



Republic of the Philippines  
*Polytechnic University of the Philippines*  
Anonas, Santa Mesa, Maynila, Kalakhang Maynila

## Activity 1

# Disaster Readiness and Risk Management

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**List of Disasters :**

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3. Hurricanes
4. Thunderstorms
5. Acid Rain
6. Sandstorms
7. Hail Storm
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**Typhoons**

**1. Where does this kind of event occur?**

Tropical cyclones occur in nearly every ocean on Earth, but one part of the Pacific hosts some of the strongest storms on the planet. The western Pacific Basin is known for some of history's biggest and most violent storms, called typhoons. Compared to the Atlantic, the Pacific Basin generally has numerous factors that help it develop storms with greater frequency and intensity.

**2. What causes this natural phenomenon?**

Several atmospheric ingredients must come together to favor the formation of a typhoon. Since a typhoon is just another term for hurricane, the same conditions apply for both. There are perhaps seven atmospheric conditions which, if met, could cause a typhoon to form. A pre-existing disturbance, warm ocean water, low atmospheric stability, sufficient Coriolis force, moist mid-atmosphere, and upper atmosphere divergence are all important factors for typhoon formation.

**3. How much warning is there?**

India

The IMD issues warnings in four stages for the Indian coast.

- Stage 1: Cyclone watch - Issued 72 hours in advance, it discusses the likelihood of development of a cyclonic disturbance in the north Indian Ocean and the coastal region likely to experience adverse weather.
- Stage 2: Cyclone alert - Issued 48 hours in advance of the commencement of adverse weather over the coastal areas.
- Stage 3: Cyclone warning - Issued 24 hours in advance of the commencement of adverse weather over the coastal areas. The location of landfall is discussed at this stage.



- Stage 4: Landfall outlook - Issued 12 hours in advance of the commencement of adverse weather over the coastal areas. The track of the cyclone after the landfall and the possible impact inland is discussed at this stage.

#### Philippines

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) releases tropical cyclone warnings in the form of Public Storm Warning Signals (or just storm signals).<sup>[19]</sup> An area having a storm signal may be under:

- PSWS #1 - Tropical cyclone winds of 30–61 km/h are expected within the next 36 hours. (Note: If a tropical cyclone forms very close to the area, then a shorter lead time is seen on the warning bulletin.)
- PSWS #2 - Tropical cyclone winds of 61–120 km/h are expected within the next 24 hours.
- PSWS #3 - Tropical cyclone winds of 121–170 km/h are expected within the next 18 hours.
- PSWS #4 - Tropical cyclone winds of 171–220 km/h are expected within 12 hours.
- PSWS #5 - Tropical cyclone winds greater than 220 km/h are expected within 12 hours.

These storm signals are usually heightened when an area (in the Philippines only) is about to be hit by a tropical cyclone. Thus, as a tropical cyclone gains strength and/or gets closer to an area having a storm signal, it may be heightened to another higher signal in that particular area. Whereas, as a tropical cyclone weakens and/or gets farther away from an area, it may be downgraded to a lower signal or may be lifted (that is, an area will have no storm signal).

#### Hong Kong and Macau

The Pearl River Delta uses a variety of warning systems to inform the public regarding the risks of tropical cyclones to the area. The Hong Kong Observatory issues typhoon signals to indicate the existence and effects of a tropical cyclone on Hong Kong. The Macao Meteorological and Geophysical Bureau in Macau uses a similar system.<sup>[16]</sup> The signal system consists of 8 signals in 5 levels numbered non-consecutively for historical reasons.<sup>[17][18]</sup> Each signal has a day signal and a night signal for hoisting, which are still hoisted in Macau but no longer hoisted in Hong Kong. Day signals are also used as signal symbols in both places.

- Signal No. 1: A tropical cyclone is centred within 800 km of the territory and may affect the territory later.
- Signal No. 3: Strong wind with a sustained speed of 41–62 km/h, gusts may exceed 110 km/h.
- Signals Nos. 8 NW, 8 SW, 8 NE, 8 SE: Gale or storm force wind with a sustained speed of 63–117 km/h from the northwest, southwest, northeast, southeast quadrants respectively, gusts may exceed 180 km/h.
- Signal No. 9: (Hong Kong) Gale or storm force wind is increasing or expected to increase significantly in strength. / (Macau) The centre of a tropical cyclone is approaching and Macau is expected to be severely affected.
- Signal No. 10: Hurricane force wind with a sustained speed over 118 km/h, gusts may exceed 220 km/h.

#### China

A two-stage warning system was long-established in China for tropical cyclones of tropical storm intensity of above.<sup>[13]</sup> Nowadays, the use of this system is restricted to coastal waters only. Thus, warnings may be discontinued even if a cyclone is maintaining tropical storm intensity inland. Color-coded alerts (below) may be in effect independently of any two-stage warnings.

- Warning: Winds may reach Beaufort Force 8 or rainstorm may occur in 48 hours.
- Urgent Warning: Winds may reach Beaufort Force 8 or rainstorm may occur in 24 hours.

Guangdong introduced a color-coded tropical cyclone warning system for land use in 1999.

- White alert: A tropical cyclone may affect the area in 48 hours.
- Green alert: Winds may reach Beaufort Force 6 in 24 hours or winds of Beaufort Force 6~7 are already blowing.



- Yellow alert: Winds may reach Beaufort Force 8 in 12 hours or winds of Beaufort Force 8~9 (gale force) are already blowing.
- Red alert: Winds may reach Beaufort Force 10 in 12 hours or winds of Beaufort Force 10~11 (storm force) are already blowing.
- Black alert: Winds may reach Beaufort Force 12 in 12 hours or winds of Beaufort Force 12 (hurricane force) are already blowing.

