



WITH YOU ALWAYS

# RE-Konnect

Risk Engineering Bulletin

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In Focus:

## Hurricanes/Cyclones

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Hurricane Andrew, cyclones in India

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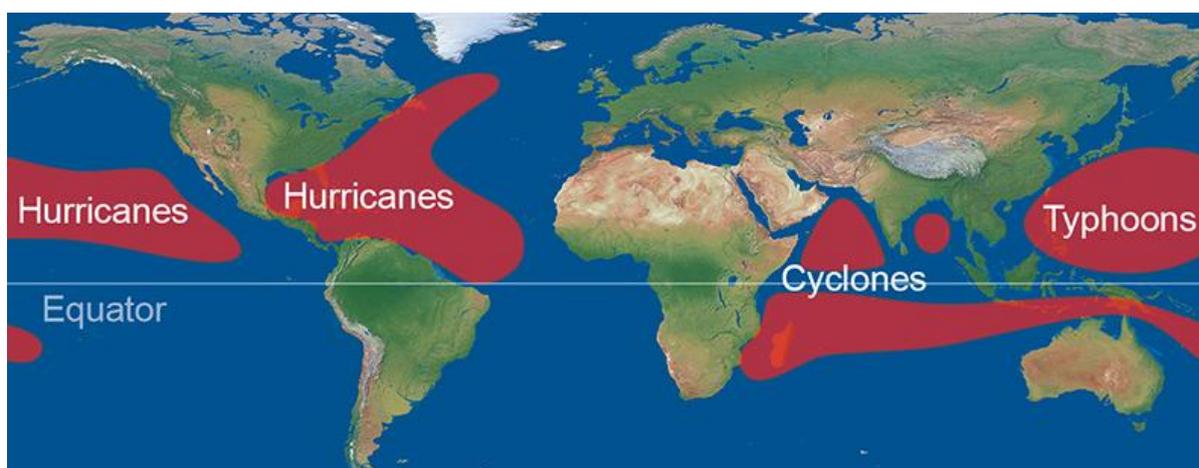
## Preface

Depending on location, they can be called Hurricanes, Cyclones or Typhoons; but they are all the result of same weather phenomenon. The scientific term for all these storms is **tropical cyclone**. With so much media coverage of recent Hurricane Harvey and Hurricane Irma, this is the right time to know more about hurricanes, their dangers and loss prevention measures.

There are several steps a property or plant owner can take to minimize damage to their assets and interruption to business in the wake of such natural disasters. In this issue of RE-Konnect, we take a deep dive into the devastating nature of tropical cyclones and learn how we, as Insurers and property owners, can build more resilience against them.

## Did You Know?

- Cyclone Bhola, which struck West Bengal and Bangladesh in 1970 and led to about 500,000 deaths, remains one of the deadliest natural disasters ever.
- Tropical cyclones are the only weather disasters that are given their own names.
- Although disastrous, tropical cyclones help in moving equatorial heat towards the poles. Without them the equator would be considerably warmer and poles would be significantly cooler.
- Sometimes misinterpreted, a hurricane makes “landfall” when its centre, not its edge, crosses the coastline. A hurricane can hit the land hours before it makes a “landfall”.
- The hurricane with most significant economic impact is believed to be Hurricane Katrina, with damage estimates of over 100 Billion dollars.
- Project Stormfury was an organization that tried to control hurricanes by seeding them with silver iodide, which would cool the hurricanes. However, the project had little success, and most scientists now have abandoned the idea of controlling hurricanes.
- Hurricanes produce enough energy in one day to run the lights of a big city for many years.
- Hurricane-generated waves frequently toss tons of fish onto beaches. The eyes of many of the fishes pop out because of sudden changes in pressure.
- How different geographical regions refer to tropical cyclones is shown in the map below.



# Disasters

## Hurricane Andrew: The Haunting Legend

Hurricane Andrew hit Bahamas and the Southeast Cost of USA in the mid of August 1992. It tore through South Florida in the middle of night, levelling entire neighbourhoods, tossing around boats and cars, and leaving millions of people without power or hope. Andrew's legacy would be far-reaching, as the storm exposed shoddy construction practices and a broken emergency response system.



