

# Typhoon Neoguri Disaster Risk Reduction Situation Report<sup>1</sup>

DRR sitrep 2014-001 - updated July 8, 2014, 10:00 CET

## Summary Report

### Ongoing typhoon situation

The storm had lost strength early Tuesday July 8, going from the equivalent of a Category 5 hurricane to a Category 3 on the Saffir-Simpson Hurricane Wind Scale, which means devastating damage is expected to occur, with major damage to well-built framed homes, snapped or uprooted trees and power outages. It is approaching Okinawa, Japan, and is moving northwest towards South Korea and the Philippines, bringing strong winds, flooding rainfall and inundating storm surge. Typhoon Neoguri is a once-in-a-decade storm and Japanese authorities have extended their highest storm alert to Okinawa's main island. The Global Assessment Report (GAR) 2013 ranked Japan as first among countries in the world for both annual and maximum potential losses due to cyclones. It is calculated that Japan loses on average up to \$45.9 Billion due to cyclonic winds every year and that it can lose a probable maximum loss of \$547 Billion.<sup>2</sup>

### What are the most devastating cyclones to hit Okinawa in recent memory?

There have been 12 damaging cyclones to hit Okinawa since 1945. Sustaining winds of 81.6 knots (151 kph), Typhoon "Winnie" caused damages of \$5.8 million in August 1997. Typhoon "Bart", which hit Okinawa in October 1999 caused damages of \$5.7 million. It sustained winds of 126 knots (233 kph). The most damaging cyclone to hit Japan was Super Typhoon Nida (reaching a peak intensity of 260 kph), which struck Japan in 2004 killing 287 affecting 329,556 people injuring 1,483, and causing damages amounting to \$15 Billion.

### What are the underlying drivers of cyclone disaster risks in Japan?

Disasters in Japan are mainly driven by exposure of people and assets. Japan is estimated to have relatively very high overall exposure, low vulnerability, and high coping capacity. Japan and the United States of America concentrate 56 percent of global risk from cyclonic winds. Urban produced capital exposed to cyclonic winds in Japan is valued at about \$14 trillion, corresponding to 100 percent of its total urban produced capital. Japan ranks 61 out of 165 on the Multi-Hazard Risk Index with a score of 0.5. Japan is also rated with high resilience with a rank of 147 out of 165 on the Lack of Resilience Index by the Pacific Disaster Center with a score of 0.26.<sup>3</sup>

### What can you do to prepare?

- The Japan Meteorological Agency provides recommended responses to all Emergency Warnings:  
<http://tinyurl.com/kc3bdsh>
- The U.S. Air Force in Kadena provides a fact sheet about typhoons in Okinawa at:  
<http://tinyurl.com/n675pgx>
- U.S. Naval Hospital in Okinawa provides a guide on 'Surviving typhoons' in Okinawa:  
<http://tinyurl.com/44zvr3v>

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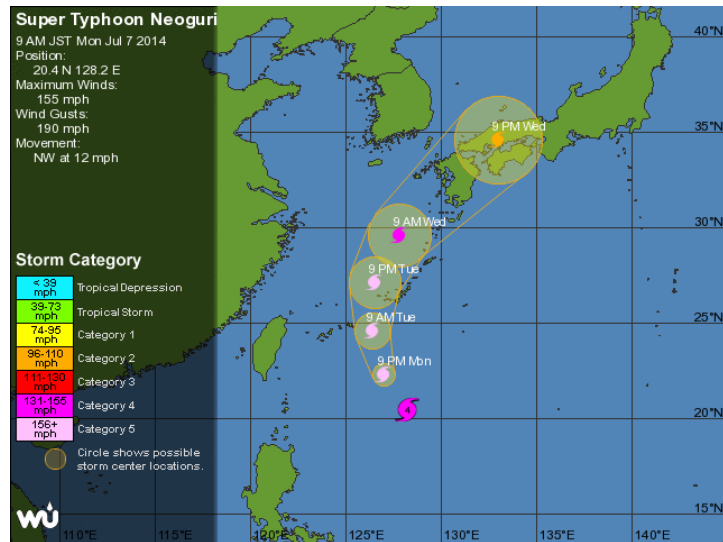
<sup>1</sup> This situation report introduces Typhoon Neoguri's intensity and track, the regions to be affected in Japan and other countries, and the potential damages of Typhoon Neoguri. It then presents historical background and details on the current situation in Japan, previous typhoons in Japan and more specifically in Okinawa Prefecture, the casualties and damages associated with them, as well as facts and figures related to other hydro-meteorological disasters in Japan. It additionally provides some background information about Japan, including the main indicators and governance system for disaster risk reduction. Finally, it offers some disaster preparedness recommendations in relation to this specific event.