Similar systems were developed in Fujian and Shanghai.

Later, China Meteorological Administration standardized the system for national use.<sup>[15]</sup> This set is part of a larger warning system that covers other forms of severe weather conditions, such as extreme temperature, torrential rainfall, drought, etc. Guangdong maintained a white alert as in the old system.

- Blue alert: Winds may reach Beaufort Force 6 in 24 hours or winds of Beaufort Force 6~7 are already blowing.
- Yellow alert: Winds may reach Beaufort Force 8 in 24 hours or winds of Beaufort Force 8~9 (gale force) are already blowing.
- Orange alert: Winds may reach Beaufort Force 10 in 12 hours or winds of Beaufort Force 10~11 (storm force) are already blowing.
- Red alert: Winds may reach Beaufort Force 12 in 6 hours or winds of Beaufort Force 12 (hurricane force) are already blowing.

#### Western Hemisphere

In 2017, the National Hurricane Center introduced a new system of warnings and watches for [storm surge](#), which would cover the [Atlantic](#) and [Gulf Coasts](#) of the [United States](#). A storm surge watch would be issued when a life-threatening storm surge, associated with a potential or ongoing tropical, subtropical or post-tropical cyclone, is possible within the next 48 hours. These watches would be upgraded to storm surge warnings when there is a danger of life-threatening storm surge occurring within 36 hours. However, both watches and warnings may be issued earlier than specified if environmental conditions are expected to hamper preparations.<sup>[11]</sup>

In [Mexico](#), a color coded alert system is used to keep the public informed when a tropical cyclone or possible tropical cyclones poses a threat to the nation. The scale starts with blue at the bottom being minimal danger, then proceeds to a green alert, which means low level danger. A yellow alert signifies moderate danger, followed by an orange alert that means high danger level. The scale tops off with a red alert, the maximum level of danger.

#### 4. Can it cause damage to people and the environment? If yes, what sort of damage can it cause?

Intensity	Wind Speed	Damage
Category 1	74- 95 mph	MINIMAL: tree branches, shrubs, unanchored mobile homes
Category 2	96-110 mph	MODERATE: mobile homes, poorly constructed buildings, some trees down
Category 3	111-130 mph	EXTENSIVE: small buildings damaged, large trees down, mobile homes destroyed
Category 4	131-155 mph	EXTREME: outer walls damaged, roof failure on small buildings, extensive damage to doors and windows, mobile homes destroyed



Category 5	>155 mph	CATASTROPHIC: complete roof failure on many buildings, some buildings destroyed, severe window and door damage, mobile homes destroyed
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### 5. How are different people affected when a natural phenomenon strikes their community?

Every citizen is affected for fear also strikes their system. Students, employees, businessmen, and others are all affected. Everyone should be prepared and takes immediate action as a natural phenomenon strikes their community.

### 6. Does a reported natural phenomenon affects people at all times?

It depends whether your area will be affected, and when you choose to be affected.

### 7. How strong are the most damaging events? List 5 events.

#### Typhoon Nancy (1961)

- **Basin: West Pacific**
- **Highest 1-minute sustained winds: 213 mph (345 kph)**
- **Lowest central pressure: 882 millibars**

Typhoon Nancy has held onto the #1 rank of strongest tropical cyclone (based on winds) for five decades and counting. But its rank isn't without controversy. It's possible that the storm's wind estimates may have been inflated during aircraft reconnaissance flyovers. (Wind readings during the 1940s to 1960s were likely overestimated due to inadequate technology and a lesser understanding at the time of how hurricanes work.)

Assuming Nancy's wind speed data *is* reliable, it qualifies Nancy for another record: the longest lasting Category 5 equivalent hurricane in the Northern Hemisphere. (It remained a Cat 5 for 5 1/2 days!)

Nancy did make landfall, though thankfully not at peak intensity. Even so, it caused \$500 million USD in damages and around 200 deaths as a Category 2 in Japan.

#### Typhoon Violet (1961)

- **Basin: West Pacific**
- **Highest 1-minute sustained winds: 207 mph (335 kph)**
- **Lowest central pressure: 886 millibars**

To be such an intense storm, Violet was surprisingly short-lived. Within 5 days of forming, it had strengthened into a Category 5 equivalent super typhoon with a central pressure of 886 millibars and winds in excess of 200 mph. A few days after reaching peak intensity, it had all but dissipated.

The fact that Violet had weakened to a tropical storm by the time it made landfall in Japan was the island's saving grace - it kept damages and loss of life to a minimum.

#### Typhoon Ida (1958) and Hurricane Patricia (2015)



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- **Highest 1-minute sustained winds: 200 mph (325 kph)**

The Western Pacific's Typhoon Ida and East Pacific newcomer, Hurricane Patricia, tie for third strongest cyclone ever recorded.

Hitting southeastern Japan as a Cat 3, Ida caused extensive flooding and mudslides and led to over 1,200 fatalities. With a minimum central pressure of 877 millibars, it is also the third strongest cyclone ever recorded in terms of central pressure.

Like Ida, Patricia also holds multiple records. In terms of pressure, it is the strongest hurricane to spin up in the Western Hemisphere. It is the strongest hurricane in terms of *reliably* measured winds. Patricia is also the fastest tropical cyclone to intensify, or "bomb out," a record previously held by --- but broken by Patricia's 100 millibar pressure decrease (from 980 mb to 880 mb) over October 22-23. It made landfall north of Manzanillo, Mexico still at Cat 5 intensity, becoming only the second Pacific hurricane to make landfall at this intensity. The storm impacted mostly rural areas and weakened to [a depression](#) within 24 hours of moving ashore (as a result of being broken apart by the mountainous terrain along the Mexican coastline) both of which limited damages to under \$200 million and casualties to under 20.

