

DISASTERS BULLETIN 9: February 24th – July 25th 2006

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Summary for the period

In comparison to recent years, the first half of 2006 has been relatively quiet with respect to major catastrophes. Over the past five months, Indonesia has borne the brunt of natural disasters, suffering a number of significant flood events, along with two earthquakes close to the south coast of Java. Together, these took close to 7,000 lives, during the first – in May – as a result of building collapse due to severe ground shaking, and in the second – in July – as a consequence of a tsunami. Total losses are estimated at more than US\$3 billion. Another strong earthquake shook western Iran in March, taking just 66 lives, but causing massive damage, while further lethal but small quakes struck Mozambique in February and Indonesia in March. Apart from Tropical Storm Alberto, which made landfall in Florida in early June, without causing substantial damage, the Atlantic Hurricane Season has so far been quiet – perhaps ominously so, given forecasts for another active season. The worst windstorm of the period was undoubtedly Cyclone Larry, which battered the Australian state of Queensland in March, causing economic losses estimated at around US\$1.1 billion, with insured losses of around US\$225 million. The less windy, but unusually wet, Tropical Storm Bilis (also known as Typhoon Florita), however, led to the largest storm losses for the period, contributing to more than 600 deaths and leaving a repair bill, in China, of close to US\$2 billion, primarily due to floods. A number of other major flood events also afflicted China, leading to a further 310 deaths and losses totalling US\$1 billion. Record rainfall levels in June also led to massive flooding in the north-eastern states of the US, notably Pennsylvania, New York, New Jersey, Maryland, Delaware, Virginia and Washington DC, leading to 16 deaths and economic losses around the US\$1 billion mark. Many other countries were also affected by serious flooding, most notably, Germany, Austria, the Czech Republic, Hungary, Bulgaria, Romania, Serbia, Croatia, Montenegro, Slovakia and Russia in Europe, Chile and Ecuador in South America, Kenya and the Democratic Republic of Congo in Africa, and Japan, Taiwan, Indonesia, the Philippines, India, Bangladesh, Thailand and Iran in Asia. A number of technological disasters occurred during the period, the most lethal involving an oil pipeline explosion in Nigeria and terrorist train bombs in Mumbai (India), each taking around 200 lives. Other notable events included the capsizing of ferries off Bahrain and Djibouti, a rail crash in Valencia (Spain), and a fire at an electronics fair in India.

Selected events

Territory:	Indonesia
Region:	Java
Date:	17 July 2006
Event:	Tsunami
Impact:	As of July 21 st , the death toll stands at 533, with 308 missing and close to a thousand injured. The number of displaced persons is set at 61,352, the great majority from the towns of Ciamis (more than 43,000) and Tasikmalaya (over 12,000), and the balance from Cilacap and Kebumen. The total number of buildings destroyed or severely damaged is put at more than 1,000, with over 1,500 fishing boats destroyed, heavily damaged or swept away. Infrastructure is also badly affected, with five bridges destroyed and more than 12 km of road lost.
Summary:	A moment magnitude 7.7 submarine earthquake occurred close to the south coast of Java at 15.24 local time, near the junction between the Australian Plate to the south and the Sunda Plate to the north. The USGS placed the quake at the relatively shallow depth of 48.6 km, and at a location 240 km SSW of the city of Tasikmalaya, and 358 km south of the capital Jakarta. More than 20 aftershocks followed the main shock, with two exceeding magnitude 6. The main quake triggered a tsunami that impacted along a 200 km stretch of West Java's south coast, in the region of the beach resort of Pangandaran. Wave height estimates range upwards from 2 m to 7 m,

with reported inundation distances of up to 800 m inland in places. A similar earthquake in the region in 1994 generated a tsunami up to 13 m high that took more than 200 lives. The Pacific Tsunami Warning Centre in Hawaii issued a tsunami warning 12 minutes after the earthquake, but no warning was transmitted to the threatened areas by Indonesian authorities. The tsunami arrived at the coast around 55 minutes after the earthquake.