<sup>2</sup> All currency figures (\$) in US Dollars

<sup>3</sup> Pacific Disaster Center Disaster Alert app Area Brief on Tropical Storm Neoguri, available from iTunes.  
<https://itunes.apple.com/us/app/disaster-alert-pacific-disaster/id381289235?mt=8>

## 1. Typhoon Neoguri intensity and track

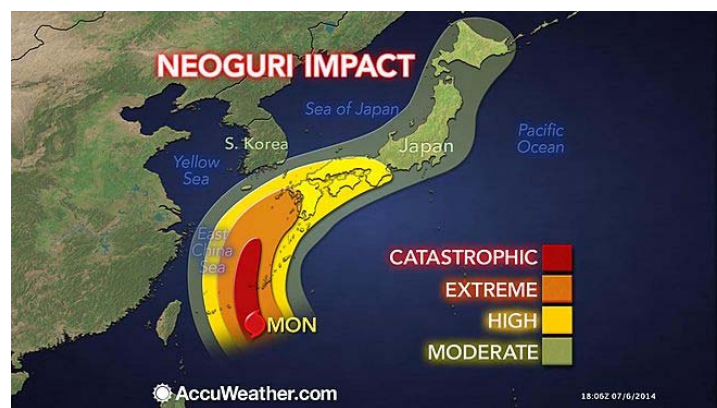
On July 7, the U.S. Joint Typhoon Warning Center (JTWC) designated Neoguri a "super typhoon," with winds reaching an estimated 250 kph.<sup>4</sup> As of Tuesday July 8, typhoon Neoguri has been downgraded from its original status as a super typhoon, but the Japan Meteorological Agency says the storm is still packing wind gusts of up to 250 kilometers per hour. As it slams into Japan's Okinawa, more than 500,000 people were urged to evacuate and hundreds of flights were cancelled. More than 50,000 households in Okinawa lost power.<sup>5</sup>



### 1.1. Regions to be affected

#### 1.1.1. Japan

The Japan Meteorological Agency (JMA) warned of heavy rains and potential flooding in Kyushu, the westernmost of Japan's main islands, as well as heavy rain in the rest of the nation as the storm turns east.

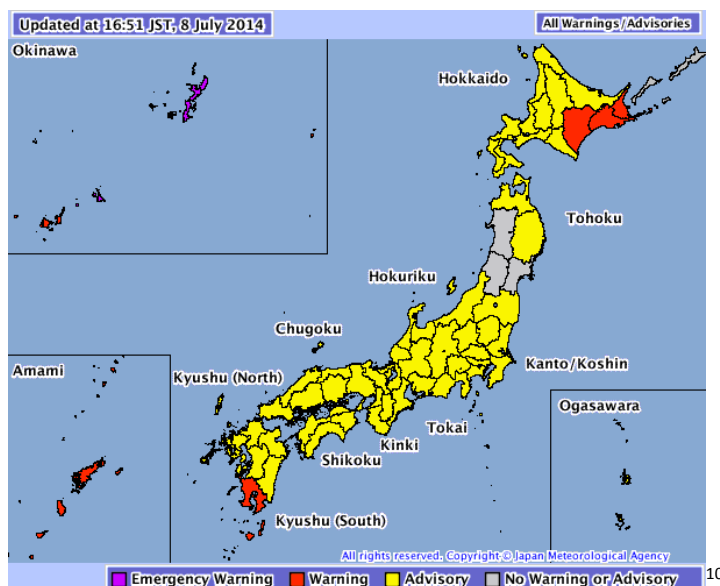


<sup>4</sup> Joint Typhoon Warning Center (JTWC) <http://www.usno.navy.mil/JTWC/>