### **Typhoon Joan (1959)**

- **Basin: West Pacific**
- **Highest 1-minute sustained winds: 195 mph (314 kph)**
- **Lowest central pressure: 885 millibars**

Joan was the 1959 typhoon season's strongest storm in terms of intensity and size (it was more than 1,000 miles across). Joan struck Taiwan (with winds of 185 mph -- the equivalent of a strong Cat 5) and China, but Taiwan was worstly affected with 11 deaths and \$3 million in crop damage.

These Western Pacific storms tie Joan as 4th strongest (by winds):

- Typhoon Haiyan, 2013: 895 mb
- Typhoon Sally, 1964: 895 mb.

### **Typhoon Tip (1979)**

- **Basin: West Pacific**
- **Highest 1-minute sustained winds: 190 mph (306 kph)**
- **Lowest central pressure: 870 millibars**

While Tip may rank at the halfway mark when it comes to wind speed, keep in mind that when it comes to central pressure, it is the #1 strongest tropical cyclone ever recorded anywhere on Earth. (It's minimum pressure bottomed out at a worldwide record low 870 millibars on October 12, 1979, shortly after passing Guam and Japan.) Tip is also the largest tropical cyclone ever observed. At peak strength, its winds spread 1380 miles (2,220 km) in diameter -- that's nearly half the size of the contiguous United States!

Two storms, a Western Pacific and an Atlantic, tie for the #5 rank:

- Typhoon Vera, 1959: 895 mb
- Hurricane Allen, 1980: 899 mb.



## **Tornadoes**

### **1. Where does this kind of event occur?**

Most tornadoes are found in the Great Plains of the central United States – an ideal environment for the formation of severe thunderstorms. In this area, known as Tornado Alley, storms are caused when dry cold air moving south from Canada meets warm moist air traveling north from the Gulf of Mexico. Tornadoes can form at any time of year, but most occur in the spring and summer months along with thunderstorms. May and June are usually the peak months for tornadoes. The Great Plains are conducive to the type of thunderstorms (supercells) that spawn tornadoes. It is in this region that cool, dry air in the upper levels of the atmosphere caps warm, humid surface air. This situation leads to a very unstable atmosphere and the development of severe thunderstorms.

### **2. What causes this natural phenomenon?**

Tornadoes form in unusually violent [thunderstorms](#) when there is sufficient (1) instability and (2) wind shear present in the lower atmosphere.

[Instability](#) refers to unusually warm and humid conditions in the lower atmosphere, and possibly cooler than usual conditions in the upper atmosphere. [Wind shear](#) in this case refers to the wind direction changing, and the wind speed increasing, with height. An example would be a southerly wind of 15 mph at the surface, changing to a southwesterly or westerly wind of 50 mph at 5,000 feet altitude.

This kind of wind shear and instability usually exists only ahead of a [cold front and low pressure system](#). The intense spinning of a tornado is partly the result of the updrafts and downdrafts in the thunderstorm (caused by the unstable air) interacting with the wind shear, resulting in a tilting of the wind shear to form an upright tornado vortex. Helping the process along, cyclonically flowing air around the cyclone, already slowly spinning in a counter-clockwise direction (in the Northern Hemisphere), converges inward toward the thunderstorm, causing it to spin faster. This is the same process that causes an ice skater to spin faster when she pulls her arms in toward her body.

### **3. How much warning is there?**

Not much for a tornado because after a minute or two of warning, tornadoes might suddenly appear.

### **4. Can it cause damage to people and the environment? If yes, what sort of damage can it cause?**

Tornadoes are exceedingly violent and dangerous funnel clouds that have rotation and high wind speeds that come in contact with the earth. Tornadoes typically have speeds between 65 and 250 mph. Tornadoes usually take the shape of a funnel cloud and become a tornado when they touch the earth. The winds are so violent that they can uproot trees, destroy homes and office buildings and crumple cars. They can stay on the ground for a few seconds to many minutes and can travel miles, cutting large swaths of destruction in their path.

### **5. How are different people affected when a natural phenomenon strikes their community?**

For a sudden attack, people are all affected by the destruction the tornado gave them.]



## 6. Does a reported natural phenomenon affects people at all times?

It depends whether your area will be affected, and when you choose to be affected.

## 7. How strong are the most damaging events? List 5 events.

1. The "Tri-State Tornado" killed 695 people and injured 2,027, traveling more than 300 miles through Missouri, Illinois and Indiana on March 18, 1925. It was rated an F5 at the top of the old Fujita scale (with winds of 260-plus mph).
2. The "Natchez Tornado" killed 317 people and injured 109 on May 6, 1840, along the Mississippi River in Louisiana and Mississippi. The official death toll may not have included slaves, according to the Federal Emergency Management Agency.
3. The "St. Louis Tornado" killed 255 people and injured 1,000 on May 27, 1896, in Missouri and Illinois. It had winds of between 207 mph and 260 mph.
4. The "Tupelo Tornado" killed 216 people and injured 700 on April 5, 1936, in the northeastern Mississippi city.
5. The "Gainesville Tornado" was a pair of storms that converged April 6, 1936, in Gainesville, Georgia, killing 203 people and injuring 1,600. The tornado destroyed four blocks and 750 houses in the northern Georgia town.

## Hurricanes

### 1. Where does this kind of event occur?

Hurricanes, also called tropical cyclones form in seven distinct basins around the world. Some hurricane formation basins are much more active than others. Some tropical cyclone basins also have conditions in which tropical cyclones may occur over longer periods during the year. Most tropical cyclones form from a disturbance in the monsoon trough. The north Atlantic basin is considerably different, as the majority of hurricanes form from easterly waves originating from Africa.

