



## WEBINAR 5

Pekerjaan Konstruksi  
Dalam Bidang Jasa  
Konstruksi

TEKNIK SIPIL POLITEKNIK NEGERI KUPANG

## Tema

Memahami Risiko  
Siklon Tropis di  
Indonesia

STUDI KASUS PROVINSI  
NUSA TENGGARA TIMUR

Link Registrasi



<https://bit.ly/jtspnk05>

Organized by :

Jurusan Teknik Sipil  
Politeknik Negeri Kupang

Sabtu

**08** Agustus 2020  
Pukul 10.00 WITA

Live on



zoom

You Tube

### Narasumber



**Dr Jonatan Lassa**  
Research Active Senior Lecturer  
Charles Darwin University  
Australia

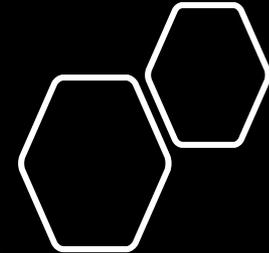
### Buruan Kuota Terbatas!!! Gratis!

- ▶ ID Meeting dan Password akan dikirim melalui alamat email yang telah didaftarkan
- ▶ Kuota terbatas
- ▶ Tersedia e-certificate bagi yang mengikuti webinar di zoom

### Narahubung

☎ +62 852-5310-9570 (Mateus)

Map data ©2018 Go





# **Risiko Siklon Tropis dan Tornado di Indonesia: Dengan Studi Kasus NTT**

**Teknik Sipil, Politeknik Negeri Kupang, 8 Agustus 2020**

**Dr. Ing. Jonatan A. Lassa**

**Emergency and Disaster Management**

**Charles Darwin University**

## Cyclone tracks - Australia [beta]

 This is a product developed as part of the Pacific Climate Change Science Program

### Tropical Cyclones

Current Cyclones

Cyclone Outlooks

Previous Cyclones

Cyclone tracks - Australia

Cyclone tracks - Southern Hemisphere

Cyclone tracks - Western North Pacific

Reports

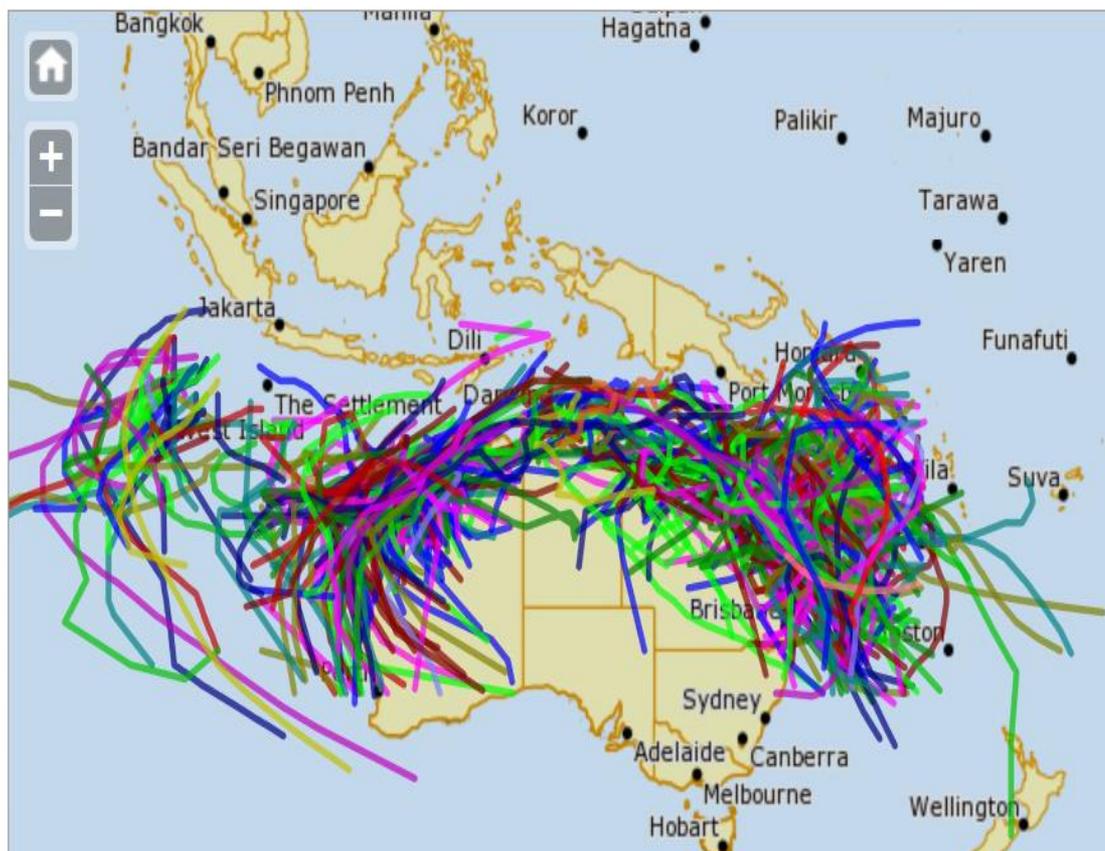
WA cyclones

NT cyclones

Qld cyclones

NSW cyclones

Cyclone Climatology



**Tracks** | Reference layers

multi-season

when: 1966 / 1967, 1967 / 1968, 1968 / 1969, 1969 / 1970, 1970 / 1971

presets: latest

where

what

Search

Visible cyclones: 421 / 421

Season 1906 / 1907

- Unnamed - 1

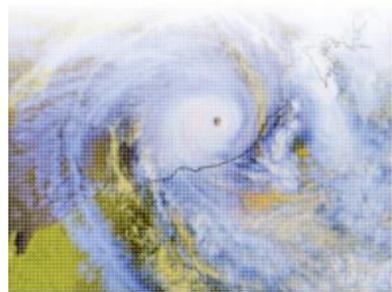
Season 1907 / 1908

- Unnamed - 2
- Unnamed - 3

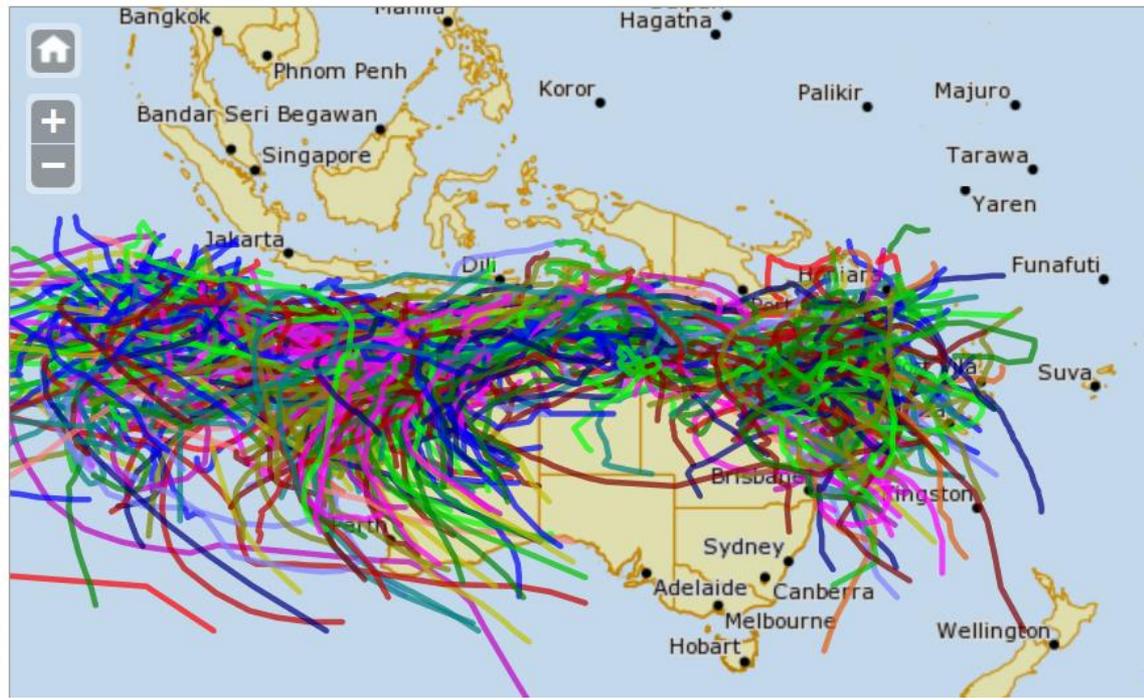
Cyclone Trends Australia 1900-1970: 5-6 events per year

## Cyclone tracks - Australia [beta]

 This is a product developed as part of the Pacific Climate Change Science Program



- Tropical Cyclones**
- Current Cyclones
- Cyclone Outlooks
- Previous Cyclones
  - Cyclone tracks - Australia
  - Cyclone tracks - Southern Hemisphere
  - Cyclone tracks - Western North Pacific
  - Reports
  - WA cyclones
  - NT cyclones
  - Qld cyclones
  - NSW cyclones
- Cyclone Climatology
- Cyclone XML Info



**Tracks** Refer

when

seasons:

- 2013 / 2014
- 2014 / 2015
- 2015 / 2016
- 2016 / 2017
- 2017 / 2018

where

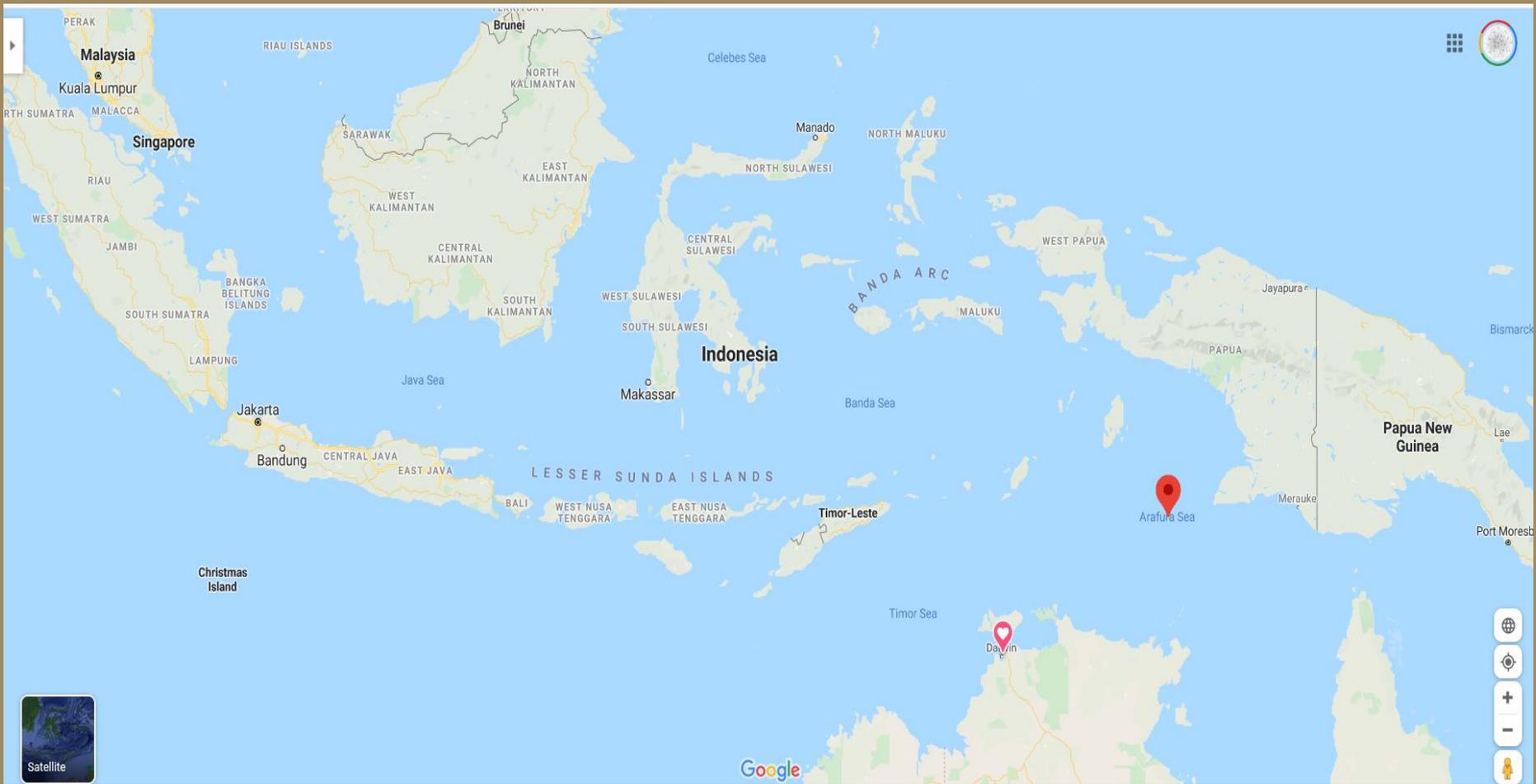
what

Visible cyclones: 530 / 530

Season 1970 / 1971

- AGGIE
- ANDREA
- BEVERLEY-EVA
- CARMEN
- DORA
- FIOMA

Cyclones History Australia 1970-2017: 11-12 events per year



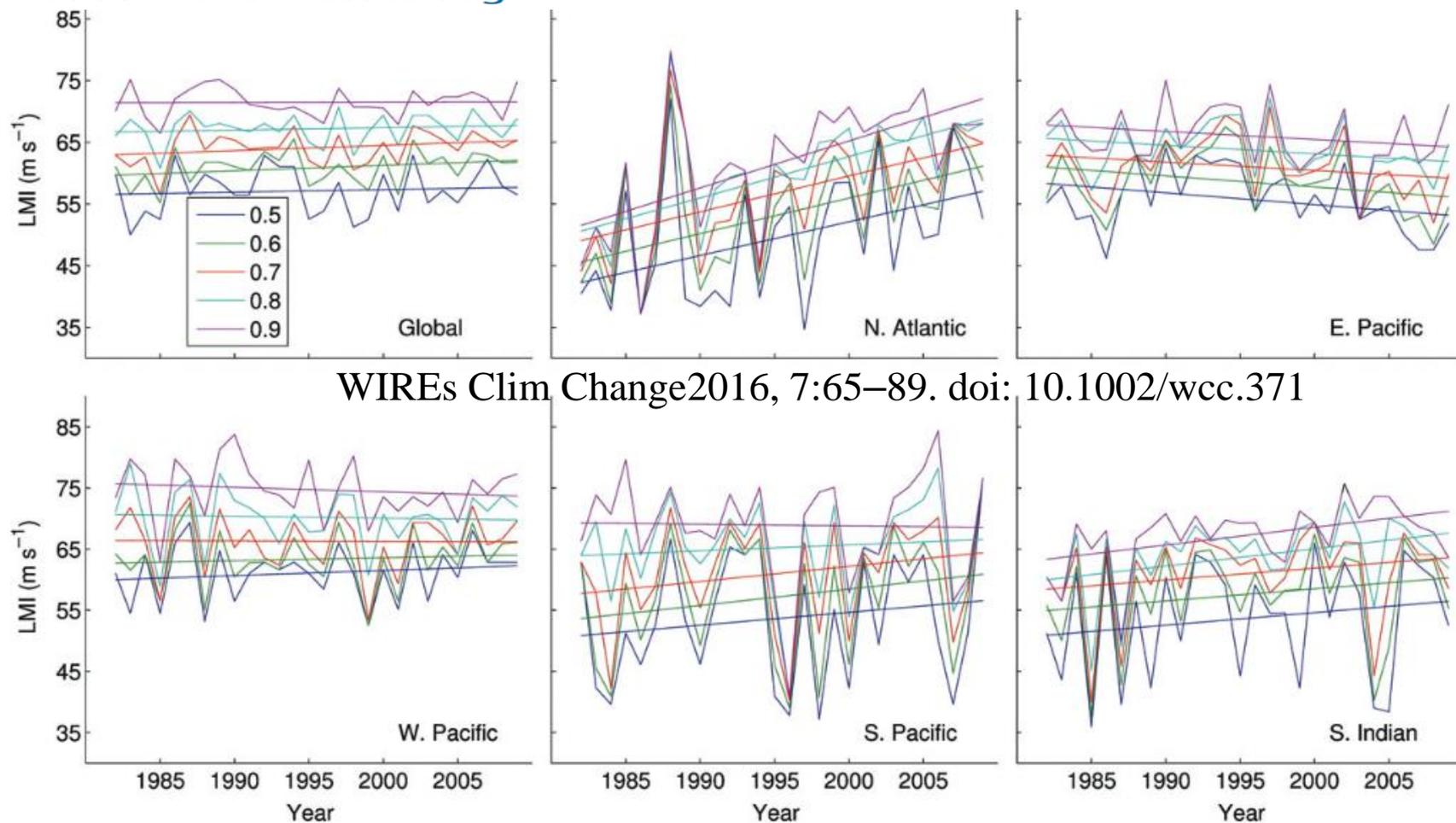
# Cyclone Breeding Grounds

---

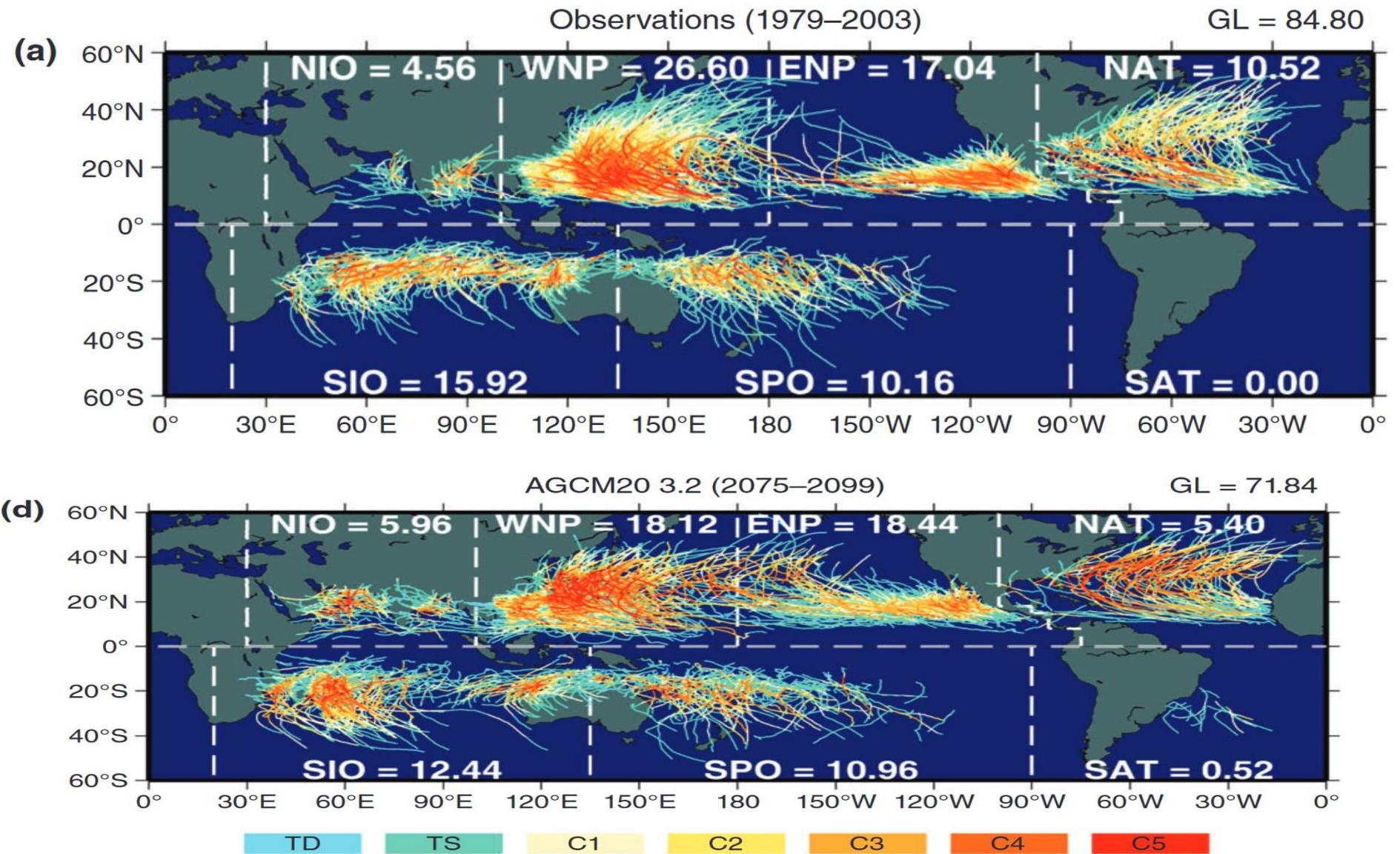


# Tropical cyclones and climate change

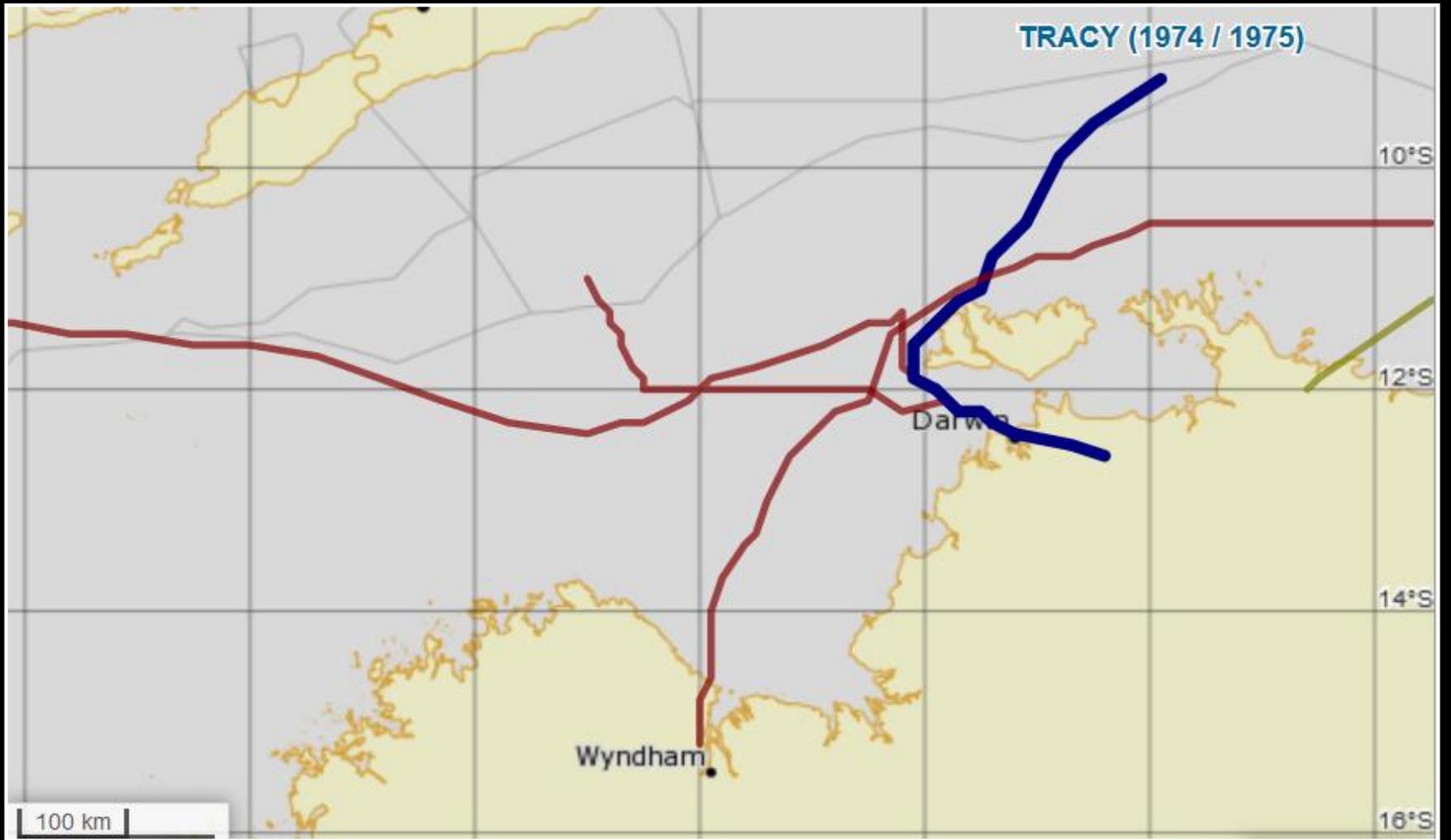
Kevin J.E. Walsh,<sup>1</sup> John L. McBride,<sup>2</sup> Philip J. Klotzbach,<sup>3</sup> Sethurathinam Balachandran,<sup>4</sup> Suzana J. Camargo,<sup>5</sup> Greg Holland,<sup>6</sup> Thomas R. Knutson,<sup>7</sup> James P. Kossin,<sup>8</sup> Tsz-cheung Lee,<sup>9</sup> Adam Sobel<sup>10</sup> and Masato Sugi<sup>11</sup>