<sup>5</sup> <http://www.voanews.com/content/japan-battens-down-as-typhoon-neoguri-nears/1952795.html>

<sup>6</sup> Weather Underground <http://www.wunderground.com/hurricane/western-pacific/2014/typhoon-Neogur>

The typhoon is then expected to lose strength before taking aim at Japan's main island of Honshu, where large cities such as Tokyo and Osaka are located.<sup>8</sup> After passing over Okinawa, forecasters expect Neoguri to hit Kyushu island, which hosts two nuclear facilities, both of which have been shut down ahead of the storm's arrival.<sup>9</sup>



### 1.1.2. Other countries

The outermost rain bands of typhoon Neoguri will graze and drench South Korea at midweek. "The island of Jeju in the Korea Strait will likely see the worst impacts for South Korea. With the storm just off to the south, the island will certainly see strong winds, along with very rough surf and heavy rain," Duffey said. The Hong Kong Observatory forecast that the typhoon may also affect Taiwan and the Philippines.<sup>11</sup>

## 1.2. Potential damages of Typhoon Neoguri

Neoguri was until Monday categorized as 5 on the Saffir-Simpson Hurricane Wind Scale (Tropical Storm Risk (TSR) classification).<sup>12</sup> The storm had lost strength early Tuesday July 8, going from the equivalent of a Category 5 hurricane to a Category 3, according to meteorologist Tom Sater.<sup>13</sup>

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many

<sup>7</sup> <http://www.accuweather.com/en/weather-news/neoguri-to-become-a-super-typh/29954152>

<sup>8</sup> <http://www.voanews.com/content/japan-battens-down-as-typhoon-neoguri-nears/1952795.html>

<sup>9</sup> <http://www.aljazeera.com/news/asia-pacific/2014/07/japan-urges-evacuation-as-typhoon-moves-2014785953955502.html>

<sup>10</sup> <http://www.jma.go.jp/en/warn/index.html>

<sup>11</sup> [http://www.weather.gov.hk/wxinfo/currwx/tc\\_pos\\_1411.htm](http://www.weather.gov.hk/wxinfo/currwx/tc_pos_1411.htm)

<sup>12</sup> <http://www.tropicalstormrisk.com/tracker/dynamic/201408W.html>

<sup>13</sup> <http://edition.cnn.com/2014/07/07/world/asia/typhoon-neoguri/>



	154-177 km/h	shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	<b>Devastating damage will occur:</b> Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	<b>Catastrophic damage will occur:</b> Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	<b>Catastrophic damage will occur:</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

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## 2. Historical context

### 2.1. Recent situation

Heavy rains from an unrelated system have been drenching Kyushu in recent days. As per the Japan Times, parts of Nagasaki recorded the heaviest rainfall in 50 years Thursday July 3, 2014 with over 6 inches of rain falling in 3 hours. Flash flooding inundated houses in the city and landslides were reported.<sup>15</sup>

Extremely heavy rainfall continued on the island Sunday July 6, 2014 with nearly 10 inches of rain reported at Mount Shibi, Kagoshima Prefecture in 24 hours, according to public broadcaster NHK.<sup>16</sup> Neoguri is the strongest tropical cyclone of the year in the Western Pacific basin. The season's first typhoon, Faxai, reached minimal typhoon status with 75-mph winds in early March. It did not affect land.

An April 2014 storm named Tapah was declared a typhoon by JTWC. However, the Japan Meteorological Agency (JMA) said Tapah peaked as a "severe tropical storm" with winds slightly below the 74-mph threshold.<sup>17</sup>

"I can't stress enough how dangerous this typhoon may be when it hits Okinawa," Brig. Gen. James Hecker, the Commander of the 18th Wing at Kadena Air Base, the largest U.S. military installation in the Asia-Pacific region, said Sunday on the base's Facebook page. "This is the most powerful typhoon forecast to hit the island in 15 years."