**North Atlantic Ocean** Hurricane season: June 1 - November 30. The most active period runs from about mid August through the latter part of October. During this peak hurricanes can form in the Atlantic ocean, Gulf of Mexico or Caribbean Sea. Locations that may be affected are the Caribbean, Bermuda, Central America including eastern Mexico, the eastern and Gulf coasts of the United States, and eastern Canada. Many of the hurricanes and tropical storms in this area move around the western periphery of the Bermuda high taking them east of the U.S. east coast. Most U.S. landfalling hurricanes occur when the Bermuda high is stronger allowing for the hurricanes to take a farther west track.

**Eastern North Pacific Ocean** Hurricane season: May 15 - November 30. This is the second most active region for tropical cyclones in the world. The hurricanes and tropical storms that form in this area mostly move into the open eastern Pacific Ocean. They can also affect western Mexico and the southern Baja. Recently this was seen as Hurricane Odile hit the southern Baja. Sometimes after developing they can move west and many days later affect Hawaii.

**Northwest Pacific Ocean** Typhoon season: All year. This is the most active basin in the world. Most typhoons form between July through November. The tropical cyclones that form here can affect the Philippines, Guam, southeast Asia (including China and Taiwan), and Japan. This basin produced the strongest tropical cyclone on record - Typhoon Tip in 1979.





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**Bay of Bengal / Arabian Sea** Severe Cyclonic storm season: April 1 - December 30. This basin has a double maximum because of the monsoon trough moving through at two different times of the year. Maximums tropical cyclone activity occurs from mid April through May and from mid September through mid December. This basin is known to produce tropical cyclones that can cause severe flooding resulting in many fatalities

**Southwest Pacific Ocean** Severe Tropical Cyclone Season: October 15 - May 1. These tropical cyclones may affect eastern Australia.

**Southeast Indian Ocean** Severe Tropical Cyclone Season: October 15 - May. These tropical cyclones may affect northern and western Australia. This basin has a double maximum in mid January, and mid February through early March.

**Southwest Indian Ocean** Tropical Cyclone Season: October 15 - May 15. These tropical cyclones may affect Madagascar and southeastern Africa. A double maximum occurs in mid January and mid February through early March.

## 2. What causes this natural phenomenon?

Hurricanes are intense [low pressure](#) areas that form over warm ocean waters in the summer and early fall. Their source of energy is [water vapor](#) which is evaporated from the ocean surface.

Water vapor is the "fuel" for the hurricanes because it releases the "latent heat of condensation" when it [condenses](#) to form clouds and rain, warming the surrounding air. (This heat energy was absorbed by the water vapor when it was [evaporated](#) from the warm ocean surface, cooling the ocean in the process.)

Usually, the heat released in this way in tropical thunderstorms is carried away by [wind shear](#), which blows the top off the thunderstorms. But when there is little wind shear, this heat can build up, causing low pressure to form. The low pressure causes [wind](#) to begin to spiral inward toward the center of the low.

These winds help to evaporate even more water vapor from the ocean, spiraling inward toward the center, feeding more showers and thunderstorms, and warming the upper atmosphere still more. The showers and thunderstorms where all of this energy is released are usually organized into bands (sometimes called "rainbands" or "feeder bands"), as well as into an "eyewall" encircling the center of the storm. The eyewall is where the strongest winds occur, which encircle the warmest air, in the eye of the hurricane. This warmth in the eye is produced by sinking air, which sinks in response to rising air in the thunderstorms. The winds diminish rapidly moving from the eyewall to the inside of the relatively cloud-free eye, where calm winds can exist.



### 3. How much warning is there?

Hurricane warning signs are not apparent until a hurricane has gotten close to making landfall. A few signs, such as an increase in ocean swell, wave frequency and driving rain, can be seen 36 to 72 hours before a hurricane strikes. Rip tides pushing away from the shoreline can appear as the storm nears. Those who live in areas where hurricanes are likely should create a disaster plan and keep an eye on weather forecasts, particularly during hurricane season, which is June 1 through Nov. 30 in the Atlantic and May 15 through Nov. 30 in the Eastern Pacific region.

#### Increased Ocean Swell

Around 72 hours before a hurricane makes landfall, ocean swell increases to about 2 meters (6 feet) in height. Waves hit the shore about every nine seconds. This is one of the earliest signs of an approaching hurricane. As the hurricane gets closer to land, waves will hit the shore with greater rapidity and increase to close to 5 meters (16 feet) in height.

#### Barometric Pressure Drop

The barometer begins to drop roughly 36 hours before a hurricane makes landfall, slightly when the hurricane is still 30 hours away and steadily plunging as the storm nears. While some believe a drop in barometric pressure can aggravate arthritis or lead to headaches, the most reliable way to detect a drop in barometric pressure is by checking a barometer. Lower barometric pressure will also cause people to experience lower blood pressure.

#### Wind Speed

Wind speed increases as a hurricane gets closer to land, from around 18 kilometers per hour (11 miles per hour) 36 hours before landfall to as high as 167 kilometers per hour (104 miles per hour) one hour before landfall. It's gusty and grows steadily stronger, blowing unsecured items about and removing tree branches.

#### Heavier Rainfall

Rain moves in around 18 hours before the hurricane. It's a driving rain that comes through intermittently, worsening the closer the hurricane gets to land, until it becomes a continual downpour around six hours before a hurricane hits. This may lead to flooding in low-lying areas.

### 4. Can it cause damage to people and the environment? If yes, what sort of damage can it cause?

Hurricane intensity is based upon the highest sustained (1 minute average) wind speed the hurricane is producing. The "Saffir-Simpson" scale rates hurricane strength in this way from Category 1 to Category 5. These categories were chosen based upon the amount of damage that each category can produce.