**FIGURE 1** | Plots of quantiles (mean to 0.9) of the lifetime maximum intensity (LMI) of storms in the various tropical cyclone formation basins, from a homogenized satellite-based analysis of tropical cyclone intensity (1982–2009). (Reprinted with permission from Ref. 3 Copyright 2013 American Meteorological Society)



**FIGURE 4** | Global distribution of TC tracks during all seasons from 1979 to 2003 for (a) observations, (b) and (c), two current climate TC simulations, and (d) the global warming projection using the same GCM as for (c). The numbers for each basin show the annual mean number of TCs. TC tracks are colored according to the intensities of the TCs as categorized by the Saffir–Simpson hurricane wind scale (e.g., tropical depression [TD], tropical storms [TSs], and TC category C1–C5). (Reprinted with permission from Ref. 19 Copyright 2012 American Meteorological Society)



Cyclone Tracy Tracks 1974



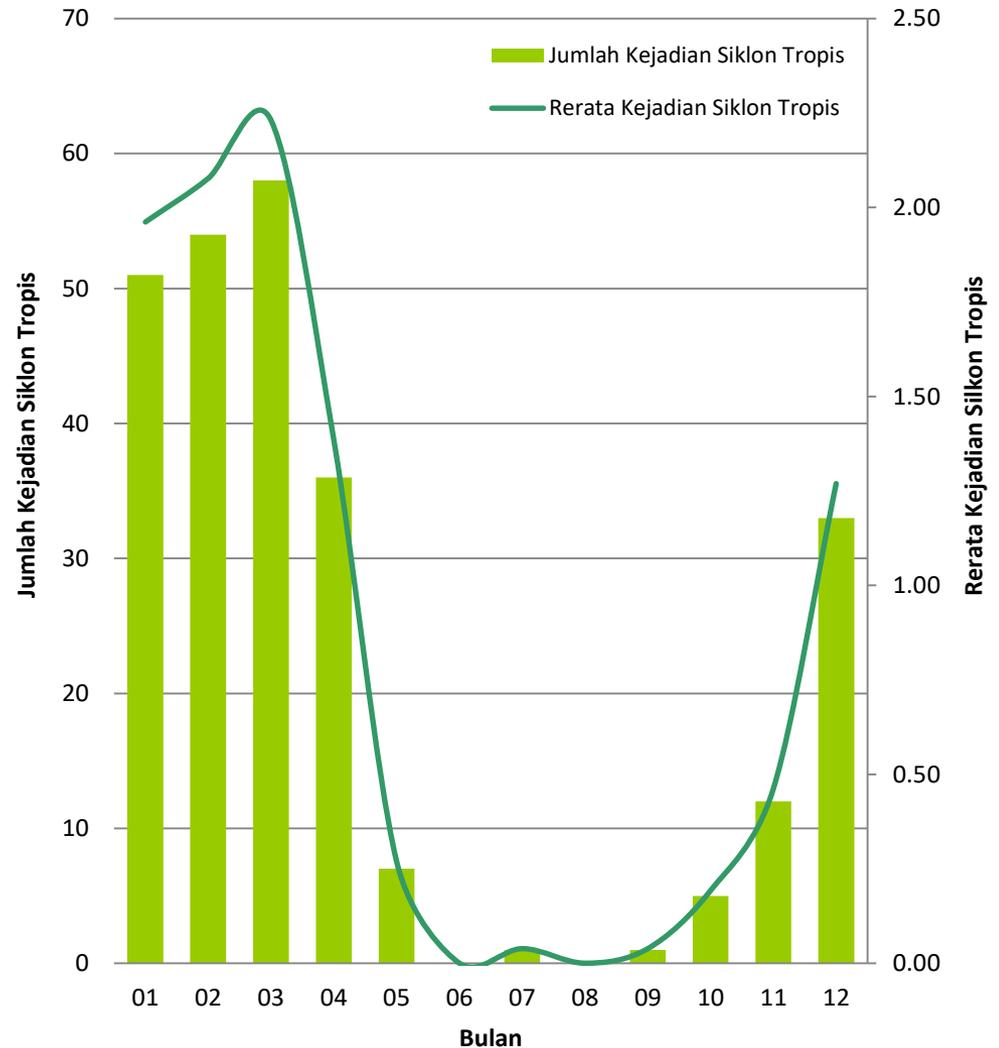
Cyclone Tracy on 25 December 1974  
Formed: 21 December 1974;  
Dissipated: 26 December 1974  
Highest winds 10-minute  
sustained: 175 km/h (110 mph)  
1-minute sustained: 205 km/h (125  
mph) Gusts: 240 km/h (150 mph)



Bidgee 2008 Three House Girders twisted during Tropical Cyclone Tracy on 25th December 1974.

## JUMLAH DAN RATA-RATA KEJADIAN SIKLON TROPIS WILAYAH PERAIRAN SEBELAH SELATAN DEKAT INDONESIA\* (BMKG)

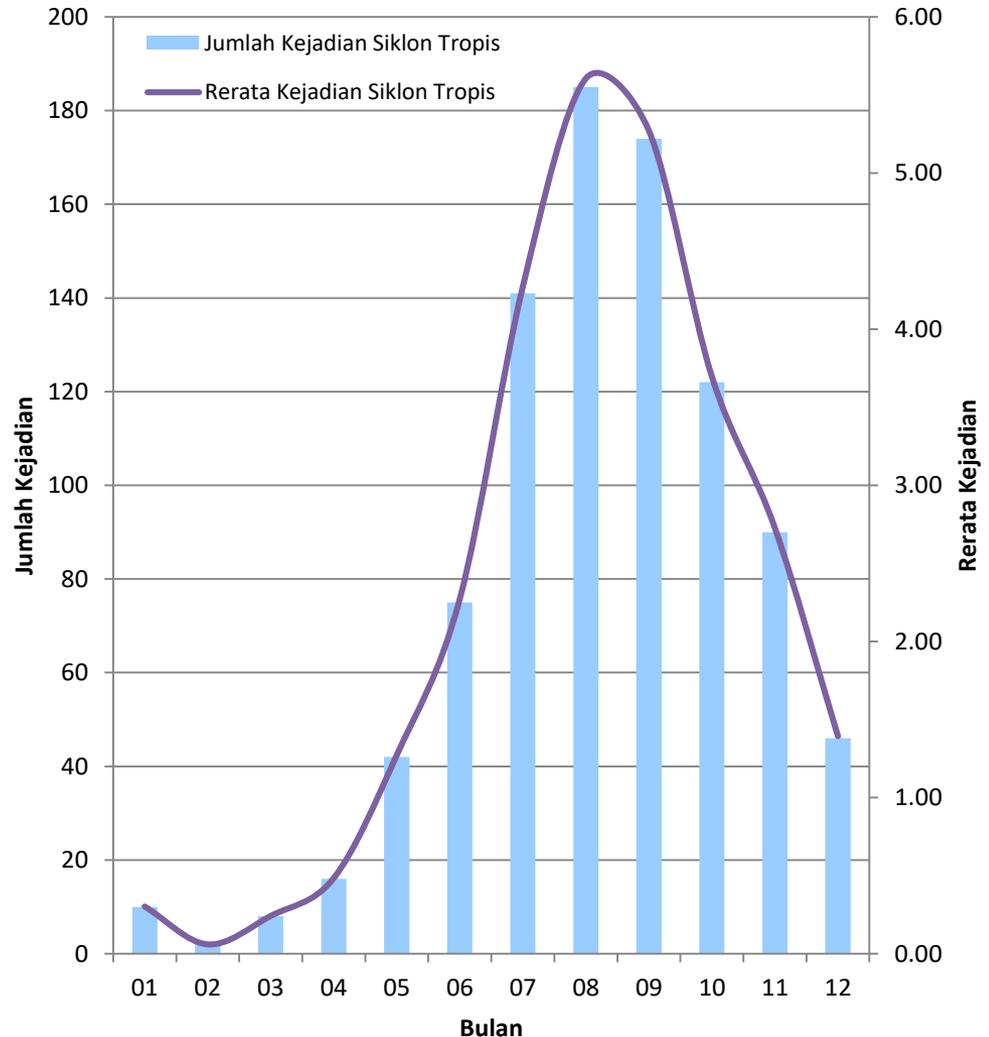
BULAN	JUMLAH	RATA-RATA
JAN	51	1.96
FEB	54	2.08
MAR	58	2.23
APR	36	1.38
MEI	7	0.27
JUN	0	0.00
JUL	1	0.04
AGS	0	0.00
SEP	1	0.04
OKT	5	0.19
NOV	12	0.46
DES	33	1.27



\*data tahun 1984 – 2012 wilayah 0-40S 90-145E

## JUMLAH DAN RATA-RATA KEJADIAN SIKLON TROPIS WILAYAH PERAIRAN SEBELAH UTARA DEKAT INDONESIA\* (BMKG)

BULAN	JUMLAH	RATA-RATA
JAN	10	0.30
FEB	2	0.06
MAR	8	0.24
APR	16	0.48
MEI	42	1.27
JUN	75	2.27
JUL	141	4.27
AGS	185	5.61
SEP	174	5.27
OKT	122	3.70
NOV	90	2.73
DES	46	1.39



\*data tahun 1977 – 2012 wilayah 0-40N 90-145E

# Waspada! Siklon Tropis Lili Tumbun di Laut Timor

Kamis, 9 Mei 2019 16:39



Meningkatnya pemberitaan soal Siklon di NTT

Travel

Akomodasi

Kuliner

Destinasi

Shopping

Ticketing

siklon

Semua Pos Kupang

Sekitar 188 hasil (0.15 detik)

Urutkan menurut:

Waspada! **Siklon** Tropis Lili Tumbuh di Laut Timor - Pos Kupang

<https://kupang.tribunnews.com/.../waspada-siklon-tropis-lili-tumbuh-di-laut-timor>



9 Mei 2019 ... Berdasarkan pantauan BMKG Kamis (9/5/2019) sekitar pukul 10.00 WIB Bibit **Siklon** Tropis 93S mengalami penguatan si  
Dilabeli Pos Kupang

Waspada! Bibit **Siklon** Tropis di Laut Banda Makin Kuat, Berpeluang ...