### 2.2. Typhoons in Japan

Summarized tables of storms (extratropical cyclone, local storm and tropical cyclone) in Japan from 1900 to 2014.

#### Ten costliest storm events in Japan from 1900 to 2014:

Year	# of Events	Deaths	Affected	Injured	Homeless	Total Affected	Total Damage (000 US\$)
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<sup>14</sup> <http://www.nhc.noaa.gov/aboutsshws.php>

<sup>15</sup> <http://www.japantimes.co.jp/news/2014/07/03/national/kyushu-hit-by-record-rainfall/#.U7mNOgg1fac>

<sup>16</sup> <http://www3.nhk.or.jp/weather/rain/index.html#ko=nk>

<sup>17</sup> <http://www.weather.com/news/weather-hurricanes/typhoon-neoguri-okinawa-japan-pacific-20140705>

2004	9	287	329556	1483	0	331039	15143500
1991	5	101	90000	777	351	91128	10086500
1999	1	26	20000	438	6900	27338	5000000
1990	2	40	147700	78	0	147778	4013000
1998	5	41	49000	864	0	49864	3335500
2011	3	86	1300	363	0	1663	2520000
2006	3	20	12087	715	99	12901	2500000
1986	2	17	2000	358	0	2358	2200000
2000	3	13	192900	141	0	193041	2050000
1993	3	113	30255	208	0	30463	1750000

#### Ten deadliest storm events in Japan from 1900 to 2014:

Year	# of Events	Deaths	Affected	Injured	Homeless	Total Affected	Total Damage (000 US\$)
1959	3	5264	1500000	0	0	1500000	600000
1945	2	4197	1881672	0	0	1881672	400000
1917	1	4000	0	0	0	0	50000
1934	1	3006	0	0	0	0	50000
1923	1	3000	0	0	0	0	10000
1954	4	2253	47049	0	0	47049	0
1958	4	1950	0	0	0	0	0
1947	1	1930	0	0	0	0	0
1912	1	1000	0	0	0	0	20000
1951	1	943	0	0	0	0	0

Source: EM-DAT: The OFDA/CRED International Disaster Database, [www.emdat.be](http://www.emdat.be) - Université catholique de Louvain - Brussels - Belgium

The Typhoon Damage Database provides a similar database allowing for the numerical comparison of the damage and the scale of typhoon disasters at: <http://agora.ex.nii.ac.jp/digital-typhoon/disaster/damage/>.

#### 2.2.1. Typhoons in Okinawa Prefecture

A list of past typhoons with a report on the disaster events they triggered is available for Okinawa Prefecture from the Weather Disaster Database, in Japanese, at: [http://agora.ex.nii.ac.jp/cgi-bin/dt/report\\_search.pl?p=47&lang=en](http://agora.ex.nii.ac.jp/cgi-bin/dt/report_search.pl?p=47&lang=en).

The U.S. Air Force in Kadena provides a list of some of the major typhoons that hit the island of Okinawa since 1945<sup>18</sup>:

Name	Date	Description
"Louise"	October 1945	Highest sustaining winds of 80 knots. Reports of waves reaching 30 to 35 feet in height. 12 ships and watercraft sunk, 222 grounded, and 32 were heavily damaged. 60 planes received damage as well. Casualties include 36 dead, 47 missing, and 100 injured. Approximately 80% of housing and buildings was destroyed.