Intensity	Wind Speed	Damage
Category 1	74- 95 mph	MINIMAL: tree branches, shrubs, unanchored mobile homes



Category 2	96-110 mph	MODERATE: mobile homes, poorly constructed buildings, some trees down
Category 3	111-130 mph	EXTENSIVE: small buildings damaged, large trees down, mobile homes destroyed
Category 4	131-155 mph	EXTREME: outer walls damaged, roof failure on small buildings, extensive damage to doors and windows, mobile homes destroyed
Category 5	>155 mph	CATASTROPHIC: complete roof failure on many buildings, some buildings destroyed, severe window and door damage, mobile homes destroyed

**5. How are different people affected when a natural phenomenon strikes their community?**

Every citizen is affected for fear also strikes their system. Students, employees, businessmen, and others are all affected. Everyone should be prepared and takes immediate action as a natural phenomenon strikes their community.

**6. Does a reported natural phenomenon affects people at all times?**

It depends whether your area will be affected, and when you choose to be affected.

**7. How strong are the most damaging events? List 5 events.**

1) The Great Miami Hurricane

The Great Miami Hurricane virtually destroyed its namesake city when it struck as a Category 4 in 1926. It caused \$105 million in damages at the time, but if an identical storm hit the same region today, costs would exceed \$178 billion, more than double that of Katrina.

2) Hurricane Katrina

Katrina was initially labeled as the most destructive hurricane when it hit the Mississippi Gulf Coast and Louisiana in 2005, but normalizing it to other major hurricanes based on current conditions revealed that the Great Miami Hurricane of 1926, in fact, would have produced a damage level nearly double that of Katrina if it hit today.

3) 1900 Galveston Hurricane

This hurricane is known as the greatest natural disaster ever to strike the United States. It caused at least 8,000 deaths, though some reports position that figure at closer to 12,000. It also destroyed 3,600 buildings and caused damage exceeding \$20 million.

4) 1915 Galveston Hurricane



This storm arrived just 15 years after a 1900 hurricane that devastated the Galveston, Texas, region and killed at least 8,000 people. The city responded by building a seawall, which protected Galveston from this storm's 21-foot waves.

#### 5) Hurricane Andrew

When Hurricane Andrew struck Dale County in Florida as a Category 5 storm in 1992, it ranked as the costliest storm on record, causing \$26.5 billion in damage. Hurricanes Katrina and Ike have since topped that figure, however.

### Thunderstorms

A thunderstorm is a storm characterized by the presence of lightning and its acoustic effect on the Earth's atmosphere, known as thunder.

#### 1. Where does this kind of event occur?

- Thunderstorms usually form within areas located at mid-latitude where warm moist air front collides and border cool air fronts.

#### 2. What causes the natural phenomenon to occur?

- If air mass becomes unstable in an area, it begins to convect violently. Pockets of rising near-surface air in an unstable air mass expand and cool, and as some of the water vapor present condenses into a cloud it releases heat, which then makes the air even warmer, forcing it to rise still higher in the atmosphere. If the lower level air is sufficiently warm and humid, and the higher altitude air is sufficiently cool, this process continues until a tall convective cloud -- the thunderstorm -- is formed.

#### 3. How much warning is there?

- PAGASA issues warnings when a thunderstorm will hit within the next 12 to 2 hours, and if flooding can be expected.

#### 4. Can it cause damage to people and the environment? If so, how are different people affected when a natural event strikes their community?

- Flooding as a result of thunderstorms are the main reason for environmental and personal damage. If the thunderstorms are heavy enough, people may evacuate their homes.

#### 5. How strong are the most damaging events?

- Sometimes, thunderstorms can be so powerful that they are instead classified as tropical cyclones or typhoons. The most infamous typhoons in the Philippines were Typhoon Ondoy in 2009, and Typhoon Yolanda in 2013.

#### 6. Does the reported natural phenomenon affect people all the time?

- In the Philippines, storms are frequent during the rainy season from June to October.

#### 7. How strong are the most damaging effects, list down examples.

- Great Bhola Cyclone (Bangladesh) - 300,000 to 500,000 casualties
- Hooghly River Cyclone (India, Bangladesh) - 300,000 casualties
- Haiphong Typhoon (Vietnam) - 300,000 casualties
- Coringa (India) - 300,000 casualties
- Backerganj Cyclone (Bangladesh) - 200,000 casualties

### Acid Rain

Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms.



**1. Where does this kind of event occur?**

- Acid rain occurs often in areas with large number of cities, the dense population, and the concentration of power and industrial plants that cause pollution in the atmosphere.

**2. What causes the natural phenomenon to occur?**

- Acidic precipitation can be caused by natural (volcanoes) and man-made activities, such as from cars and in the generation of electricity. The precursors, or chemical forerunners, of acid rain formation result from both natural sources, such as volcanoes and decaying vegetation, and man-made sources, primarily emissions of sulfur dioxide and nitrogen oxides resulting from fossil fuel combustion. The burning of fossil fuels (coal and oil) by power-production companies and industries releases sulfur into the air that combines with oxygen to form sulfur dioxide. Exhausts from cars cause the formation of nitrogen oxides in the air. From these gases, airborne sulfuric acid and nitric acid can be formed and be dissolved in the water vapor in the air. Although acid-rain gases may originate in urban areas, they are often carried for hundreds of miles in the atmosphere by winds into rural areas. That is why forests and lakes in the countryside can be harmed by acid rain that originates in cities.

**3. How much warning is there?**

- There are usually no warnings issued if acid rain will occur in a nearby timeframe.

**4. Can it cause damage to people and the environment? If so, how are different people affected when a natural event strikes their community?**

- Some fish and animals, such as frogs, have a hard time adapting to and reproducing in an acidic environment. Many plants, such as evergreen trees, are damaged by acid rain and acid fog. Buildings can also be worn down by acid rain, especially those made of marble and limestone.