<https://kupang.tribunnews.com/.../waspada-bibit-siklon-tropis-di-laut-banda-makin-kuat-berpeluang-terjadi-di-ntt>



8 Mei 2019 ... Petugas penyelamat membersihkan jalan dari puing-puing yang disebabkan oleh angin kencang **siklon** tropis Mangkhut d  
Baggao di ...  
Dilabeli Pos Kupang

Siklon dalam rekaman media di Indonesia – Observasi 4 tahun

# Waspada! Bibit Siklon Tropis di Laut Banda Makin Kuat, Berpeluang Terjadi di NTT

Rabu, 8 Mei 2019 14:58



New Cyclone Breeding Grounds: Laut Banda?

# Dampak Siklon di Gliting, Sikka



Foto: © Jonatan Lassa





puting beliung



Semua Pos Kupang

Sekitar 4,490 hasil (0.19 detik)

Urutkan menurut: I

Tag: **puting beliung** - Pos Kupang

<https://kupang.tribunnews.com/tag/puting-beliung>



Berita dan foto terbaru **puting beliung** - **Puting Beliung** Terbangkan Atap Rumah Onisius di Tanaduen. Dilabeli Pos Kupang

**BREAKING NEWS** - Puluhan Rumah Warga di Malaka Rusak ...

<https://kupang.tribunnews.com/.../breaking-news-puluhan-rumah-warga-di-malaka-rusak-dihantam-angin-puting-beliung>



10 Feb 2020 ... terdapat 35 rumah warga yang rusak diterjang **puting beliung** yang berada di Dusun Nuau dan Debnaruk serta satu p

Media Lebih Sensitive Pada Puting Beliung



bantu korban angin puting beliung ...  
bengkulu.antaranews.com



Angin Puting Beliung Ancam Cirebon  
m.ayocirebon.com



Angin Puting Beliung | BPBD Provinsi NTB  
bpbd.ntbprov.go.id



Viral Puting Beliung Terj...  
liputan6.com



Angin Puting Beliung T...  
hariannusa.com



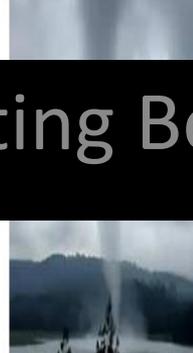
Disapu Angin Puting Beliung, 10 Warung ...  
fin.co.id



Dilanda Angin Puting Beliung  
m.ayocirebon.com



Puting Beliung di Laut Alamiah Halaman ...  
sains.kompas.com



Puting Beliung Terjang 1...  
nasional.tempo.co



Kenali Tanda-tanda Alam Munculnya ...  
m.ayobandung.com



Angin Puting Beliung di...  
kumparan.com

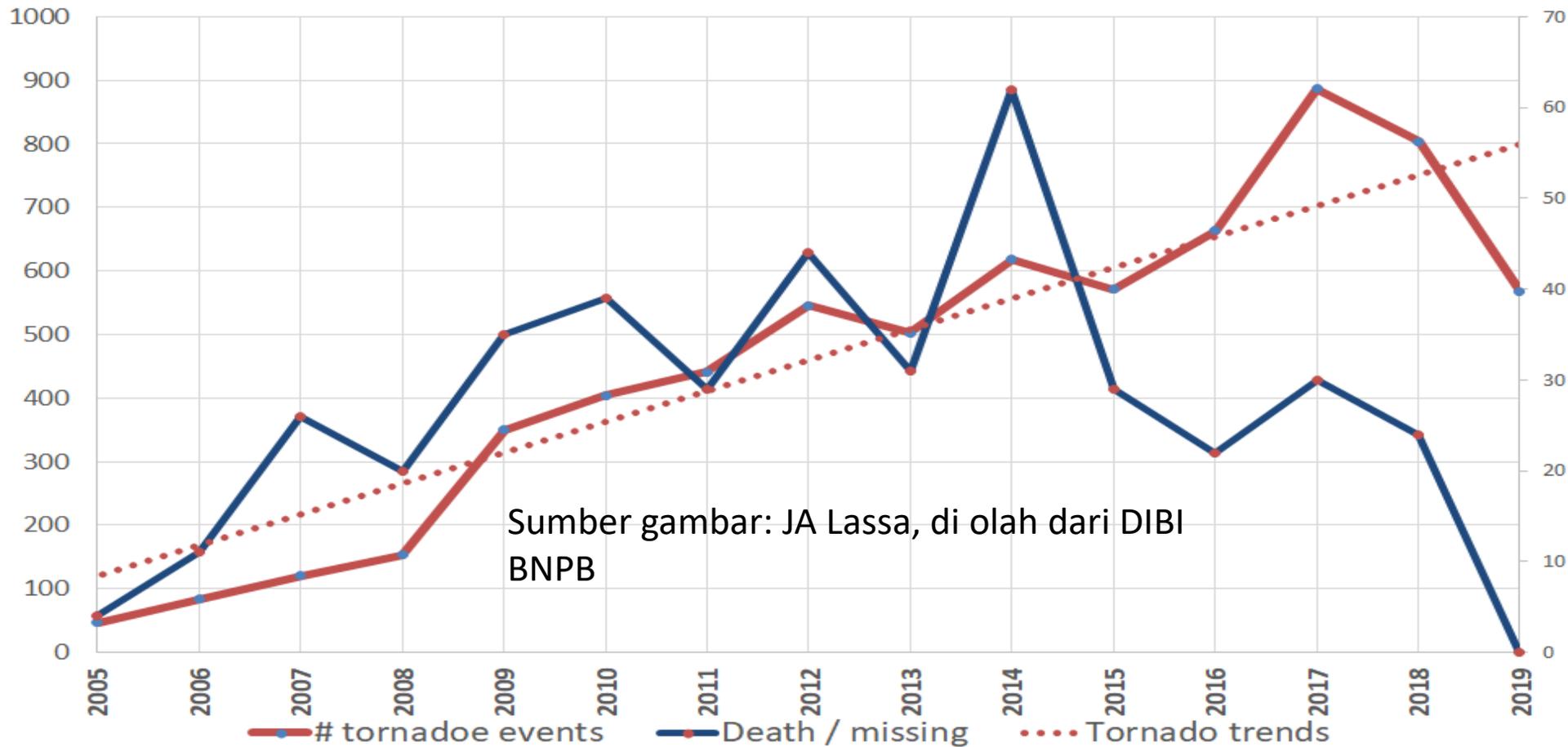


Angin Puting Beliung Rusak 157 Rumah di ...  
republika.co.id

# Tornado (Puting Beliung di Indonesia



## Recorded tornado events in Indonesia



Sumber gambar: JA Lassa, di olah dari DIBI  
BNPB

# Recorded tornado events in Indonesia





Angin Puting Beliung Mampir Pati Satu ...  
radarkudus.jawapos.com

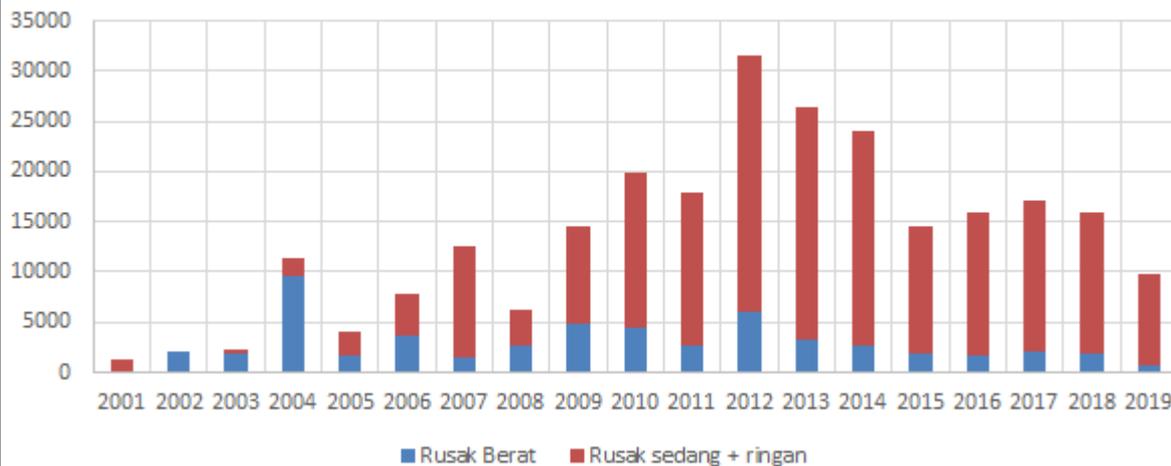


Puting Bel ...  
news.detik



Rumah Rusak Diterjang Puting Beliung ...  
timlo.net

### Trend kerusakan rumah akibat puting beliung



Rusak Akibat Puting Beliung di Sidoarjo ...  
detak.co



Puting ...  
nasion



uting Beliung ...