Data sources: USGS Earthquake Hazards Program
<http://earthquake.usgs.gov/eqcenter/recenteqsww/Quakes/usqgaf.php>

ReliefWeb
<http://www.reliefweb.int/rw/dbc.nsf/doc108?OpenForm&emid=TS-2006-000087-IDN&rc=3>

Additional sources

The Jakarta Post
<http://www.thejakartapost.com/detailheadlines.asp?fileid=20060720.B04&irec=3>

Image: Image from the IKONOS satellite shows the 'tide mark' of debris left following retreat of the Java tsunami. Courtesy: **CHECK COPYRIGHT ON THE SITE**
http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17342

Territory: Australia

Region: Queensland

Date: 20 March 2006

Event: Cyclone

Impact: The worst effects of Cyclone Larry were centred upon the small town of Innisfail (population ~ 8,500) 90 km south of Cairns. Despite severe damage to buildings, including the loss of around 50 percent of roofs, no fatalities occurred. In total, around 10,000 buildings in Innisfail were damaged, leaving thousands homeless. A quarter of government buildings were also damaged, and many roads and bridges made impassable. At Babinda, 30 km north of Innisfail, an estimated 80 percent of buildings were damaged, along with virtually all homes at neighbouring Silkwood, which was the worst hit settlement. Around a third of properties at Kurrimine Beach and Mission Beach were also damaged, but the city of Cairns escaped lightly. Cairns airport and harbour were closed, however, and more than 50,000 residents in the area lost power. The banana industry, which provides around 6,000 jobs, was severely affected, with the level of crop destruction reported to be as high as 90 percent, and losses estimated at more than US\$255 million. Australia also lost 10 percent of its sugar production due to the cyclone, with resulting losses set at around US\$145 million. Total economic losses are forecast to be about US\$1.1 billion, with insured losses hovering around US\$225 million.

Summary: Tropical Cyclone Larry started life as a low pressure system over the Coral Sea on March 16th. Two days later, and 1150 km off the Queensland coast, the system had developed into a Category 2 cyclone (on the Australian Intensity Scale). The storm intensified to category 5 on the AIS, and made landfall on the Queensland coast close to Innisfail, between 06.20 and 07.20 h on March 20th. 10 minute sustained wind speeds are estimated at ~ 200 km an hour, with gusts as high as 290 km and hour – and perhaps up to 320 – close to Innisfail. Maximum wind speeds are typical of a Category 4 storm on the Saffir-Simpson Scale for Atlantic hurricanes, although the lowest pressure, at 915 mb, is more characteristic of a Category 5 Atlantic hurricane.

Larry was downgraded to a tropical low pressure system as it headed inland, before dissipating over the next 24 hours. This short-lived but extremely intense storm is the most powerful to strike the Queensland coast since 1931.

Data sources: Tropical Cyclone Larry Review. Guy Carpenter
<http://gcportal.guycarp.com/portal/extranet/popup/pdf/GCPub/Tropical%20Cyclone%20Larry%20051906.pdf?vid=1>

Australian Bureau of Meteorology, Queensland Regional Office
http://www.bom.gov.au/weather/qld/cyclone/tc_larry/

Additional sources

The Australian
<http://www.theaustralian.news.com.au/story/0,20867,18531510-31037,00.html>

Image: Tropical Cyclone Larry bearing down on Queensland on March 19th, imaged by the MODIS instrument on the TERRA satellite. Courtesy: Jeff Schmaltz, MODIS Rapid Response Team, NASA Goddard Space Flight Centre.
http://en.wikipedia.org/wiki/Image:Cyclone_Larry_2006.jpg

Note: good alternative images at Australian Bureau of Meteorology site (above)

Territory: Indonesia

Region: Java

Date: 27 May 2006

Event: Earthquake

Impact: Around five million people live within 50 km of the epicentre, including many on the densely populated Bantul Plain. It is not surprising, therefore, that despite its relatively small size, the impact of the earthquake was severe. Final estimates put the death toll at 5,778, with more than 37,883 injured. Over 140,000 homes were completely destroyed, and a further 468,000 damaged. In early July, a quarter of a million people were still displaced. More than 260 schools were destroyed, along with hundreds of government buildings and 50 km of roads. Total economic losses are estimated to be in excess of US\$3.1 billion.