**5. How strong are the most damaging events?**

- Acid rain is not a damaging event when occurring rarely, however, its effects add up by increasing the acidity of the area and wearing down manmade structures.

**6. Does the reported natural phenomenon affect people all the time?**

- Acid rain does not occur usually. The frequency of acid rain has also shown to be decreasing over time.

**7. How strong are the most damaging effects, list down examples.**

None

## **Sandstorms**

Sandstorms arise when a [gust front](#) or other strong wind blows loose sand and [dirt](#) from a dry surface. Fine particles are transported by [saltation](#) and suspension, a process that moves soil from one place and [deposits](#) it in another.

**1. Where does this kind of event occur?**

- Sandstorms occur most often in dry, hot desert regions. Examples are major deserts such as the Sahara, Rub al Khali, and the Gobi Desert.

**2. What causes the natural phenomenon to occur?**

- Sandstorms are caused by strong convection current [winds](#) that blow over loose soil or sand, and picking up so much of that material that visibility is greatly reduced.

**3. How much warning is there?**

- Thunderstorms are usually the first sign that appears before a sandstorm. Sandstorms are easily visible from a distance once they occur. However, the velocity of a storm can be very fast, leaving little time to prepare.

**4. Can it cause damage to people and the environment? If so, how are different people affected when a natural event strikes their community?**



- Dust storms have also been shown to increase the spread of disease across the globe. Virus spores in the ground are blown into the atmosphere by the storms with the minute particles and interact with urban air pollution. Short-term effects of exposure to desert dust include immediate increased symptoms and worsening of the lung function in individuals with asthma, increased mortality and morbidity from long-transported dust from both Saharan and Asian dust storms suggesting that long-transported dust storm particles adversely affects the circulatory system. Dust pneumonia is the result of large amounts of dust being inhaled. Dust storms cause soil loss from the dry lands, and worse, they preferentially remove organic matter and the nutrient-rich lightest particles, thereby reducing agricultural productivity. The abrasive effect of the storm damages young crop plants. Dust storms also reduced visibility affecting aircraft and road transportation. In addition, dust storms also create problems due to complications of breathing in dust.

**5. How strong are the most damaging events?**

- There was a prolonged drought in the Great Plains of the United States in the 1930's. This led to vast areas of exposed dirt, which helped feed dust storms. This event is believed to have been caused by an unusual sea surface temperature pattern in the eastern Pacific Ocean, made worse by poor land use practices by farmers plowing up relatively dry grassland to plant wheat. The Dust Bowl, which made life even more miserable for many during the Great Depression.

**6. Does the reported natural phenomenon affect people all the time?**

- In desert regions at certain times of the year, sandstorms become more frequent because the strong heating of the air over the desert causes the lower atmosphere to become unstable. This instability mixes strong winds in the middle troposphere downward to the surface, producing stronger winds at the surface.

**7. How strong are the most damaging effects, list down examples.**

Black Sunday refers to a particularly severe dust storm that occurred on April 14, 1935, as part of the Dust Bowl. It was one of the worst dust storms in American history and it caused immense economic and agricultural damage. It is the deadliest sandstorm in history, and presumably the only one named by historians.

## **Hail Storm**

### **Where does this kind of event occur?**

Hail is a form of solid [precipitation](#). It is distinct from [ice pellets](#) (American sleet), though the two are often confused. It consists of balls or irregular lumps of ice, each of which is called a hailstone. Ice pellets (American sleet) fall generally in cold weather while hail growth is greatly inhibited during cold surface temperatures. Each year, hailstorms lead to crop and property damage across the United States. While every state can be the target of a hailstorm, some states are more at risk than others. Landlocked states in the Great Plains and the Midwest are most frequently impacted by hailstorms. That's because hail commonly occurs in regions where the air's freezing altitude dips below 11,000 feet. The region where Nebraska, Colorado and Wyoming meet tops the list as the most common location for hailstorms. It is appropriately known as Hail Alley. The city of Cheyenne, Wyoming, experiences more hailstorms than any other city, with upwards of 10 hailstorms a year. Hailstorms can occur during the spring, summer or fall months. The majority of these storms appear between May and September.

### **What causes this natural phenomenon?**

In order for a hailstorm to occur, atmospheric conditions must be right. Thunderstorm clouds must be present. In order to produce hail, they must have high moisture content and a large portion of their cloud layer must be at freezing temperatures. Meteorological readings can often predict when a hailstorm is on the way. If you are concerned about an upcoming hailstorm, your first step is to listen to a weather report. If you are away from a television or a radio, then look to the sky. Gray clouds, rain, thunder or lighting are all signs of a



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possible hailstorm. You should also take note if you feel a sudden drop in temperature. Cold fronts are a strong indicator that hail or other forms of severe weather are on their way and that you'll be safer indoors.

### **How much warning is there?**

Hail falls without warning, so, unfortunately, there is no way to prepare for it. If the fallen hail is severe enough, it can cause damage to your home and roof. However, there are times that hail damage is not as bad as it seems and it does not leave behind any roof damage.

There are major warning signs of hail that you can look for if you are unsure that hail has damaged your roof.

### **Dented gutters or downspouts**

Many times if the hail damage is significant enough to cause roof damage, your gutters will be impacted as well. If your gutters and downspouts are heavily dented or ripped in any place, your roof might need to be checked by a professional.

### **Damage to sidings**

Check your home's sidings and windowsills for dents and dings. If these places are destroyed, they are good indicators that your roof may also be damaged.

### **Shredded plants and trees**

Are the plants and trees surrounding your yard shredded to pieces? If the landscaping around your home is damaged and not in good shape, chances are the fallen hail was severe enough to cause damage to your roof.