Puting Beliung Rusak 17 Rumah di Mamuju...  
republika.co.id



Rumah Rusak Akibat Puting Beliung ...  
tribunnews.com



Rumah Rusak Diterjang Puting Beliung...  
onlinemetro.id



Angin Puting Beliung Rusak Belasan ...  
balipusanews.com



Diterpa Puting Beliung, Empat Rumah ...  
radarmojokerto.jawapos.com



Rusak Disapu Puting Beliung ...  
news.okezone.com



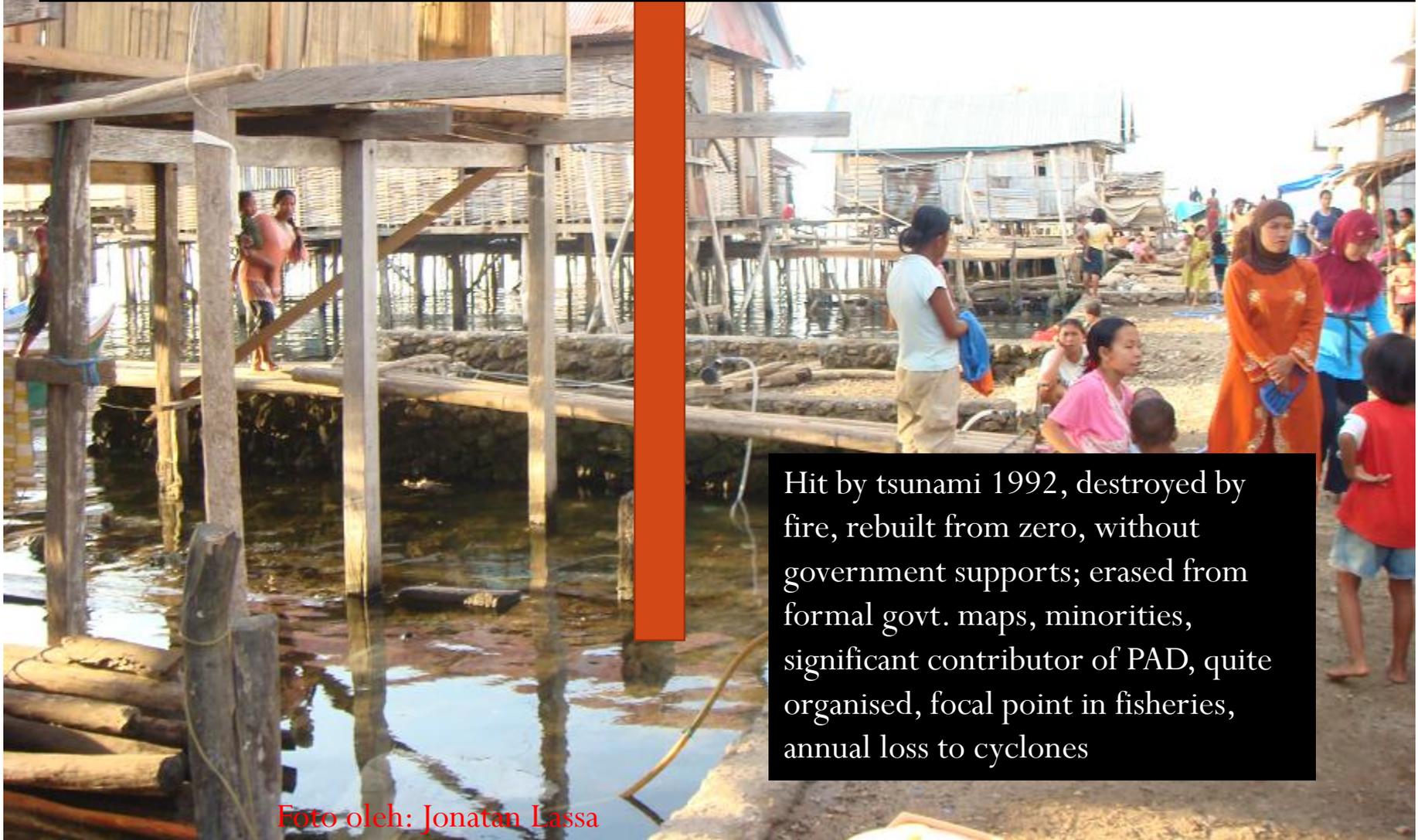
Puting Beliung Terjang Soppeng Sulsel ...  
news.detik.com



Puting Beliung Rusak 189 Rumah di ...  
republika.co.id

Elv: +2.4 - +3.2 m

## Interaksi Siklon dan Tsunami dan Gempa dalam Jangka Panjang



Hit by tsunami 1992, destroyed by fire, rebuilt from zero, without government supports; erased from formal govt. maps, minorities, significant contributor of PAD, quite organised, focal point in fisheries, annual loss to cyclones

Foto oleh: Jonatan Lassa

# Legacy of Tsunami/Eq. 1992 – Flores

Masa inkubasi untuk bencana berikut?

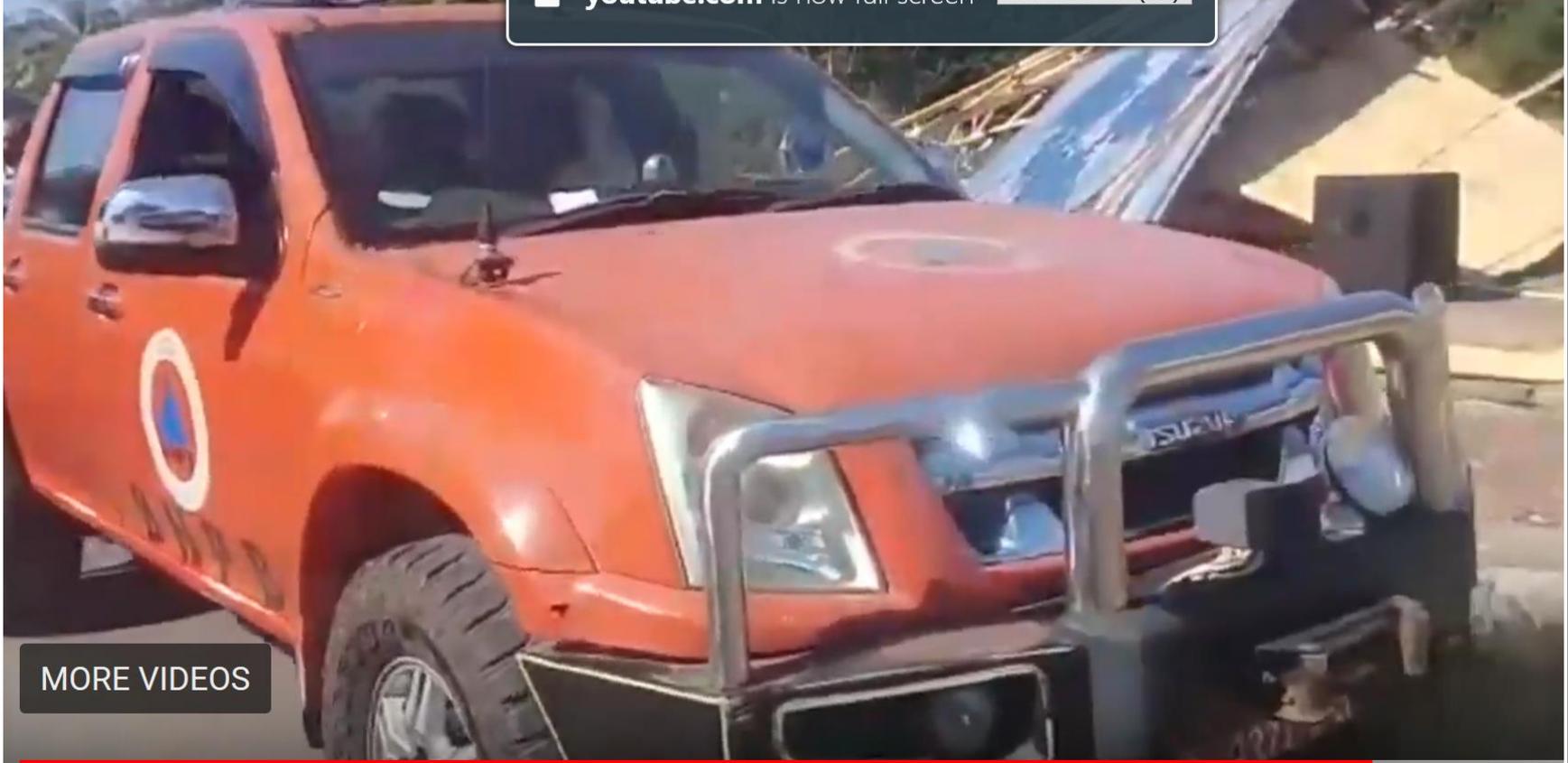




Bencana Angin Puting Beliung Hancurkan Rumah Warga di Kabupaten Sikka



youtube.com is now full screen Exit Full Screen (Esc)



MORE VIDEOS



Dampak Putting Beliung: Kelompok Ekonomi Lemah Menanggung dampak yang lebih besar!

# PERATURAN PEMBEBANAN INDONESIA UNTUK GEDUNG 1983

## BAB - 4 BEBAN ANGIN

### Pasal 4.1. PENENTUAN BEBAN ANGIN

Beban angin ditentukan dengan menganggap adanya tekanan positif dan tekanan negatif (isapan), yang bekerja tegak lurus pada bidang-bidang yang ditinjau. Besarnya tekanan positif dan tekanan negatif ini dinyatakan dalam  $\text{kg/m}^2$ , ditentukan dengan mengalikan tekanan tiup yang ditentukan dalam Pasal 4.2. dengan koefisien-koefisien angin yang ditentukan dalam Pasal 4.3.

### Pasal 4.2. TEKANAN TIUP

- (1) Tekanan tiup harus diambil minimum  $25 \text{ kg/m}^2$ , kecuali yang ditentukan dalam ayat-ayat (2), (3) dan (4).
- (2) Tekanan tiup di laut dan di tepi laut sampai sejauh 5 km dari pantai harus diambil minimum  $40 \text{ kg/m}^2$ , kecuali yang ditentukan dalam ayat-ayat (3) dan (4).
- (3) Untuk daerah-daerah di dekat laut dan daerah-daerah lain tertentu, di mana terdapat kecepatan-kecepatan angin yang mungkin menghasilkan tekanan tiup yang lebih besar dari pada yang ditentukan dalam ayat-ayat (1) dan (2), tekanan tiup ( $p$ ) harus dihitung dengan rumus:

$$p = \frac{V^2}{16} \text{ (kg/m}^2\text{)}$$

$V=20 \text{ m/s}$

$V=72 \text{ km/hr?}$

# Lalu harus bagaimana?

**SNI**

Standar Nasional Indonesia

SNI 1727:2013

Beban minimum untuk perancangan bangunan  
gedung dan struktur lain

## 26.5 Zona bahaya angin

### 26.5.1 Kecepatan Angin Dasar

### 26.5.2 Wilayah Angin Khusus

### 26.5.3 Perkiraan kecepatan angin dasar dari data iklim daerah

### 26.5.4 Pembatasan

Tornado belum diperhitungkan dalam mengembangkan distribusi kecepatan-angin dasar.

**Australian tropical cyclone  
intensity scale**

Category	Sustained winds	Gusts
<b>Five</b>	>107 kt >198 km/h	>151 kt >280 km/h
<b>Four</b>	86–107 kt 158–198 km/h	122–151 kt 226–280 km/h
<b>Three</b>	64–85 kt 118–157 km/h	90–121 kt 167–225 km/h
<b>Two</b>	48–63 kt 89–117 km/h	68–89 kt 126–166 km/h
<b>One</b>	34–47 kt 63–88 km/h	49–67 kt 91–125 km/h

**F SCALE**

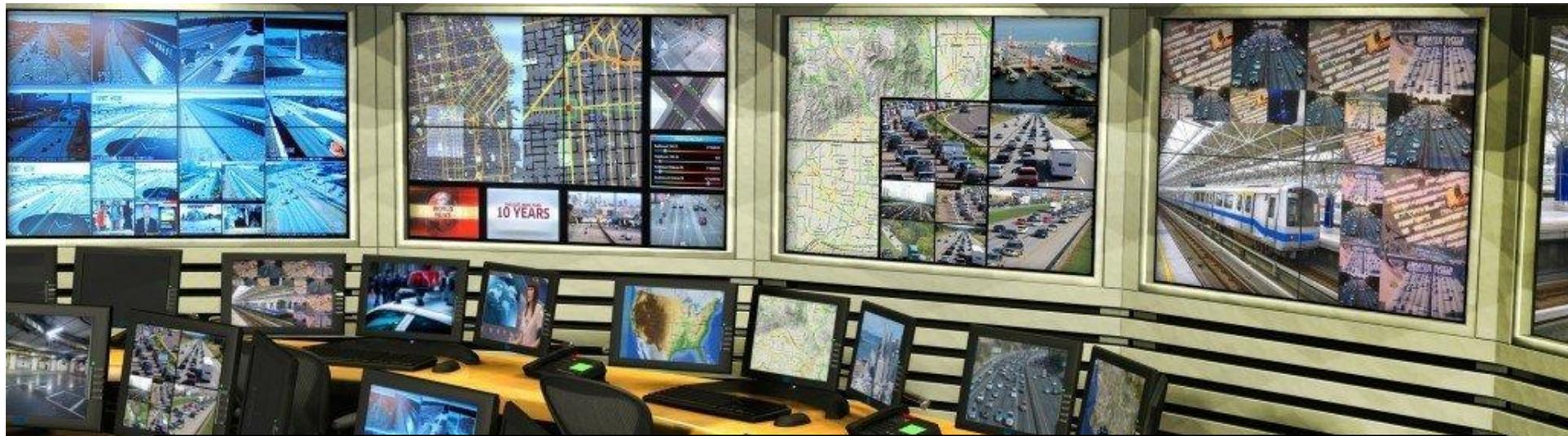
- F0 • 40–72 mph (64–116 km/h)**
- F1 • 73–112 mph (117–180 km/h)**
- F2 • 113–157 mph (181–253 km/h)**
- F3 • 158–207 mph (254–332 km/h)**
- F4 • 208–260 mph (333–419 km/h)**
- F5 • 261–318 mph (420–512 km/h)**