Summary: At 05.54 local time, a magnitude 6.3 earthquake struck the south coast of Java close to the towns of Galur and Bantul, some 10 - 15 km SSE of the city of Yogyakarta and 455 km ESE of the Indonesian capital, Jakarta. At a depth of around 17 km, the earthquake was shallow, occurring within the Sunda Plate that overlies the Australian Plate, which is subducting beneath it to the south of Java. The quake was felt across much of Java and also in the island of Bali to the east. Ground shaking reached intensity IX in the plain of Bantul to the south of Yogyakarta, VIII in Yogyakarta itself, V at Surakarta, IV at Salatiga and Blitar, and II at Surabaya. Hundreds of aftershocks, with magnitudes up to 5.2 occurred in the weeks following the main shock, but no tsunami was reported. Speculation that the quake was related to activity at the Merapi volcano, less than 50 km from the epicentre, remains unfounded.

Data sources: USGS Earthquake Hazards Program
<http://earthquake.usgs.gov/eqcenter/recenteqsww/Quakes/usneb6.php#details>

Reliefweb

[http://www.reliefweb.int/rw/dbc.nsf/doc108?OpenForm&emid=EQ-2006-000064-
IDN&rc=3](http://www.reliefweb.int/rw/dbc.nsf/doc108?OpenForm&emid=EQ-2006-000064-
IDN&rc=3)

Additional sources

British Geological Survey
http://www.earthquakes.bgs.ac.uk/latest/java_26052006.htm

Preliminary damage report. Indonesian government & international partners
http://www.eeri.org/lfe/pdf/Indonesia_Yogyakarta_Damage_Risk_Assmt_ExecSum.pdf

Image: Collapsed houses in the town of Klaten, 20 km NE of the city of Yogyakarta
Courtsey: USAID.

http://en.wikipedia.org/wiki/Image:Klaten_collapsed_houses.jpg

Territory: Iran
Region: Lorestan province
Date: 31 March 2006
Event: Earthquake

Impact: Although the duration of the quake was just 55 seconds, this was sufficient to cause major damage. Around 45,000 buildings were completely destroyed or seriously damaged across 320 villages and in the city of Borujerd, and many tens of thousands more suffered some damage. An estimated 136 schools were destroyed, with a further 200 or so damaged. In Borujerd, a third of the historic old city was severely damaged or destroyed, with 40 major historical monuments destroyed. At just 66, the death toll was relatively small, and has been attributed to many people leaving their homes in response to a warning by authorities following a foreshock several hours before the main quake. In addition to the dead, a further 1,500 people were injured and more than 160,000 affected.

Summary: A very shallow (~ 7 km), magnitude 6.1 earthquake struck western Iran at 04.47 local time, 335 km SW of the capital Iran. The province of Lorestan was worst hit, particularly the Borujerd – Dorud area. Hundreds of aftershocks followed the main shock, and continued for more than three months. The quake occurred close to a geological structure known as the Main Recent Fault, a major strike-slip fault that generated a magnitude 7.4 earthquake in 1909. Both quakes resulted from the release of crustal strain accumulated due to the northward movement of the Arabian Plate against the Eurasian Plate, at a rate of 2 – 3 cm a year.