<sup>18</sup> <http://www.kadena.af.mil/library/history/typhoonalley.asp>

"Charlotte"	October 1959	Highest sustained winds of 55 knots gusting to 79 knots. The resulting landslides caused by the rains killed 46 and injured 24 Okinawans.
"Emma"	November 1959	Total damage incurred from Emma to Kadena AB totaled \$219,286.50. The highest sustained winds of 100 knot gusted to 135 knots and dumped 50.87 inches of rain on Kadena AB. Responsible for four fatalities: one Army policeman (electrocution) and three Okinawans.
"Alia"	September 1966	Damaged over 2,500 structures on Okinawa. Highest sustaining winds of 147.7 knots. First typhoon to hit the island since 1961.
"Vera"	August 1986	Total damage incurred \$320,500. Winds gusting to 84 knots. Vera was the strongest typhoon to hit Okinawa since 1969.
"Dinah"	September 1987	Total damage incurred \$378,000. Sustaining winds of 93 knots. Dumped 10.77 inches of rain in a 24-hour period.
"Kinna"	September 1991	Total damage incurred near \$1 million. Sustaining winds of 107.7 knots. Caused the deaths of three local citizens and dropped a total of 8.1 inches of rain.
"Winnie"	August 1997	Total damage incurred \$5.8 million. Sustaining winds of 81.6 knots.
"Bart"	October 1999	Total damage incurred \$5.7 million. Sustaining winds of 126 knots.
"May-Li"	July 2007	Sustaining winds reaching about 109 knots. Total of almost 15 inches of rain fell. 108,000 homes lost power. 39-foot waves were recorded. 23 were injured but no deaths occurred during the storm.
"Kompasu"	August 2010	Winds gusting up to 116 knots. Caused power outages in 32,400 homes. Seven were injured but there were no deaths. Approximately 25,000 were stranded at Naha International Airport. Kompasu was the first typhoon to strike Okinawa since July 2007.
"Muifa"	July 2011	Sustaining winds of about 65 knots gusting to 78 knots. A total of 41 inches of rain fell. 37 people were injured with six of them in critical condition. Flight cancellations left 13,630 people stranded in airports.

### 2.3. Other disasters in Japan

#### Summarized table of hydro-meteorological disasters in Japan from 1900 to 2014:

		# of Events	Killed	Total Affected	Damage (000 US\$)
<b>Flood</b>	Unspecified	31	12,814	7,015,269	268,300
	ave. per event		413.4	226,299	8,654.8
	Flash flood	1	21	25,807	1,950,000
	ave. per event		21	25,807	1,950,000
	General flood	14	232	151,034	3,214,000
	ave. per event		16.6	10,788.1	229,571.4
	Storm surge/coastal flood	2	34	384,143	7,440,000
	ave. per event		17	192,071.5	3,720,000
	<b>Mass movement wet</b>				
	Avalanche	1	13	-	-
	ave. per event		13	-	-
	Landslide	21	994	25,706	210,000
	ave. per event		47.3	1,224.1	10,000
	<b>Storm</b>				
	Unspecified	24	1,890	192,814	453,500
	ave. per event		78.8	8,033.9	18,895.8
	Local storm	15	219	116,869	770,200
	ave. per event		14.6	7,791.3	51,346.7
	Tropical cyclone	118	32,629	7,615,483	55,669,900
	ave. per event		276.5	64,538	471,778.8

Source: EM-DAT: The OFDA/CRED International Disaster Database, [www.emdat.be](http://www.emdat.be) - Université catholique de Louvain - Brussels - Belgium

## 2.4. World's most destructive cyclones

### The world's 10 costliest typhoons ordered by overall losses

Date	Event	Affected area	Overall losses in US\$ m original values	Fatalities
2013	Typhoon Haiyan (Yolanda)	Philippines, Vietnam, China, Taiwan	10,500	6,235
1991	Typhoon Mireille	Japan	10,000	62
2004	Typhoon Songda	Japan, South Korea	9,250	41
2000	Typhoon Saomai	Japan, South Korea, Russia	6,270	25
1999	Typhoon Bart	Japan, South Korea	5,000	29
2013	Typhoon Fitow (Quedan)	China, Japan	5,000	12
2009	Typhoon Morakot (Kiko)	China, Philippines, Taiwan	4,600	732
2002	Typhoon Rusa	South Korea, North Korea	4,550	150
2003	Typhoon Maemi	South Korea, Japan	4,200	120
1990	Typhoon Flo	Japan	4,000	43