**Tornado Fujita Scale**

- light damage**
- moderate damage**
- considerable damage**
- severe damage**
- devastating damage**
- incredible damage**

**EF SCALE (U.S.)**

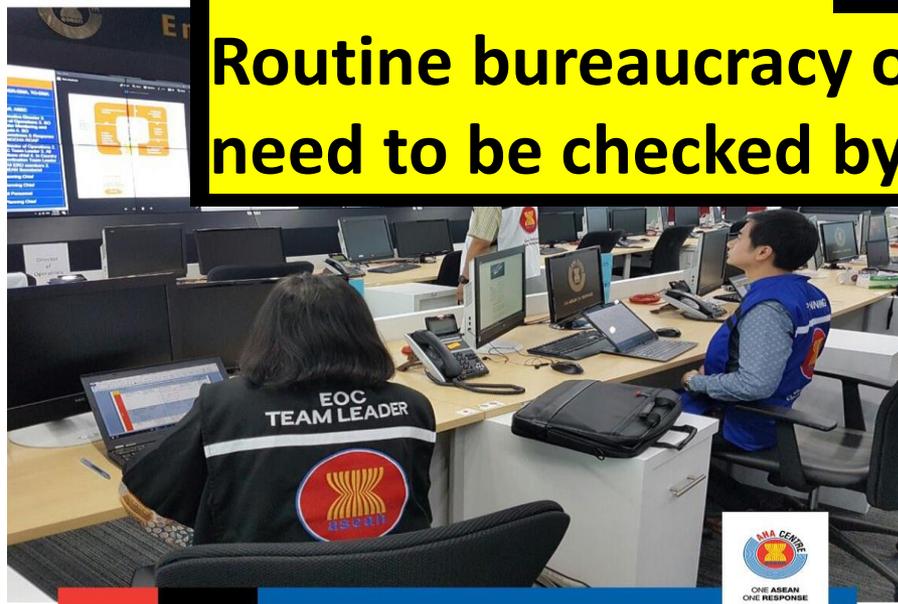
- EF0 • 65–85 mph (105–137 km/h)**
- EF1 • 86–110 mph (138–178 km/h)**
- EF2 • 111–135 mph (179–218 km/h)**
- EF3 • 136–165 mph (219–266 km/h)**
- EF4 • 166–200 mph (267–322 km/h)**
- EF5 • over 200 mph (over 322 km/h)**



**Hazard monitoring is getting better. What is lacking is action on the ground to make our home and infrastructure safer!**

**Routine bureaucracy on IMB and building permits need to be checked by proper mitigation**

//Emergency P



# IS YOUR HOUSE PREPARED FOR A CYCLONE?

## ADVICE FOR THE HOMEOWNER



Government of Western Australia  
Department of Housing and Works



This brochure was prepared by  
the Cyclone Testing Station  
with support from them  
Territory, Queensland and  
Western Australia governments.



## 1. AIM

This brochure has been prepared for you, the homeowner, to create awareness of the main causes of cyclone damage to houses. It highlights maintenance issues that you may need to address to ensure your house is in good condition in readiness for the cyclone season. It also provides an overview of key areas in and around your house that may require protection to reduce the risk of cyclone damage.

## 2. WHAT IS A CYCLONE?

Every year between November and April, coastal areas within cyclonic regions C and D are at risk of being hit by cyclones. Check with your local council if your house is located within one of these cyclonic regions.

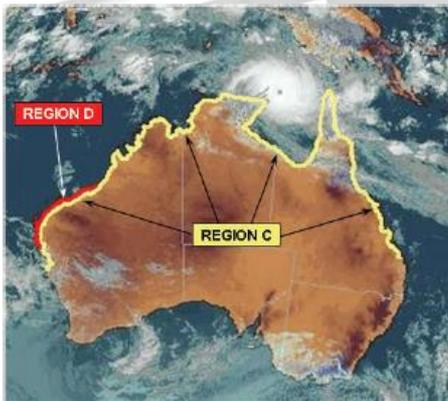


Image showing Cyclone Monica from April 2006 and highlighting coastal areas of Australia within cyclonic regions C and D. Image from Bureau of Meteorology.

A cyclone is a violent storm characterised by strong winds rotating around a calm centre. It can produce destructive winds and bring heavy rain causing flooding and, in some events, cause a storm surge (i.e. a rapid rise in sea level).

Strong winds, heavy rain and flying debris created during a cyclone can cause extensive damage to your house. However, the risk of damage can be minimised if you take a proactive approach to protecting your house.

## 3. DAMAGE FROM CYCLONIC WINDS

A review of past reports on cyclone damage to houses in Australia shows that the most common types of damage observed were:

- Damage due to failure of corroded fasteners, connector plates, roof battens and other components.
- Damage caused by failure of rotten timbers.
- Garage doors being blown in or out.
- Roofs being blown away in whole or in part.
- Collapse of unreinforced masonry walls.
- Damage to inadequately built housing in exposed locations such as hills and sea frontages.
- Flying debris breaking doors and windows, resulting in further damage from water leakage and strong winds.
- Doors and windows blown open due to inadequate fixing to walls or inadequate locks.
- Damage to ceilings and walls due to water leakage.
- Failure of attachments such as guttering, fascias and eaves.
- Damage due to fallen trees.

## 4. MAINTAINING YOUR HOUSE

One of the most important actions you can take to protect your house is to maintain it in good condition. Your house may be at risk of cyclone damage if house elements are

## Tropical Cyclone impacts and environment quality

This graph shows the number of killed per inhabitant exposed to tropical cyclones (in blue). Such ratio is a proxy of vulnerability, Cuba showing the lowest vulnerability and Haiti the highest. Although level of development is correlated, the most developed country (USA) is not the country with the lowest vulnerability. The level of deforestation (in green) provides higher correlation (89%) with vulnerability. Dominican republic (0% deforestation) has the same exposure as Haiti, (5.6% of deforestation), but 4.6 less killed per exposed. Relation between environment quality and risk should be better studied.

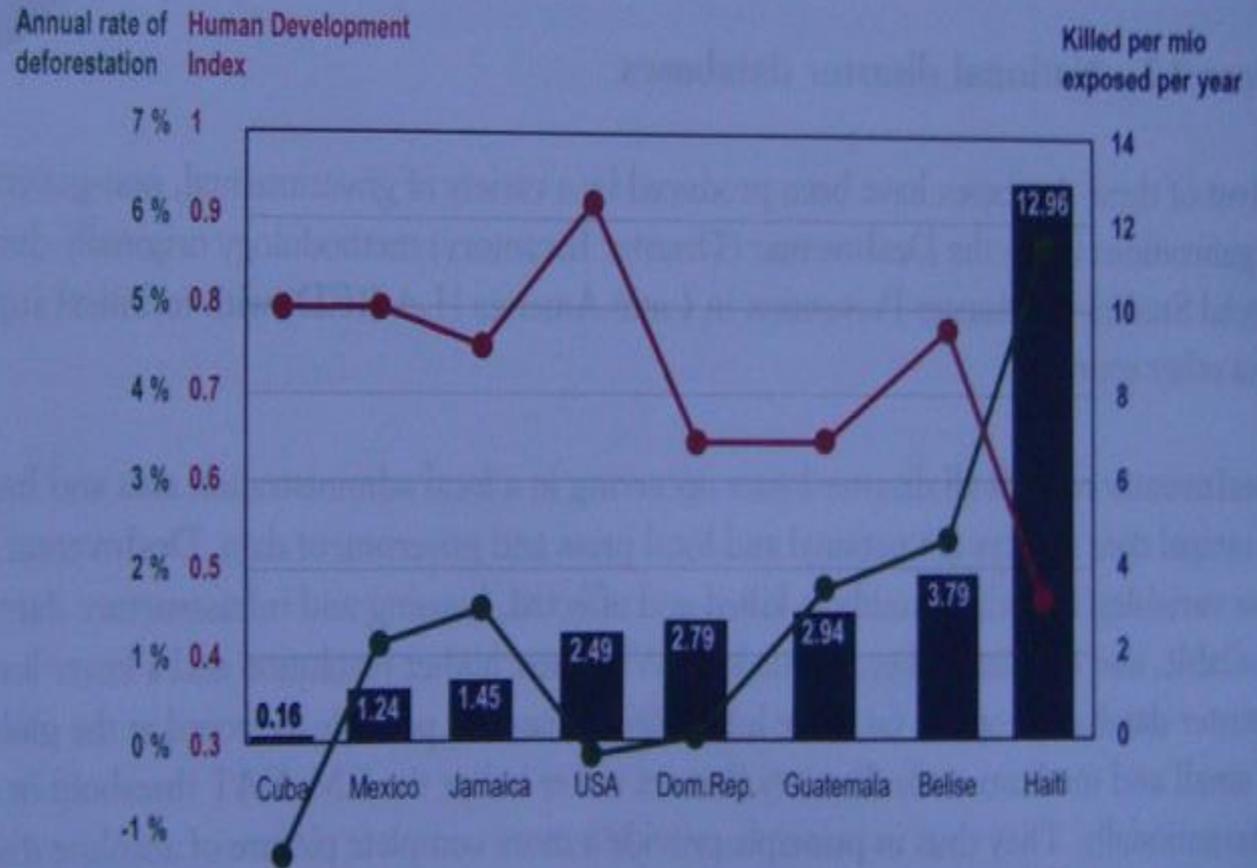
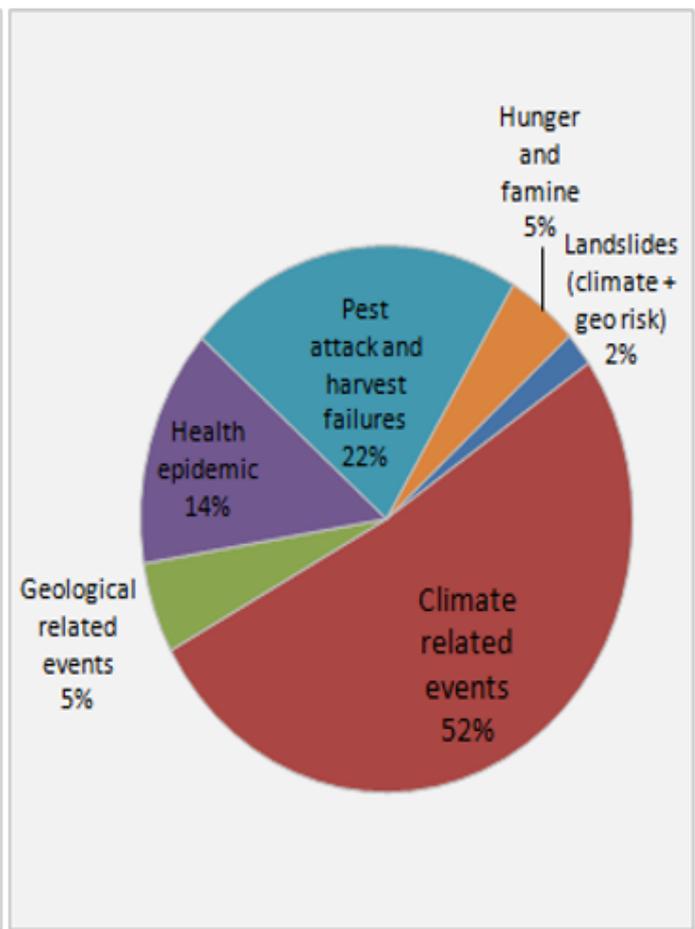
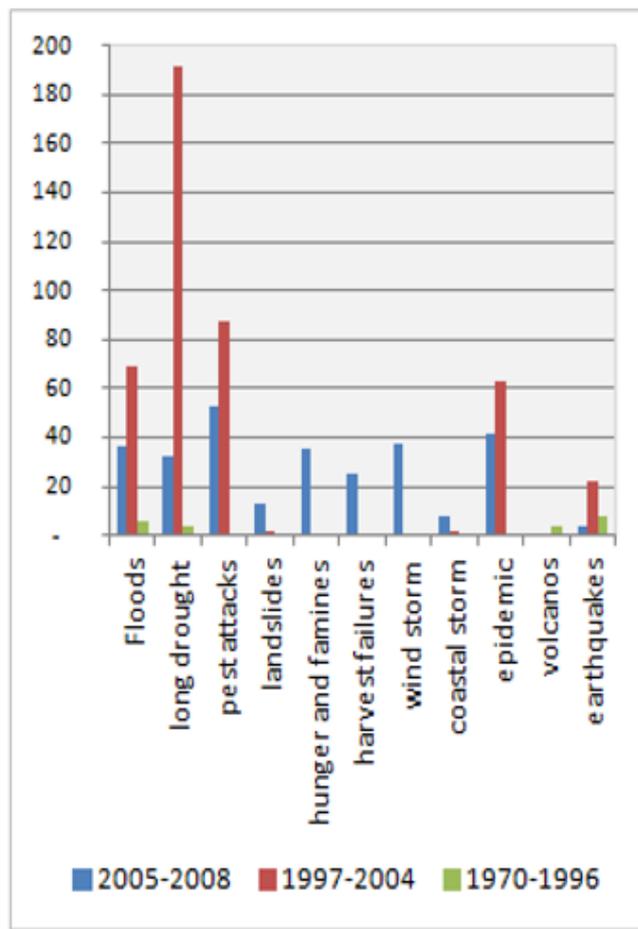
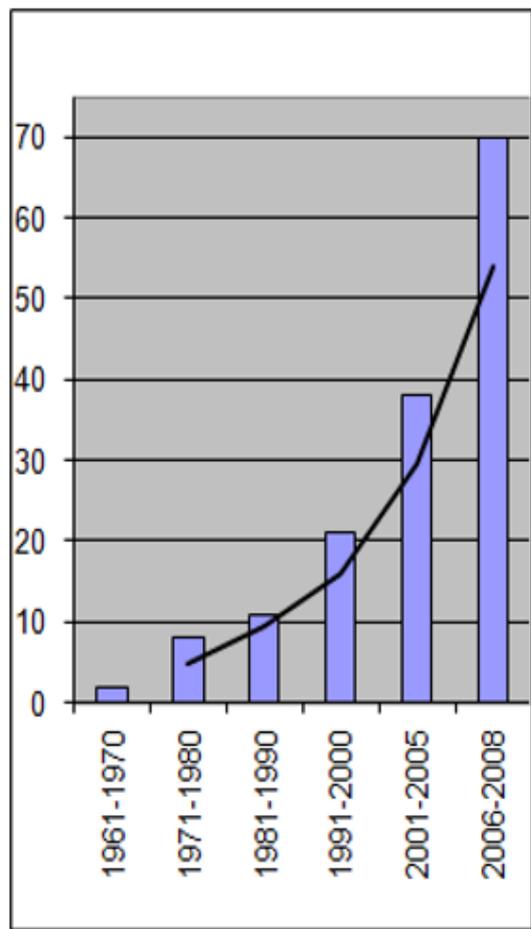