Data sources: ReliefWeb
[http://www.reliefweb.int/rw/rwb.nsf/doc106?openForm&rc=3&cc=irn&emid=EQ-
2006-000043-IRN&po=0&so=63](http://www.reliefweb.int/rw/rwb.nsf/doc106?openForm&rc=3&cc=irn&emid=EQ-
2006-000043-IRN&po=0&so=63)

USGS Earthquake Hazards Program
<http://earthquake.usgs.gov/eqcenter/recenteqsww/Quakes/uskyae.php>

Additional sources

Asian Disaster Reduction Centre
http://www.adrc.or.jp/view_disaster_en.php?Lang=en&Key=946&Frame=yes/Western

Image:	Building damage in the Borujerd Bazaar, in the historic heart of the city. http://en.wikipedia.org/wiki/Image:HafeziCarevanserai.jpg
Territory:	Philippines, Taiwan, China
Region:	Respectively, Luzon, northern Taiwan and SE China
Date:	8 – 15 July 2006
Event:	Tropical Storm Bilis (Typhoon Florita)
Impact:	While maximum wind speeds barely reached the level of a category 1 tropical cyclone, the particularly heavy rains associated with Tropical Storm Bilis resulted in considerable damage and loss of life, and qualified Bilis as the most damaging storm – so far – of 2006. Although Bilis did not make landfall in the Philippines, the country was affected by the strongest winds and heaviest precipitation as the storm passed to the north. The outer rain bands brought torrential rain to central Luzon, including the capital Manila, killing nine in flash floods and landslides. Four people were killed in Taiwan, although damage here was relatively light due to less in the way of sustained heavy rainfall. China bore the brunt of the storm, with latest estimates (July 24 th) putting the death toll at 612, with more than 200 missing, and over three million displaced. Serious flooding affected the provinces of Fujian, Guangxi, Guangdong, Yunnan, Zhejiang, and floods and wind caused travel disruption in the city of Shanghai. The province of Hunan was worst affected, with massive flooding and landslides destroying an estimated 31,000 homes and claiming more than 400 lives. Rainfall measurements in China indicated hourly precipitation rates of up to 11 cm, and this – combined with the persistence of Bilis is blamed for the severe flooding in the south-east of the country. Total economic losses are currently (end July) estimated at US\$1.98 billion, but can be expected to rise. Insured loss data are not currently available.
Summary:	Tropical Storm Bilis began life on July 7 th , as a tropical disturbance south of Guam in the western Pacific. By the following day, the disturbance had organised itself into a tropical depression, and by the 9 th achieved tropical storm status. Bilis headed north-westward towards Taiwan and was classified as a severe tropical storm on July 11 th . Two days later, Bilis reached peak intensity, with wind speeds reaching 110 km an hour, before making landfall in northern Taiwan. After crossing the island, Bilis made a second landfall in China's Fujian province on the 14 th . The storm weakened to a tropical depression over SE China the following day, and to a remnant low the day after. This remained organised for several days thereafter, moving slowly westwards and bringing very heavy rains to inland China. Confusingly, Tropical Storm Bilis was also named Typhoon Florita by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), although it is questionable whether wind speeds warranted typhoon status.
Data sources:	ReliefWeb http://www.reliefweb.int/rw/dbc.nsf/doc104?OpenForm&rc=3&cc=chn Dartmouth Flood Observatory http://www.dartmouth.edu/~floods/
Additional sources	NASA Earth Observatory http://earthobservatory.nasa.gov/NaturalHazards/

Image:

The Tropical Rainfall Measuring Mission (TRMM) shows Bilis as a strongly asymmetric storm, with the heaviest rain concentrated south of the storm centre. Here it is viewed passing to the north of the Philippines on July 10th. Courtesy: Hal Pierce (SSAI/NASA GSFC)

http://earthobservatory.nasa.gov/NaturalHazards/natural_hazards_v2.php3?img_id=13711