### **Check your air conditioner unit and mailbox**

Air conditioner units contain a condenser coil that is made up of aluminum fins. These fins are exposed on the unit. If hail hits the fins, they will become bent and stop moving air through them. You should also take a look at your mailbox for any large dents. Cuts or dents in your mailbox and damage to your air conditioner are good indicators of roof damage.

### **Size of the hail**

Hail can fall in all shapes and sizes. If you go outside after a storm and the hail is about a quarter size or smaller, most likely your roof will not have any damage. Now if the hail is the size of a golf ball or larger than you might want to be concerned about the potential damage to your roof.

Hail damage always happens when you least expect it. The worse part about it is that you never know how much damage the hail will cause. Once you call your insurance agent and an adjuster has confirmed there is damage to your roof, be sure to [call](#) Hays + Sons. We will be right there before you know it and we will get the job done the right way.

### **Can it cause damage to people and the environment? If yes, what sort of damage can it cause?**

#### **National Hail Statistics**

According to a [May 2016 National Insurance Crime Bureau report](#), Colorado had the second highest number of hail claims in the US from 2013-2015 (182,591), second only to Texas. Texas was the top state in hail loss





claims from 2013 through 2015 with 394,572 hail claims. The top 10 states represented 66 percent of the total number of hail claims during this timeframe.

"Personal Property Homeowners" was the policy type most affected by hail loss claims from 2013 through 2015 - over 50 percent more often than the next most impacted policy type, "Personal Automobile", in hail loss claims over that three-year span.

The nation has experienced severe storms (wind, tornado, hail) that are occurring with more intensity and affecting more areas of the country. While scientists debate why these storms occur, no one argues with their effects—extensive property damage and, many times, loss of life. The property damage can be as minimal as a few broken shingles to total destruction of buildings.

There were 5,412 major hail storms in 2015, according to statistics culled from NOAA's Severe Storms database, with the largest number of severe hail storms occurring in June (1,324 storms). During the past five years, claims related to wind and hail damage on a national basis accounted for almost 40 percent of all insured losses, averaging approximately \$15 billion annually; and growing each year.

The United States experienced the largest insured loss event of 2014 - a spate of severe storms with hail across five days in May struck from Colorado to Pennsylvania, causing insured losses of \$2.9 billion.

### **Colorado Hail Statistics**

Colorado's damaging hail season is considered to be from mid-April to mid-August. Colorado's Front Range is located in the heart of "Hail Alley," which receives the highest frequency of large hail in North America and most of the world, so residents usually can count on three or four catastrophic (defined as at least \$25 million in insured damage) hailstorms every year. In the last 10 years, hailstorms have caused more than \$3 billion in insured damage in Colorado. As a result, up to one-half of your homeowners insurance premium may be going toward hail and wind damage costs. If you carry comprehensive coverage on your auto policy, hail damage is covered by almost all insurance companies. Comprehensive insurance is optional, but if you live in a hail prone area, the insurance industry recommends this coverage.

### **How are different people affected when a natural phenomenon strikes their community?**

Millions of people are affected by natural phenomenon every year, and their impact can be calamitous. From the destruction of buildings to the spread of disease, natural disasters can devastate entire countries overnight.

### **Does a reported natural phenomenon affect people at all times?**

No, because it depends on the people to do such preparation before the said phenomenon strikes.

### **How strong are the most damaging events? List 5 events.**

Date	Location	Incident
6 July 1928	Potter, Nebraska, USA	A 7 in (178 mm) hailstone weighing 1.5 lb (680 g) is believed to be the record largest known in the U.S. at the time. <sup>[1]</sup>





2 September 1960	Southern California, USA	Golf ball to baseball sized hail occurred in parts of southern California, including 2.75 in (7.0 cm) (possibly larger) hail around Boulevard and in Riverside County. That is the largest hail recorded in southern California. A severe thunderstorm also struck San Bernardino. <sup>[2]</sup>
December 1967	Los Angeles County, California, USA	A hailstorm hit the county, blanketing the region much like a snowstorm. The storm also produced lightning, and one bolt struck an oil tank in Manhattan Beach, causing an explosion that covered much of the South Bay with oil. The next hailstorm to hit the area was in 1979. <sup>[citation needed]</sup>
3 September 1970	Coffeyville, Kansas, USA	At the time the largest hailstone ever found in the U.S., measuring 5.7 in (140 mm) diameter, 17.5 in (440 mm) circumference, and 1.67 lb (760 g).
30 July 1979	Fort Collins, Colorado, USA	A violent forty-minute hailstorm bombed Fort Collins, CO, with hail up to grapefruit size. Two thousand homes and 2500 automobiles were severely damaged, and about 25 people were injured, mainly when hit on the head by the huge stones. A three-month-old baby died of a fractured skull, struck by a large hailstone while being carried by her mother, who was running with her to seek cover. <sup>[3]</sup>

## Whirlpool

### Where does this kind of event occur?

Whirlpools occur when two opposing currents meet. They cause the water to spin round and round very rapidly. Huge whirlpools at sea are normally caused by powerful tides. The most famous whirlpool is the Maelstrom, which appears between two islands off the coast of Norway.

### What causes this natural phenomenon?

A whirlpool is a body of swirling water produced by the meeting of opposing currents. The vast majority of whirlpools are not very powerful and very small whirlpools can easily be seen when a bath or a sink is draining. More powerful ones in seas or oceans may be termed maelstroms.

### How much warning is there?

Powerful whirlpools have killed unlucky seafarers, but their power tends to be exaggerated by laymen. There are virtually no stories of large ships ever being sucked into a whirlpool. Tales like those by [Paul the Deacon](#), [Edgar Allan Poe](#), and [Jules Verne](#) are entirely fictional.