Figure 7 NTT reported disaster incidents during 1960-2008



Note: Left Figure: a temporary standardized reported disaster data based on EMDAT standard (i.e. at least 20 people died and more than 100 people affected); Center: unstandardized natural hazards events in NTT compiled by PMPB Kupang including EMDAT. Right: Percentage of unstandardized hazards events in NTT compiled by PMPB Kupang.

# Potensi interaksi Siklon dan legacy of Tsunami/Eq. 1992 – Flores

Masa inkubasi untuk bencana berikut?



# Floods disrupts cargo inspection!

## SUARA CARGO

Berita Seputar Cargo, Logistik dan Transportasi

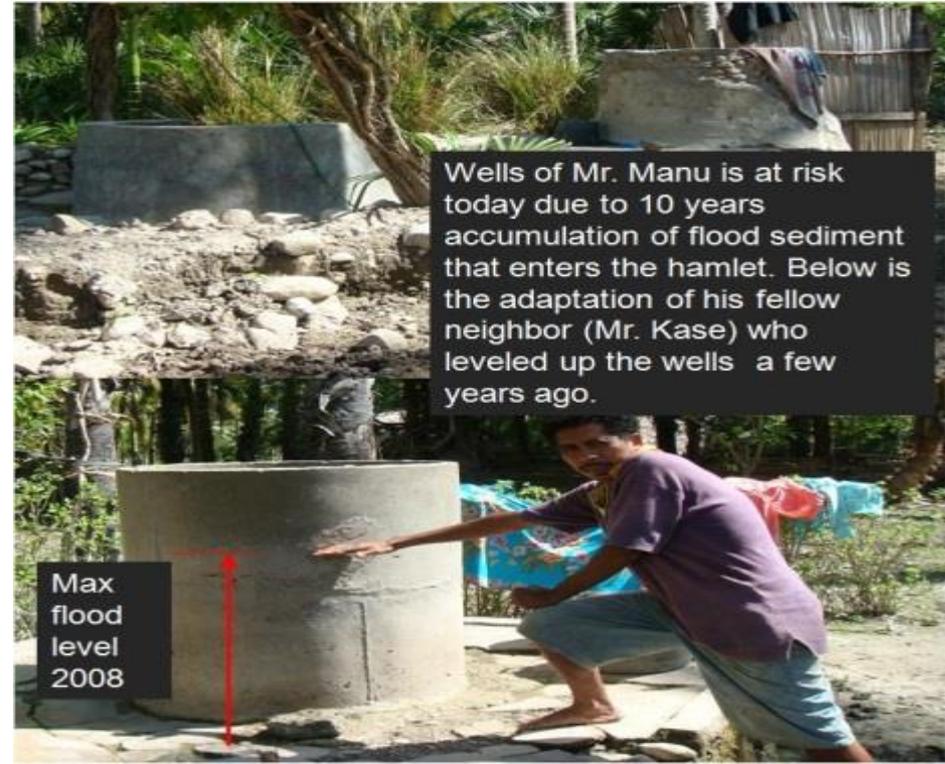
### Banjir Hambat Inspeksi Peti Kemas di Pelabuhan Tanjung Priok

By [suaracargo](#) -  
Feb 11, 2015



- Delays in physical inspection
- Disruptions of flow of receiving and delivery
- Cost
- Additional cost of energy and labor

# Transformasi Multi-Sektor: Perumahan, Air, Pertanian, Ekonomi, Kelembagaan dsb.



# Diterjang Ombak Setinggi 6 Meter, Penahan Dermaga Kolbano Ambrol

Kompas.com - 29/04/2017, 16:15 WIB

BAGIKAN:



## Membangun Infrastruktur Maritime?

[Komentar](#)



Penahan Dermaga Kolbano di Desa Kolbano, Kecamatan Kolbano, Kabupaten Timor Tengah Selatan (TTS), NTT, ambrol akibat di hantam gelombang setinggi enam meter yang melanda wilayah itu. Nampak Anggota DPRD NTT Jefry Unbanuaek (baju putih) sedang meminjau lokasi itu. (Ditin: www.kompas.com)

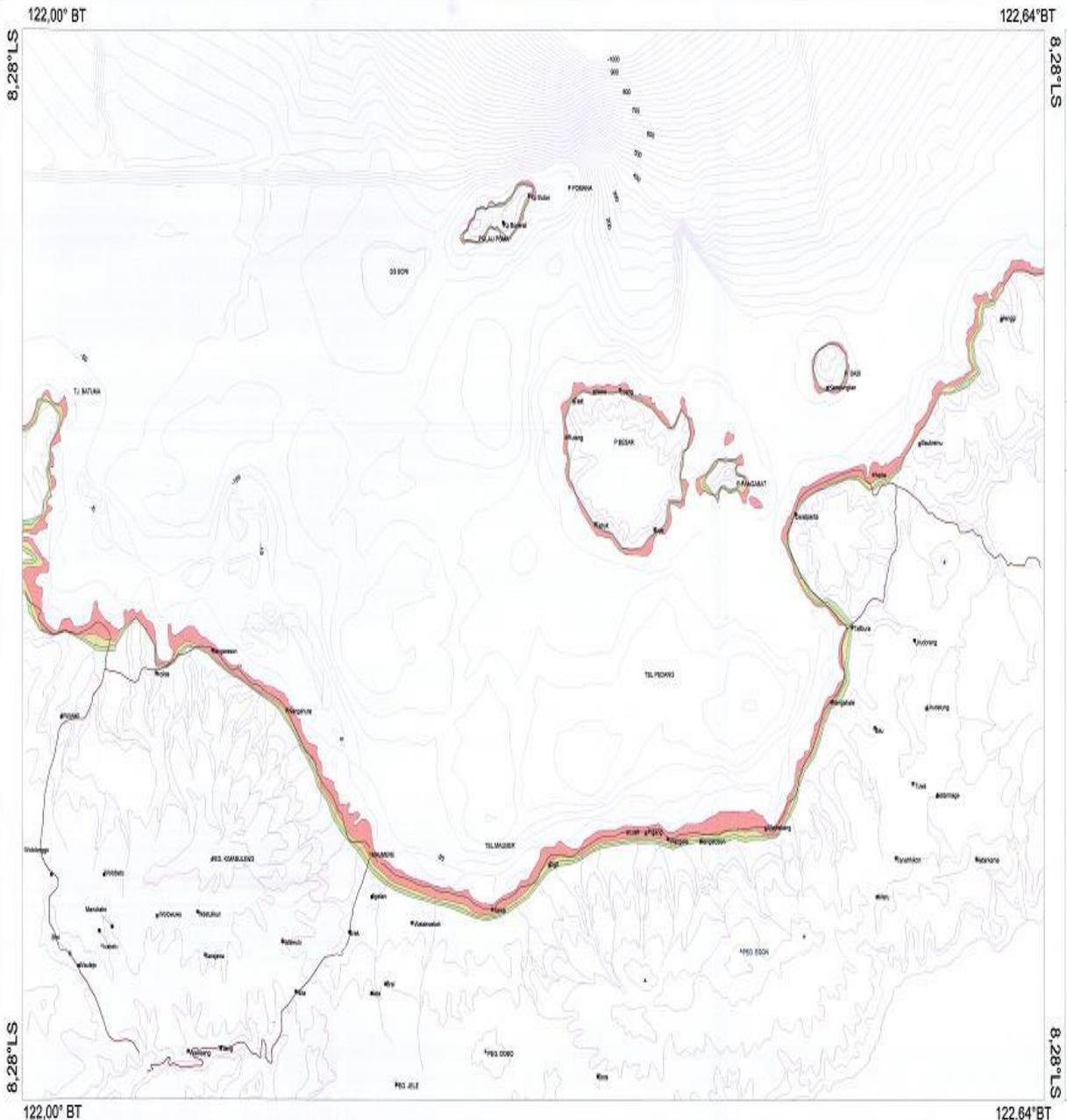




# Interaksi siklon, banjir dan kekeringan - Proteksi Sumur di Pantai Selatan



Figure: © PMPB Kupang



# PETA ZONASI KERAWANAN TSUNAMI DAERAH MAUMERE DAN SEKITARNYA PROVINSI NUSA TENGGARA TIMUR



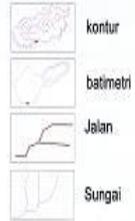
oleh :  
Eka T. Putranto, dkk.