Source: Munich Re, NatCatSERVICE, 2014

## 3. Underlying risk drivers for Japan

### 3.1. Disaster risk driver indicators

#### World Development Indicators 2014:

- Population: 127.6 million
- Surface area: 378,000 sq. km
- Population density: 350 people per sq. km
- Urban population: 92% of total population
- Gross national income:
  - \$6,106.7 billion (Atlas method)
  - \$47,870 per capita (Atlas method)
  - \$4,687.6 billion (purchasing power parity)
  - \$36,750 per capita (purchasing power parity)
- Gross domestic product:
  - 2.0% growth
  - 2.2% growth per capita

Source: World Bank

#### Human Development Report 2013:

- Japan rank: 10
- Human Development Index Value: 0.912

Source: UNDP

#### Global Assessment Report 2013:

According to the GAR, roughly 80 percent of cyclonic wind risk is concentrated in Asia.<sup>19</sup>

<sup>19</sup> [http://www.preventionweb.net/english/hyogo/gar/2013/en/home/GAR\\_2013/GAR\\_2013\\_53.html](http://www.preventionweb.net/english/hyogo/gar/2013/en/home/GAR_2013/GAR_2013_53.html)

Japan and the United States of America concentrate 56 percent of global risk from cyclonic winds, corresponding to the high value of their exposed capital. Urban produced capital exposed to cyclonic winds (speed higher than 150 km/h for 250 year return period) in Japan is valued at about US\$14 trillion. This corresponds to 100 percent of total urban produced capital for Japan.<sup>20</sup>

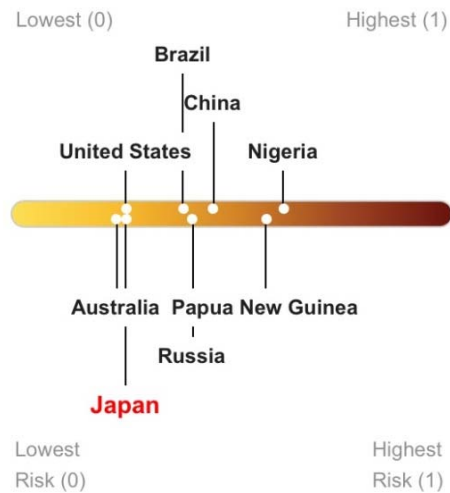
Indicator	Value
Cyclone winds Annual average loss (AAL) is the estimated average loss per year over a long time period considering the range of loss scenarios relating to different return periods <i>M US\$</i>	45,933.3
Cyclone winds Annual average loss (AAL) <i>R : ranking of the country</i>	1
Cyclone winds probable maximum loss (PML) is the maximum loss that could be expected for a given return period <i>M US\$</i>	547,819.58
Cyclone winds probable maximum loss (PML) <i>R : ranking of the country</i>	1
Cyclone winds ratio: Cyclone winds probable maximum loss (PML) / urban produced capital	3.74
Percentage of exposed population to Cyclone winds in urban areas with more than 2,000 inhabitants	100

Source: UNISDR

**Pacific Disaster Center (PDC):**

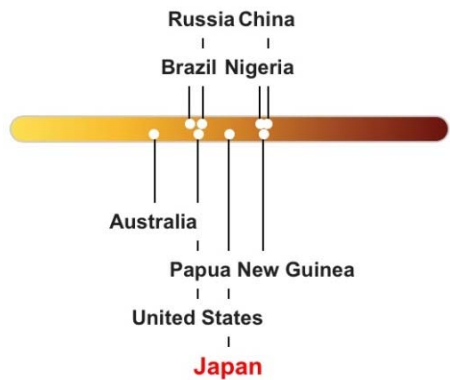
**Lack of Resilience Index:**

Lack of Resilience represents the combination of susceptibility to impact and the relative inability to absorb, respond to, and recover from negative impacts that do occur over the short term. Japan ranks 147 out of 165 on the Lack of Resilience index with a score of 0.26. Based on the sub-component scores related to Vulnerability and Coping Capacity, the three thematic areas with the weakest relative scores are Recent Disaster Impacts, Marginalization and Environmental Stress.