Andrew was the strongest and costliest hurricane to ever hit United States until it was surpassed by Hurricane Katrina in 2005. It was a Category 5 hurricane with sustained wind speeds as high as 280 km/h. Many homes were left with nothing but their concrete foundations. Not only did it completely destroy more than 63000 homes but also damaged more than 124000 others. Total damage was in excess of \$26.5 billion with insurance payouts of more than \$15.5 billion (in 1992 USD). Prior to Andrew,

insurance veterans, who based their judgement on experience data only, had estimated the maximum damage to be only about one-third of the actual loss. Eight insurance companies became insolvent duet to payouts, while some other companies became technically insolvent and required transfer of funds from parent companies.

Property owners and Insurers were taken by complete surprise as the event brought a harsh awakening and forced them to come to grips with the necessity of preparing for unprecedented disasters. It led to rapid evolution of complex catastrophic modelling, strong building codes and better risk management and emergency preparedness for large scale disasters. Andrew's legendary impact now forms part of several papers and technical and business case studies. The tragedy struck about 25 years ago, but in reality Andrew never really left.

## Costliest Cyclones in India

India's eartern costline has been specially vulnerable to some of the worst tropical cyclones. These have led to devastating results owing to densely populated coastlines coupled with relatively poor infrastructure and inadequate disaster preparedness and emergency response. We collated a list of some of the costliest cyclones that have hit India over the last decade. Overall damage includes damages to countries other than India. Peak wind speed refers to highest 3-minute average sustained wind speeds.

| Cyclone | Year | Affected Indian Coastlines | Peak Wind Speed km/h | Overall Damage (million USD) | Damage in India (million USD) |
|---------|------|----------------------------|----------------------|------------------------------|-------------------------------|
| Vardah  | 2016 | TN                         | 130                  | 5100                         | 1000                          |
| Hudhud  | 2014 | Odisha and AP              | 185                  | 3400                         | 3400                          |
| Phailin | 2013 | Odisha and AP              | 215                  | 696                          | 696                           |
| Nilam   | 2012 | TN and AP                  | 85                   | 57                           | 57                            |
| Thane   | 2011 | TN and AP                  | 140                  | 235                          | 235                           |
| Jal     | 2010 | Odisha and AP              | 110                  | 1730                         | 54                            |
| Laila   | 2010 | TN and AP                  | 100                  | 118                          | 118                           |
| Phyan   | 2009 | MH and GJ                  | 85                   | 300                          | 300                           |
| Nisha   | 2008 | TN                         | 85                   | 800                          | 800                           |

TN= Tamil Nadu, AP= Andhra Pradesh, MH= Maharashtra, GJ= Gujajrat



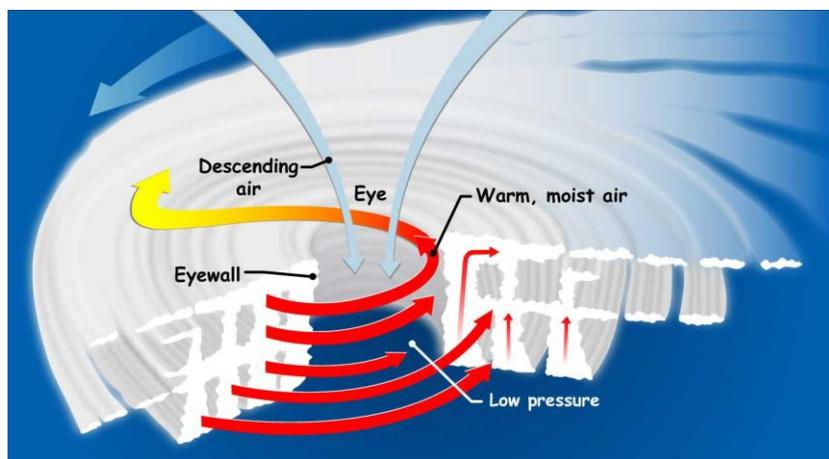
Sint Maarten, an island country in the Caribbean, was hit by Category 5 Hurricane Irma in Sep 2017. This aerial picture gives a glimpse of the widespread damage inflicted by Irma.



A house in Texas was protected by Aqua dam when torrential rains caused flooding during Hurricane Harvey. As the neighbourhood houses submerged, this house continued to stand unharmed. Aqua dam is a system of inflatable tubes that are filled with water to serve as giant sandbags.