### Keterangan

#### Litologi :

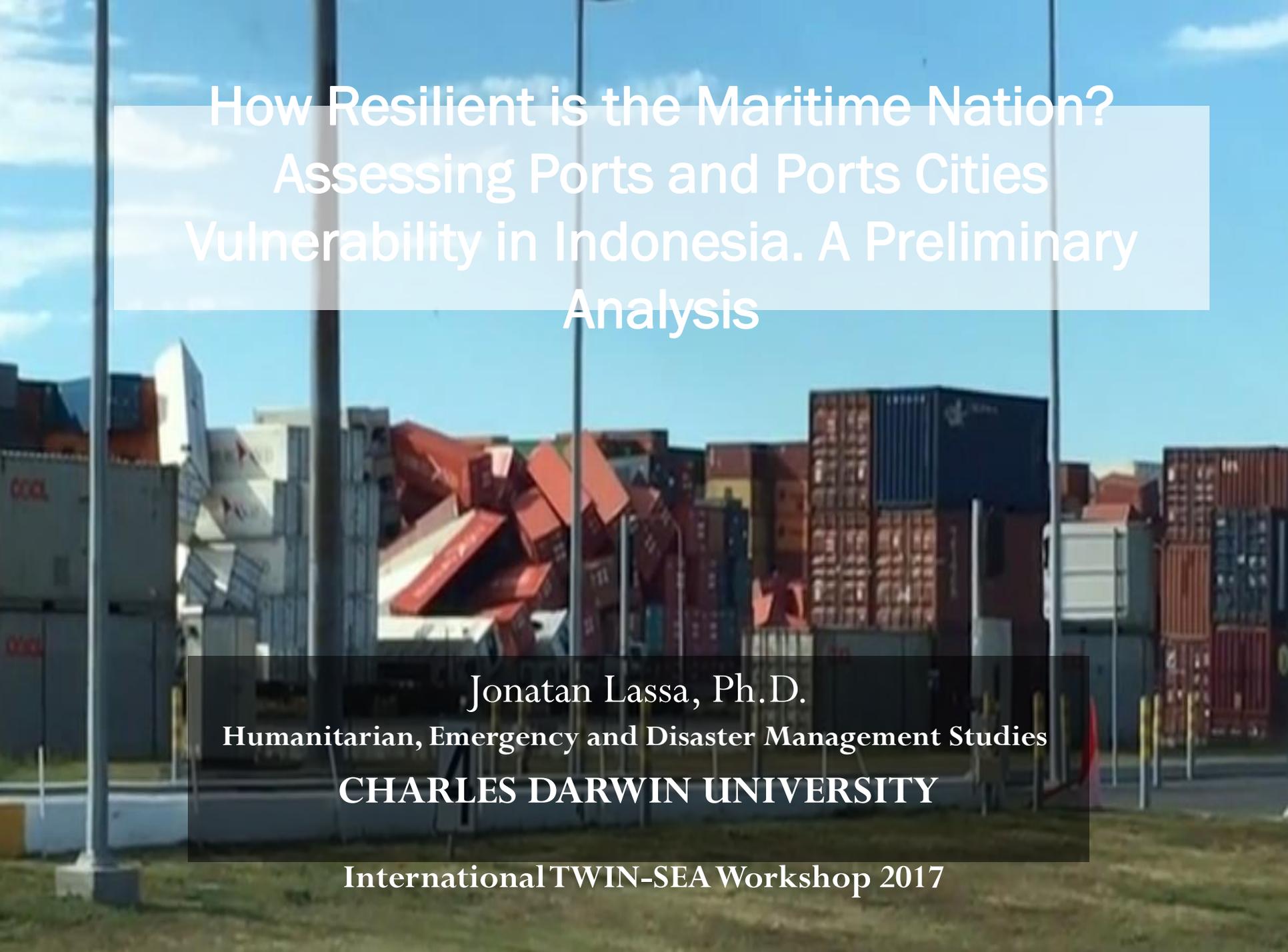


#### Topografi :



#### Zona Kerawanan Tsunami:

- Zona Kerawanan Tinggi**  
 Merupakan daerah dengan resiko kerusakan atau kehancuran paling besar apabila terlanda tsunami. Memiliki karakteristik pantai berpasir, bentuk pantai berteluk atau kantong pantai, pantai sempit dengan bibir pantai landai. Relief dengan morfologi belakang pantai relatif datar.
- Zona Kerawanan Menengah**  
 Daerah dengan tingkat resiko kerusakan aset tidak begitu besar. Pantai berbentuk lurus dan berbatu. Memiliki pelindung alami maupun buatan, bibir pantai curam.
- Zona Kerawanan Rendah**  
 Daerah yang memiliki resiko kerusakan paling kecil jika terlanda tsunami. Pantai landai dengan morfologi belakang pantai yang lebih tinggi. Bentuk pantai lurus, vegetasi tanaman keras dan semak. Daerah belakang pantai merupakan areal pertanian atau perkebunan.



How Resilient is the Maritime Nation?  
Assessing Ports and Ports Cities  
Vulnerability in Indonesia. A Preliminary  
Analysis

Jonatan Lassa, Ph.D.  
Humanitarian, Emergency and Disaster Management Studies

**CHARLES DARWIN UNIVERSITY**

International TWIN-SEA Workshop 2017



Dave Andrews  
@chopperdaveqld

Follow

What a mess 🤯 Shipping containers all over the place at the PoB after yesterday's storm 🌪️



RETWEETS 24  
LIKES 21



1:27 pm - 13 Nov 2016 From Brisbane, Queensland



# Maritime Policy & Management

The flagship journal of international shipping and port research

ISSN: 0308-8839 (Print) 1464-5254 (Online) Journal homepage: <http://www.tandfonline.com/loi/tmmpm20>

## Risk assessment framework for exposure of cargo and ports to natural hazards and climate extremes

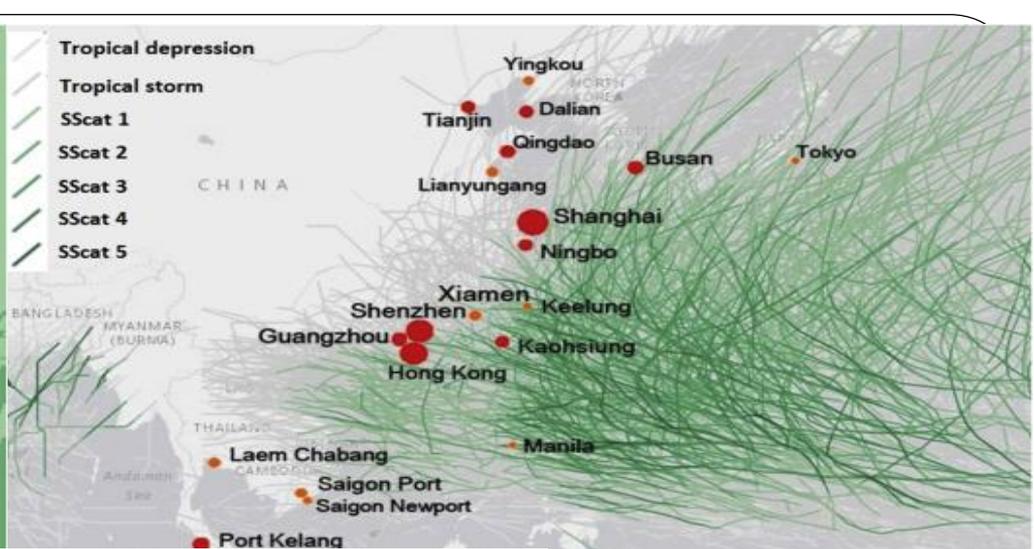
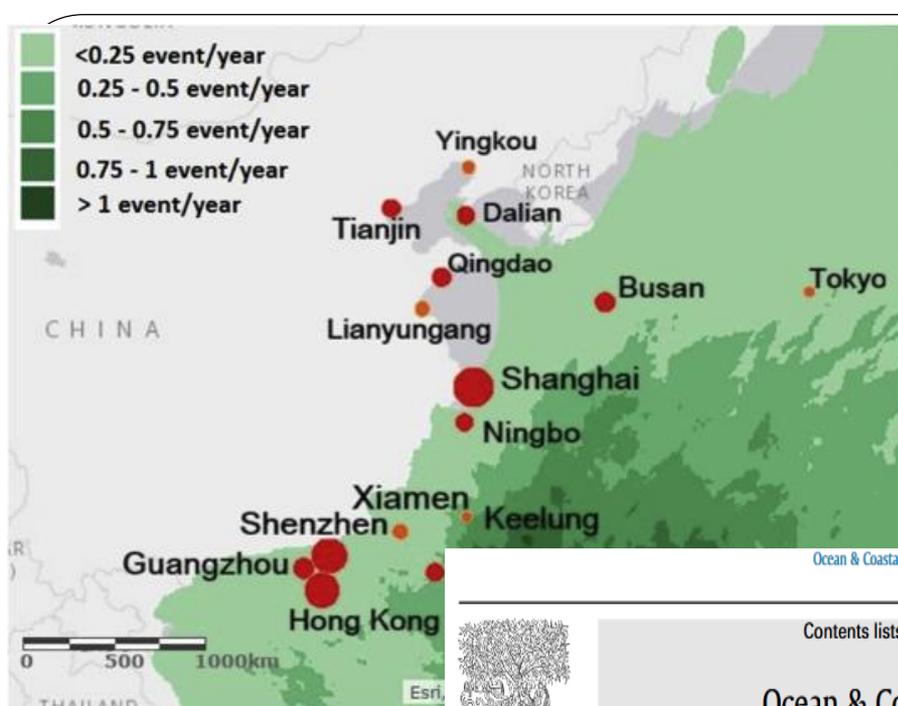
Jasmine Siu Lee Lam & Jonatan A. Lassa

To cite this article: Jasmine Siu Lee Lam & Jonatan A. Lassa (2016): Risk assessment framework for exposure of cargo and ports to natural hazards and climate extremes, *Maritime Policy & Management*, DOI: [10.1080/03088839.2016.1245877](https://doi.org/10.1080/03088839.2016.1245877)

To link to this article: <http://dx.doi.org/10.1080/03088839.2016.1245877>



Published online: 23 Nov 2016.



Ocean & Coastal Management 141 (2017) 43–54

Contents lists available at [ScienceDirect](http://ScienceDirect)

## Ocean & Coastal Management

journal homepage: [www.elsevier.com/locate/ocecoaman](http://www.elsevier.com/locate/ocecoaman)



### Cyclone risk mapping for critical coastal infrastructure: Cases of East Asian seaports

Jasmine Siu Lee Lam <sup>a,\*</sup>, Chang Liu <sup>b</sup>, Xueni Gou <sup>b</sup>

<sup>a</sup> School of Civil and Environmental Engineering, Nanyang Technological University, Singapore  
<sup>b</sup> Maritime Institute, Nanyang Technological University, Singapore

#### ARTICLE INFO

*Article history:*  
 Received 7 July 2016  
 Received in revised form  
 14 February 2017  
 Accepted 21 February 2017

#### ABSTRACT

Seaport is a critical coastal infrastructure serving important economic purposes but at the same time is exposed to a wide range of natural hazards including tropical cyclones. Mapping of cyclone risk for seaports is a primary step in risk planning and mitigation which remains a gap in the literature. Since East Asia is among the most affected areas of cyclone risk, and also the region where the world's top container ports are located, cyclone risk mapping for major seaports in East Asia is carried out. The