**Multi Hazard Risk Index:**

Japan ranks 61 out of 165 on the Multi-Hazard Risk Index with a score of 0.5. Japan is estimated to have relatively very high overall exposure, low vulnerability, and high coping capacity.



<sup>20</sup> [http://www.preventionweb.net/english/hyogo/gar/2013/en/home/GAR\\_2013/GAR\\_2013\\_62.html](http://www.preventionweb.net/english/hyogo/gar/2013/en/home/GAR_2013/GAR_2013_62.html)



### Exposure estimates by OECD:

According to the 2008 the Organization for Economic Cooperation and Development (OECD) report on “Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes: Exposure Estimates”<sup>21</sup> many Asian mega-cities are highly vulnerable to storms. In terms of assets exposed, Osaka-Kobe, Tokyo (including Chiba and Yokohama) and Nagoya are among the top 10 vulnerable cities in the world. The exposure of the population in Japanese port cities to potential wind damage is extremely high. Tokyo ranks highest in the world for exposure to potential wind damage, with Osaka-Kobe in sixth place.

### 3.2. Governance

Japan enacted Disaster Countermeasures Basic Act<sup>22</sup> in response to huge disaster damage by Typhoon Isewan (Vera) in 1965. Since then, disaster management system has been reviewed whenever it is stricken by such huge disasters. Likewise, in response to the Great East Japan Earthquake in 2011, the revision of Disaster Countermeasures Basic Act and Basic Disaster Management Plan has already been completed. The Disaster Countermeasures Basic Act clearly specifies responsibilities of organizations involved in disaster risk reduction.

Based on the Disaster Countermeasures Basic Act, the Central Disaster Management Council prepares Basic Disaster Management Plan which is a basis for disaster reduction activities. Based on the Basic Disaster Management Plan, each designated government organization and designated public corporation develops Disaster Management Operation Plan. Similarly, based on the Basic Plan, each prefectural and municipal disaster management council draws up Local Disaster Prevention Plan subject to local circumstances. The Basic Disaster Management Plan states comprehensive and long-term disaster reduction issues such as disaster management related systems, disaster reduction projects, early and appropriate disaster recovery and rehabilitation, as well as scientific and technical research.<sup>23</sup>

### 4. Recommendations

On July 7, the Japan Meteorological Agency (JMA) issued its highest alert for typhoon Neoguri. It is the first typhoon warning since the Emergency Warning System was launched on 30 August 2013. JMA website retails recommended responses to all Emergency Warnings, including examples of municipal and resident responses to weather Warnings/Advisories:  
[http://www.jma.go.jp/jma/en/Emergency\\_Warning/ew\\_index.html](http://www.jma.go.jp/jma/en/Emergency_Warning/ew_index.html).

The U.S. Air Force in Kadena provides a fact sheet about typhoons in Okinawa at:  
[http://www.kadena.af.mil/library/factsheets/factsheet\\_print.asp?fsID=7290&page=1](http://www.kadena.af.mil/library/factsheets/factsheet_print.asp?fsID=7290&page=1). It contains a link to a guide focusing on the emergencies that can occur on Okinawa - natural disaster, major accident, or a Weapons of Mass Destruction (WMD) attack. An additional guide on ‘Surviving typhoons’ in Okinawa is available from the U.S. Naval Hospital in Okinawa at:  
<http://www.med.navy.mil/sites/nhoki/Documents/Surviving%20Typhoons-Okinawa%20Typhoon%20Guide.pdf>.

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<sup>21</sup> [http://www.oecd-ilibrary.org/environment/ranking-port-cities-with-high-exposure-and-vulnerability-to-climate-extremes\\_011766488208](http://www.oecd-ilibrary.org/environment/ranking-port-cities-with-high-exposure-and-vulnerability-to-climate-extremes_011766488208)

<sup>22</sup> <http://www.preventionweb.net/english/professional/policies/v.php?id=30940>

<sup>23</sup> <http://www.preventionweb.net/english/professional/policies/v.php?id=31426>