# Formation of Tropical Cyclones

Tropical cyclones are like giant engines that use warm, moist air as fuel. That is why they form only over warm ocean waters near the equator. The warm, moist air over the ocean rises upward from near the surface. Because this air moves up and away from the surface, there is less air left near the surface. The rise of warm air causes an area of lower air pressure below. Air from surrounding areas with higher air pressure pushes in to the low pressure area. Then that "new" air becomes warm and moist and rises, too. As the warm air continues to rise, the surrounding air swirls in to take its place. As the warmed, moist air rises and cools off, the water in the air forms clouds. The whole system of clouds and wind spins and grows, fed by the ocean's heat and water evaporating from the surface. As the storm system rotates



faster and faster, an eye forms in the centre. It is very calm and clear in the eye, with very low air pressure. Higher pressure air from above flows down into the eye. As long as the cyclone remains over waters of 26 °C or warmer, it continues to pull moisture and grow in size and force.

As cyclone's winds spiral around the storm, they push water into a mound towards the storm's centre. This mound of water becomes dangerous when the storm reaches land because it causes flooding along the coast. This is called **storm surge**. When high tide happens at the same time as a storm surge, the combination of the two is called **storm tide**. During a storm tide, the water level may be 20 feet or more above normal. This causes severe floods.

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For naming of tropical cyclones, World Meteorological Organization (WMO) maintains an extensive list of names which are rotated after every six years. A name is retired from the list if the tropical cyclone leads to extensive damages.

| Wind Speeds  | Classification             |
|--------------|----------------------------|
| ≤62 km/h     | Tropical Depression        |
| 63–118 km/h  | Tropical Storm             |
| 119–153 km/h | Category 1 hurricane       |
| 154–177 km/h | Category 2 hurricane       |
| 178–208 km/h | Category 3 major hurricane |
| 209–251 km/h | Category 4 major hurricane |
| ≥ 252 km/h   | Category 5 major hurricane |

The Saffir–Simpson hurricane wind scale (SSHWS), classifies hurricanes into five categories distinguished by the intensities of their 1 minute sustained winds. Officially, this scale is used only to describe hurricanes forming in the Atlantic Ocean and northern Pacific Ocean east of the International Date Line. Some cyclone tracking organizations including Indian Meteorological Department (IMD) use a different classification system.

It should be noted that tropical cyclones which form exclusively over the tropical seas (due to the requirement of warm waters) are different from **extratropical cyclones** which form over middle latitudes outside of tropics. Extratropical cyclones can result in thunderstorms, blizzards and tornadoes. Sometimes extratropical cyclones transition in to **subtropical cyclones** by gaining tropical characteristics. A discussion on the differences and transitioning between tropical, extratropical and subtropical cyclones is beyond the scope of this bulletin.

# Loss Prevention

While nothing can be done to stop cyclones, there are actions you can take to maintain your safety and minimize the damage to your property or business. Tropical cyclones affect in two ways: 1) blow impact due to strong winds and 2) floods due to sudden heavy precipitation and/or storm surge. Analyzing your property in view of these risks is important to arrive at a customized preparedness and emergency response plan.

Management of cyclones can be broadly discussed in three phases: before, during and after the event. These are more or less as applicable to a normal home owner as to a large manufacturing plant, only the scales are different. These are elaborated below:

## 1. PLAN

As for any disaster, cyclone preparedness should start long before the event occurs. This is the most important phase and thoroughness of this step often dictates how efficiently the property owner comes out unscathed or at least with reduced damage. This is the time to research, brainstorm and prepare a well defined Emergency Response Plan and Business Continuity Plan. These should have following considerations:

- Know if you have tropical cyclone exposure. India's eastern and southern coasts are especially vulnerable. Contact district disaster management authority or ask your insurer.
- Understand the various hazards associated with tropical cyclones.
- Check the integrity of your property – inspect and review if various structures can withstand your zone specific heavy wind blows; modify and revamp if required. Know which facilities/stored materials are vulnerable to flooding. Raise the plinth level and provide flood barriers to protect valuable electronics and raw/finished products.
- Back-up programmes – verify critical data is backed-up regularly and stored in servers which won't be affected in case of local damage. Review emergency power back-ups and sizing issues as cyclones will often result in complete grid failure. Identify business critical documents for relocation.
- Review your insurance policies – ensure you have adequate coverage for damage to property and loss of profit due to business interruption.
- Have a written Evacuation Plan – include alternative routes, communication channels, clearly defined roles/responsibilities, checklists and understand how local weather/disaster forecasting works.
- Emergency Supply Kit – have it ready well in advance, enough for minimum one week supply. These should include food/water, first-aid, extra batteries/back-up power and cash.
- Consider forming Emergency Response Team (ERT). Make sure all stakeholders are properly trained in the emergency response and mock drills are conducted periodically.

## 2. EXECUTE

If the previous step of planning has been done right, the situation will be much easier to manage during the actual event without causing any panic or alarms.

- Stay up to date with local warnings and review your response should the situation escalate. Be prepared to seize all production activities and evacuate.
- Estimate loss of utilities such as electricity and water and review available back-ups.
- Determine if the well trained Emergency Response Team consisting of volunteer members can remain at the site following a thorough review of predicted scenarios, building integrity and refuge alternatives.
- Relocate business critical electronics/data and valuables to secure locations. Turn off electrical supply to circuits and equipments that can be flooded. Facilities and equipments should be thoroughly secured and closed.
- Once the cyclone arrives, all personnel should move to a safe location.

### 3. RESURRECT

Remember that even if the event is over, the risk is not completely gone. If the electrical systems or equipments have been exposed to flood water or wind damage, there is a risk of their failure.

- Survey the site for hazards such as live wires, flammable gas/liquid leakage, and weakened walls. Document the findings and take pictures.
- Verify status of fire protection systems such as fire pumps, sprinklers and fire alarms and give primary importance to their repair.
- Do not operate the equipments or electrical systems without thorough examination and restoration. Methodically drain, dry, clean and lubricate the equipments before energizing. Engage the equipment manufacturer for recommendations and repairs.
- Maintain a parallel communication with your insurer for inspection and claim reporting.
- Begin salvage of goods and materials as soon as possible. Get utilities and hazardous processes checked by qualified personnel before taking them back in service.

## Resources

- **Regional Specialized Meteorological Centre for Tropical Cyclones over North Indian Ocean:** Cyclone awareness and warning division of IMD. Various documents, standard operating procedures and alerts can be referred from this website - <http://www.rsmcnewdelhi.imd.gov.in>
- **National Hurricane Centre:** Division of United State's National Weather Service. Various alerts, satellite imagery and educational resources are available on the website - <http://www.nhc.noaa.gov>

## Engage

Answer the following question and win Amazon coupons worth Rs 500 each. Send the answer to [editor.bulletin@tata-aig.com](mailto:editor.bulletin@tata-aig.com). Five winners for this quiz will be announced in the next issue.

**Q.** Indian Meteorological Department (IMD) uses a different classification system for cyclones than Saffir-Simpson scale. This is shown on right (for peak 3-min average sustained wind speeds).

| Win Speeds   | IMD Classification              |
|--------------|---------------------------------|
| 63-88 km/h   | Cyclonic Storm                  |
| 89-117 km/h  | Severe Cyclonic Storm           |
| 118-165 km/h | Very Severe Cyclonic Storm      |
| 166-220 km/h | Extremely Severe Cyclonic Storm |
| ≥ 221 km/h   | Super Cyclonic Storm            |

A hypothetical tropical cyclone, TCHYPO, forms and has both peak 1-min and 3-min average sustained wind speeds of 150 miles/h. According to Saffir-Simpson and IMD scales, TCHYPO would be classified as (1 mile ~ 1.61 km):

- A) Category 3; Very severe cyclonic storm
- B) Category 4; Super cyclonic storm
- C) Category 5; Extremely severe cyclonic storm
- D) Category 4; Very severe cyclonic storm

**Winners of the previous issue are as follows:**

- **Abhishek Negi** – Marsh India Insurance Brokers
- **V Ganesan** – Marsh India Insurance Brokers
- **Girish G** – GIC of India, Mumbai
- **Prashant Muta** – Aditya Birla Insurance Brokers, Mumbai
- **Yogesh Ghorpade** – Thermax Limited

