68.4  |
| 9     | 69.5               | NIL   | NIL   | 7.1   | 26.2  | 11.2  | NIL   | 3.2   | 12.4  | 6.1   | 21.2  | trace | 156.9  | 69.5  |
| 10    | 0.0                | NIL   | NIL   | 0.2   | trace | 0.0   | NIL   | 3.0   | trace | NIL   | 42.2  | trace | 47.0   | 42.2  |
| 11    | 1.9                | NIL   | NIL   | NIL   | 0.2   | 3.8   | NIL   | 0.1   | NIL   | trace | trace | trace | 5.5    | 3.8   |
| 12    | NIL                | NIL   | NIL   | NIL   | 0.2   | 2.8   | 2.3   | trace | 2.8   | 0.6   | 1.5   | 1.5   | 11.7   | 2.8   |
| 13    | NIL                | 0.3   | NIL   | trace | 0.4   | 22.2  | NIL   | NIL   | 0.1   | trace | 0.1   | NIL   | 31.1   | 22.2  |
| 14    | NIL                | 1.1   | trace | 36.0  | 5.7   | NIL   | 41.5  | 1.0   | NIL   | trace | 0.4   | NIL   | 85.7   | 41.5  |
| 15    | NIL                | NIL   | 9.0   | NIL   | 9.0   | NIL   | NIL   | 8.0   | NIL   | 26.8  | 3.5   | NIL   | 57.1   | 26.8  |
| 16    | NIL                | trace | NIL   | 0.7   | 0.8   | NIL   | 3.6   | trace | NIL   | 3.8   | NIL   | 8.9   | 3.8    |       |
| 17    | 1.0                | trace | 2.2   | trace | 0.6   | 7.6   | 9.5   | trace | NIL   | 0.5   | 3.2   | NIL   | 24.6   | 9.5   |
| 18    | NIL                | NIL   | trace | NIL   | NIL   | 128.2 | 0.2   | trace | 2.1   | 20.6  | 2.7   | 0.1   | 153.9  | 128.2 |
| 19    | NIL                | NIL   | NIL   | NIL   | trace | 17.0  | 0.6   | NIL   | NIL   | NIL   | 2.8   | 4.1   | 24.5   | 17.0  |
| 20    | 6.1                | NIL   | NIL   | NIL   | NIL   | 0.7   | 27.2  | NIL   | 10.9  | 7.0   | trace | 19.9  | 71.0   | 27.2  |
| 21    | NIL                | NIL   | NIL   | NIL   | NIL   | 2.2   | 4.7   | NIL   | 6.2   | trace | 1.5   | 7.8   | 22.4   | 7.8   |
| 22    | 0.2                | NIL   | 1.3   | NIL   | trace | 14.1  | 14.1  | 2.5   | 0.5   | NIL   | 29.3  | 1.2   | 63.2   | 29.3  |
| 23    | NIL                | NIL   | NIL   | 80.3  | 18.6  | 32.9  | 7.9   | 2.0   | trace | 29.2  | 16.9  | 4.4   | 190.2  | 80.3  |
| 24    | NIL                | trace | 0.6   | 2.3   | NIL   | NIL   | 5.7   | NIL   | NIL   | 24.8  | 9.6   | 1.4   | 50.4   | 24.8  |
| 25    | NIL                | NIL   | trace | NIL   | trace | 2.0   | 0.7   | 6.3   | NIL   | 13.9  | 54.0  | 2.9   | 80.6   | 54.0  |
| 26    | NIL                | trace | trace | 9.4   | trace | NIL   | 4.4   | NIL   | 2.3   | trace | NIL   | 2.9   | 18.0   | 9.4   |
| 27    | NIL                | trace | trace | 0.6   | trace | 59.4  | 13.3  | 0.7   | NIL   | 16.2  | 0.7   | 10.1  | 100.0  | 59.4  |
| 28    | NIL                | NIL   | trace | NIL   | trace | 5.3   | 0.4   | 6.4   | 35.7  | trace | trace | trace | 47.8   | 35.7  |
| 29    | 9.5                | NIL   | NIL   | 26.1  | 6.7   | NIL   | NIL   | trace | 2.7   | 0.2   | 6.9   | 16.2  | 62.4   | 26.1  |
| 30    | NIL                | 0.5   | NIL   | 6.9   | NIL   | 38.7  | 17.5  | 0.9   | 3.1   | 42.4  | 1.6   | 11.5  | 42.4   |       |
| 31    | NIL                | NIL   | NIL   | 65.7  | 13.7  | 0.4   |       |       | 15.1  |       | trace | 94.9  | 65.7   |       |
| Total | 172.3              | 36.6  | 42.6  | 163.9 | 243.9 | 370.3 | 200.0 | 57.9  | 160.5 | 230.5 | 339.3 | 164.4 | 2182.2 |       |
| Max   | 69.5               | 19.6  | 26.1  | 80.3  | 68.0  | 128.2 | 41.5  | 17.5  | 48.0  | 35.7  | 54.0  | 57.5  | 128.2  |       |

**Daily Rainfall**

# RECENT OF FLASH FLOODS

2015



Jerudong Park  
Amphitheatre, 20 Dec



Mulaut, 16 Oct



Temburong, 26  
Jan

2016



Tutong, 26 Jan

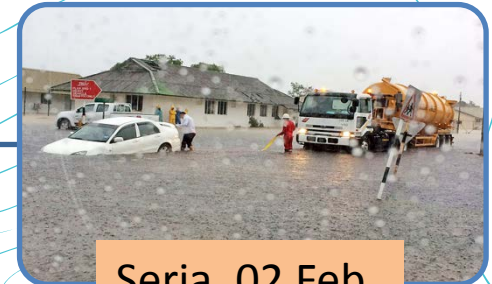


Rambai, 16 Nov

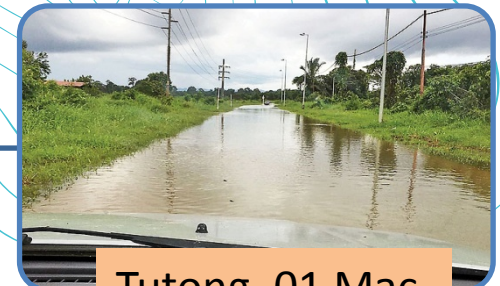


Brunei-Muara,  
01 Dec

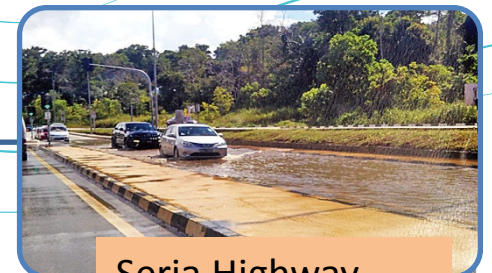
2017



Seria, 02 Feb



Tutong, 01 Mac

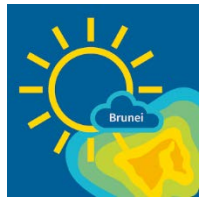


Seria Highway,  
01 Feb

# Thank you



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