Territory:	United States
Region:	Maryland, Pennsylvania, Delaware, Virginia, New York, New Jersey, Washington DC.
Date:	25 June – 1 July 2006
Event:	Flood
Impact:	Widespread flooding across Virginia, Washington DC, Maryland, Pennsylvania, Delaware, New Jersey and New York State, led to tens of thousands of buildings being damaged and hundreds of thousands of people being temporarily displaced. On the Susquehanna River in Pennsylvania, 200,000 people were evacuated as the river exceeded its flood stage, but were allowed to return when levees successfully held the flood crest conditions. In New York State, eastern and central areas were worst affected, including the city of Binghamton on the Susquehanna, where more than 15,000 were evacuated. Property damage in the state is estimated at ~ US\$100 million. In New Jersey, Trenton on the Delaware suffered major flooding, as the river burst its banks and flood waters reached close to 2 m depth. Six thousand residents were forced to flee and thousands of homes were inundated. In Montgomery County, Maryland, 2,000 people were forced out by rising floodwaters on the Susquehanna, while in Washington DC, many highways and government buildings were flooded, including the Justice and Commerce departments and the IRS, which was expected to remain closed for a month. The Washington Metro was disrupted, and Amtrack services halted, while tens of thousands lost power across the region. The final death toll is estimated at 16, with economic losses due to the flooding set at around US\$1 billion. Insured loss data are not currently available.
Summary:	Between June 22 nd and the 28 th , the Mid-Atlantic and North Eastern states of the US experienced exceptionally heavy precipitation. The cause was a mass of tropical air from the Atlantic pushing north-westwards into a stationary front located over the region. The result was four or five days of severe thunder storms, many of which continually reformed to repeatedly dump torrential rain across the same areas. In places, rainfall exceeded 25 cm, breaking many records and leading to widespread flooding across the greater Washington DC area, in Virginia and Maryland, and northwards in parts of Pennsylvania, Delaware, New Jersey and New York. In Washington and Columbia (Maryland), 15 – 22 cm of rain fell within 24 hours, closing federal buildings and dozens of roads in the capital and carrying vehicles away in flash floods. At least 10 cm of rain fell across most of the Delaware River Basin, with up to 32 cm in places. Near record flood conditions occurred along the Delaware River on June 28 th and 29 th . In Pennsylvania, more than 20 cm of rain led to the Susquehanna River reaching dangerous levels, and required the opening of floodgates to prevent uncontrolled overtopping of the banks. River levels were above their flood stages in many places, including Wilkes-Barre, Danville, and Harrisburg on the Susquehanna, and Phillipsburg and Trenton on the Delaware. The

Susquehanna River was reported at one point to be nearly 5 m above flood level, with the Delaware around 10 m above flood level in places.

Data sources: Dartmouth Flood Observatory
<http://www.dartmouth.edu/~floods/>

Delaware River Basin Commission
http://www.state.nj.us/drbc/Flood_Website/2006/summary7-17.pdf

Additional sources NOAA North East River Forecast Center
<http://www.erh.noaa.gov/er/nerfc/>

Image:

Precipitation over the north eastern United States in the seven days to June 28th 2006.
Courtesy NOAA.

<http://www.ncdc.noaa.gov/img/climate/research/2006/jun/northeastrainfall.gif>

Territory: Czech Republic, Germany, Austria

Region: Saxony, Saxony-Anhalt and Brandenburg (Germany), Upper and Lower Austria, northern, southern and eastern Czech Republic.

Date: 28 March – 17 April 2006

Event: Flood

Impact: Along the Elbe in Saxony, residents were evacuated from parts of the city of Dresden adjacent to the river, when a dyke was breached in three places, but damage to the city was not severe. Several towns downriver, between Dresden and Hamburg, were also flooded following the saturation and collapse of several dykes. The medieval town of Hitzacker was particularly badly affected, with the Elbe reaching 7.6 m above normal, and flooding much of the Old Town. In the Czech Republic, Elbe floodwaters inundated the city of Usti nad Labem and the historic town of Hrensko, while flooding also occurred on the Luznice river at Veseli nad Luznici, and on the Dyje river at Znojmo, close to the Austrian border. In Austria, the town of Angern an der March in Lower Austria was flooded by Danube waters. Many thousands of people were evacuated across the region. Economic losses are estimated at US\$217 million. Insured losses are predicted to be on the order of Euro15 million for Germany alone.