**Answers to previous questions:** 1. 16 ft high: un-layered and un-compacted, high grade coal 2. Adsorption 3. Compaction

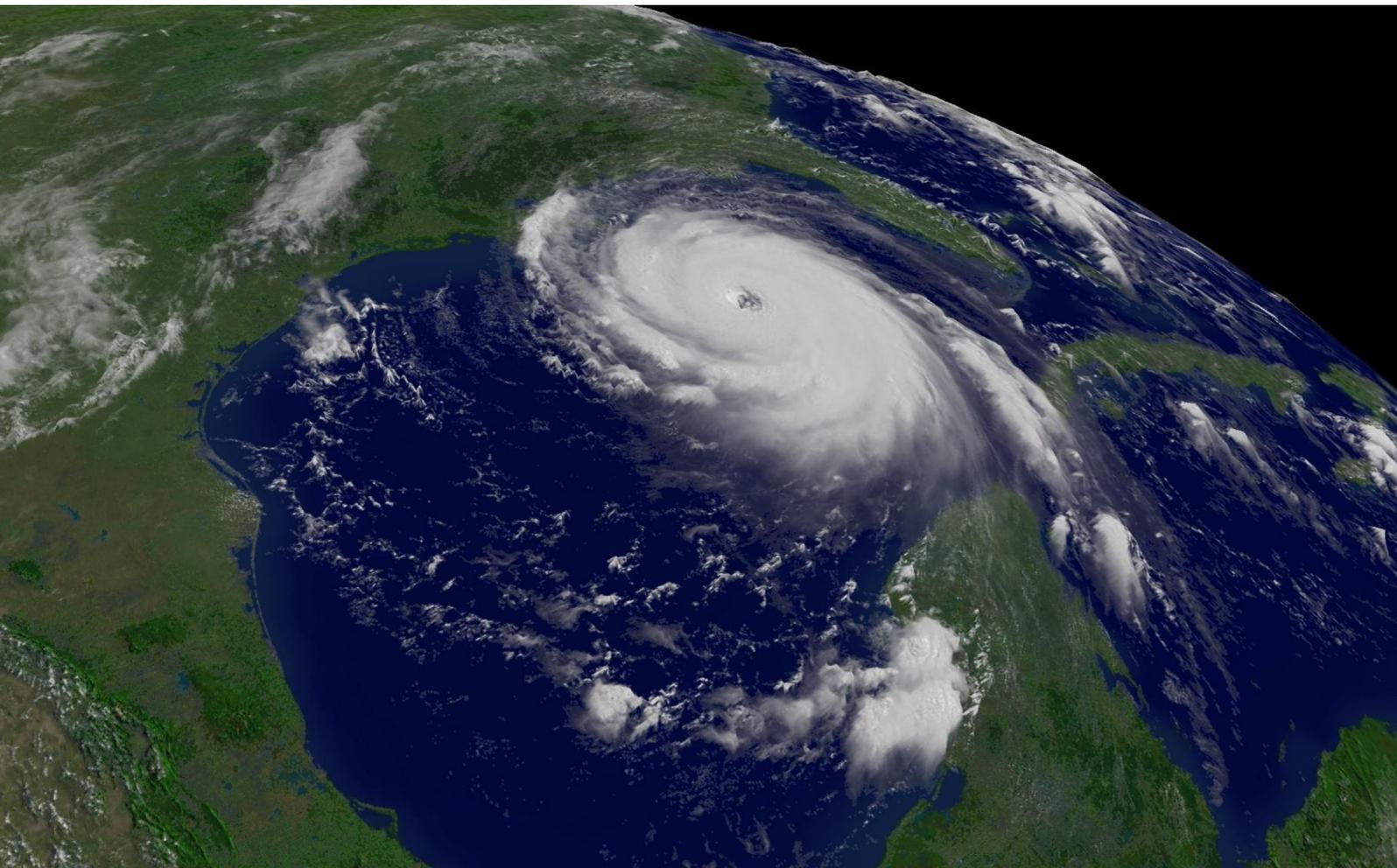
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*A satellite image of Hurricane Katrina as it moves towards United States' southeast coastline*

To download previous issues of the bulletin, please visit the following link:

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