However, temporary whirlpools caused by major engineering disasters are capable of submerging large ships. A prominent example is the drilling disaster that occurred on November 20, 1980, in [Lake Peigneur](#). A drilling platform, eleven barges, several trees, and multiple acres of the surrounding terrain were submerged by the resulting whirlpool. Days after the disaster, once the water pressure equalized, nine of the eleven sunken barges popped out of the whirlpool and refloated on the lake's surface.

**Can it cause damage to people and the environment? If yes, what sort of damage can it cause?**



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A whirlpool can generate a vortex large enough to pull down a swimmer and, especially if combined with the effects of dizziness and orientation, induce drowning. Also, a tidal whirlpool can sink a container ship. In order for this to happen, the whirlpool would have to be significantly stronger than any maelstrom ever recorded.

### **How are different people affected when a natural phenomenon strikes their community?**

Well this doesn't necessarily affect the people when they are on the land. This usually happens in the surface of water, especially in the seas.

### **Does a reported natural phenomenon affect people at all times?**

No. Only those who are beyond the surface of the large bodies of water will be affected by this.

### **How strong are the most damaging events? List 5 events.**

#### **Gulf of Corryvreckan**

This whirlpool in Scotland is the third largest whirlpool in the world. It is extremely dangerous and ships are warned to not get close.

#### **Old Sow Whirlpool**

Old Sow Whirlpool is the biggest in the western world located in Canada. Its currents are so strong small boats can be swept easily.

#### **Moskstraumen**

Moskstraumen is actually one of the oldest maelstroms found in the open sea. There are several whirlpools around it making it very dangerous.

#### **Skookumchuck Narrows**

Due to the turbulence and strong currents there are rapids that are ridden by kayakers in Skookumchuck Narrows of Canada. Despite their popularity, they're still very dangerous and you need to be experienced to go there.

#### **Niagara Falls Whirlpool**

Niagara falls are some of the biggest waterfalls in the world, and the whirlpools that form beneath them due to the different powerful currents colliding are some of the most dangerous on the planet.

## **Earthquake**

### **1. Where does this kind of event occur?**

Places near fault line

### **2. What causes the natural phenomenon?**



Earthquakes are usually caused when rock underground suddenly breaks along a fault.

### **3. How much warning is there?**

There are intensities, the higher the intensity, the bigger the chance of a devastative earthquake.

### **4. Can it cause damage to people and environment, if so, what sort of damages can it cause?**

Yes, destruction of buildings and properties.

### **5. How are different people affected when a natural phenomenon strikes their community?**

They help each other to rise from that trauma and lend a hand in someone needy.

### **6. Does a reported natural phenomena affect people at all the time?**

Yes, because sometimes people are hard-headed, they are not following warnings.

### **7. How strong are the most damaging effects, list down examples.**

1. Southern Chile. 9.5 Mw, May 1960.
2. Alaska, USA. 9.2 Mw, Mar 1964.
3. Sumatra, Indonesia. 9.1 Mw, Dec 2004.
4. North Japan. 9.0 Mw, Mar 2011.
5. Kamchatka, Russia. 8.9-9.0 Mw, Nov 1952.

## **Tsunami**

### **1. Where does this kind of event occur?**

Oceans and seas

### **2. What causes the natural phenomenon?**

Earthquake starts a tsunami, a tsunami is a series of large waves generated by an abrupt movement on the ocean floor that can result from an earthquake, an underwater landslide, and a volcanic eruption.

### **3. How much warning is there?**

If there are series of big waves in the ocean, it might be an tsunami.

### **4. Can it cause damage to people and environment, if so, what sort of damages can it cause?**

Yes, destruction of properties.

### **5. How are different people affected when a natural phenomenon strikes their community?**

They help each other to rise from that trauma and lend a hand in someone needy.

### **6. Does a reported natural phenomena affect people at all the time?**

Yes, because sometimes people are hard-headed, they are not following warnings.

### **7. How strong are the most damaging effects, list down examples.**

1. Indonesia. 34.85m, Dec 2004, 283,100 deaths.
2. Greece. 1410 B.C., 100,000 deaths,



3. Portugal. 12.20m, Nov 1755.
4. South China Sea. May 1782, 40,000 deaths.
5. Indonesia. 35m, Aug 1883, 36,500 deaths.

## **Volcanic eruptions**

### **1. Where does this kind of event occur?**

Volcanoes

### **2. What causes the natural phenomenon?**

Magma rises through cracks or weaknesses in the Earth's crust. When this pressure is released, as a result of plate movement, magma explodes to the surface causing a volcanic eruption.

### **3. How much warning is there?**

If the volcano is active and the volcano's eruption history is just a year ago, then it's a high risk of a volcanic eruption.

### **4. Can it cause damage to people and environment, if so, what sort of damages can it cause?**

Yes, destructions of buildings and properties.

### **5. How are different people affected when a natural phenomenon strikes their community?**

They help each other to rise from that trauma and lend a hand to someone in need.

### **6. Does a reported natural phenomenon affect people at all the time?**

Yes, because sometimes people are hard-headed, they are not following warnings.

### **7. How strong are the most damaging effects, list down examples.**

1. Sumbawa, Indonesia. 92-100,000 deaths (caused by starvation) Apr 1815.
2. Unzen, Japan. 15-53,000 deaths (caused by landslide & tsunami) Apr 1793.
3. Mount Pelée, Martinique. 30-40,000 deaths (caused by pyroclastic flows) May 1902.
4. Krakatoa, Sumatra/Java. 36,400 deaths (caused by tsunami) Aug 1883.
5. Nevado del Ruiz, Columbia. 22-25,000 deaths (caused by landslides) Nov 1985.