Summary: A combination of torrential rains and snow melt led to extensive flooding along the Danube in Austria, the Elbe in Germany, and a number of rivers in the Czech Republic. In Germany, the Elbe reached almost three times its normal level, and 13 cm higher than in the summer floods of 2002, which saw water levels reach 150 year highs across parts of central and eastern Europe. Most badly affected were the German States of Saxony, Saxony-Anhalt and Brandenburg, while in Austria, the worst flooding occurred along the Danube in Upper and Lower Austria. In the Czech Republic, temporary flood defences were raised in the capital, Prague, to prevent a repeat of the devastating 2002 floods.

Data sources: Centre for Satellite-based Crisis Information
http://www.zki.dlr.de/applications/2006/germany/elbe_flood_2006_en.html

European Space Agency
<http://earth.esa.int/ew/floods/germanyfl-apr06/>

Additional sources Dartmouth Flood Observatory
<http://www.dartmouth.edu/~floods/>

Image: Floodwaters in Dresden following record water levels on the River Elbe.
 Courtesy: Thomas Richter
http://en.wikipedia.org/wiki/Image:Flood_dresden_april2006_004.jpg

Other notable and unusual events (selected)

Date	Country/region	Event	Fatalities	Economic losses (mil US\$)	Insured losses (mil US\$)
Mid-July	Japan (Tenryu river)	Floods	17		
Mid - July	Chile (southern)	Floods	17		
Mid – July	Ecuador (Tungurahua)	Volcanic eruption	0		
July 11	India (Mumbai)	Train bombs	200		
July 7 - 11	China (Guangxi Zhuang)	Floods	8	31	
July 3	Pakistan (Peshawar)	Mudslide	22		
July 3	Spain (Valencia)	Metro crash	43		
June 18 - 21	Indonesia (Sulawasi; Kalimantan)	Flash floods and landslides	291	55.2	
June 12 - 16	China (Guizhou)	Floods	52	130	
June 10 - 13	Taiwan (central and southern)	Floods	1	116.13	
June 4 - 12	Russia (Yakutia-Lensk)	Floods	0	125	
May 31 - July	India and Bangladesh	Monsoon floods	21		
May 30 – June 9	China (south-east)	Monsoon floods	57	393	
May 21 – June 11	Thailand (northern)	Flash floods and landslides	83	26	
May 18 - 22	China (south-east)	Floods – Tropical Storm Chanchu	23	475	
May 12	Nigeria (Lagos)	Oil pipeline explosion and fire	> 200		
May 8 - 13	Iran (Ardebil)	Floods	14	16	
April 19	Indonesia (Java)	Flash floods	19		
April 10	India (Uttar Pradesh)	Fire at electronics fair	~ 50		
April 8 – 10	DR Congo (Kinshasa)	Floods	7		
April 6	Djibouti	Capsized ferry	~ 113		

April 4 – May 22	Kenya (coastal region)	Floods	60		
April 4 – May 11	Serbia, Montenegro, Croatia (Danube and tributaries)	Floods	0	44.6	
March 30	Bahrain	Capsized ferry	69		
March 28 – May 9	Slovakia (western and central); Hungary (north-west)	Floods	3	37	
February - April	Ecuador (El Oro, Esmeraldas, Guayas, Los Rios, Manabi)	Floods	16		
March 14	Indonesia (Seram)	Earthquake	2		
March 8	DR Congo	Tornado	3		
February 23	Mozambique	Earthquake	4		
February 21	Indonesia (Sulawasi)	Floods	33	17.6	