



Hurricane Preparedness for Business

Over the past decade alone, tropical cyclones produced nearly \$231 billion dollars damage in 2010 dollars across the U.S. Millions of lives were disrupted and thousands of businesses were severely impacted. Businesses from Texas to Florida learned a lot after the devastating 2004, 2005 and 2008 hurricane seasons. Many learned that their hurricane plans were severely lacking. After the 2005 hurricane season, I was tasked with examining a number of hurricane plans from various types of businesses and coming up with recommendations for improvement. For the most part, I found that most businesses have a rather poor understanding of the meteorology of hurricanes. By meteorology, I mean typical wind structure, potential storm surge, movement and forecast accuracy. In the short space of this article, I don't have the time to go into all of the details of hurricane meteorology, but I can give you the benefit of what I've learned over the years as far as developing your hurricane plan and preparing your business for the inevitable.

Developing Your Timeline

The first step is the hardest, and that is coming up with an accurate action timeline. Most businesses use what's called a phased hurricane plan, grouping preparatory actions at specific times prior to the arrival of a hurricane. Sometimes it's hard to determine when a certain action needs to take place. This is particularly true if your business has not been directly threatened by a hurricane in recent years. But if you have experienced a direct threat, then you can use that knowledge to modify your plan before the next threat. You can examine each step that was taken as the hurricane approached and ask yourself if that action was taken too early, too late, or at the right time.

In defining your action timeline, it's important to define what I'll call hard trigger points. A hard trigger point involves a specific action that must be taken at a precise time prior to the arrival of the hurricane. Let's say you're in charge of a major oil refinery and it takes 40 hours to perform a complete and safe shutdown. You don't want to be caught in the shutdown operation when the hurricane arrives, so you must make your decision at 40 hours prior to the hurricane's arrival. That's a hard trigger point. In contrast, you may have one action that involves reserving hotel rooms for evacuating employees. This action can occur at any time between 4 and 6 days prior to the hurricane's arrival. It's a flexible or soft trigger point.



Hurricane Preparedness for Business

The final part of developing your action timeline is taking into consideration whether the actions of outside vendors or suppliers could have an impact on your business. It's possible that your supply of a vital raw material or service may be interrupted before you're ready to shut down your business. This is where you can use your past experiences with hurricane threats and talk with your suppliers about their hurricane plans. Get to know when to expect that critical raw materials or services may be discontinued and build this knowledge into your timeline. Once you have your timeline, you're ready to consider possible triggers for moving from one phase of your plan to the next.

Some Common Errors

I've looked at quite a few hurricane plans over the years, and I've identified three common errors:

- Triggers based on proximity to a hurricane
- Triggers based on Saffir-Simpson category
- Incorrect assumptions about hurricane forecast accuracy (track and intensity)

What I'll call "proximity triggers" are quite common. Your plan may call for a certain action to be taken when a hurricane moves to within a certain distance of your business. There are many problems with such a trigger. There is no consideration of the hurricane's speed of movement, its size, or its heading. A hurricane entering the northwest Caribbean, for example, may be anywhere from 48 hours to 120 hours from reaching the northern Gulf Coast. Or it may be no threat at all to the northern Gulf Coast. If and when your business might be impacted depends on the hurricane's speed of movement, its size and its heading. Because your timeline requires actions to be taken at specific times before impact, you can't use such proximity triggers in your plan.

Also common are triggers based upon a projected Saffir-Simpson category. For example, your plan might call for a ride-out team to remain in place on-site for a Category 1 or 2 hurricane, but evacuate your facility for a Category 3-4-5 hurricane. There are several errors in this line of reasoning, the greatest of which is that you're making an incorrect assumption about the potential impact on your business based upon the Saffir-Simpson category. The Saffir-Simpson scale is a wind scale, nothing more. It says nothing about the size and scope of the



Hurricane Preparedness for Business

damaging winds or the potential storm surge that may be generated. A Category 2 hurricane, for example, can generate a storm surge as low as 2-3 feet, or it could produce a storm surge over 30 feet high. Surge height depends on the size of its wind field, speed of movement, coastal bathymetry and angle of impact. The Saffir-Simpson category plays a very small part in storm surge generation. To complicate things even further, our ability as hurricane meteorologists to accurately forecast hurricane intensity has not improved significantly in the past several decades. Forecasts are currently accurate only to within about one Saffir-Simpson category per day before impact. So you can't use a projection of Saffir-Simpson category as a trigger.

Relying on the forecast arrival of specific winds at your location is also not a good idea. Think of those businesses in southwest Louisiana as Category 5 Hurricane Rita moved across the Gulf in September of 2005. About 4 days prior to landfall, Rita was forecast to strike the lower Texas Coast. Southwest Louisiana is not expected to be impacted by Rita, so should no actions be taken? Unfortunately, Rita's track forecast changed with time. It eventually made landfall near the Texas/Louisiana border. Unfortunately, many businesses in that area failed to act early enough, as their plans relied on the predicted arrival time of the hurricane. They did not take into consideration forecast accuracy. That yellow cone you see around the hurricane's track is called an error cone. It's basically a 5-year 67 percentile error, meaning that over the past 5 years, the center of 66% of all storms tracked somewhere within that yellow cone. Even if the hurricane doesn't veer off the forecast track, larger hurricanes can have hurricane-force winds that extend outside this cone. That 67 percentile error amounts to a circle just over 800 miles across centered on that 5-day forecast point. The hurricane's center could be anywhere within that circle 67% of the time. That error could be on either side of the track or the error could be almost all what we call along-track error. The hurricane could arrive at your location over 24 hours earlier than forecast. You do have to take this into consideration in your plan.



Hurricane Preparedness for Business

Objective Guidance

Since you cannot reliably use the proximity of a hurricane, the predicted Saffir-Simpson category at landfall, or even the forecast track for guidance (all the time), what can you use? The best solution is to incorporate at least some objective guidance into your hurricane plan. Such guidance would take into account typical forecast track error and the size of the hurricane's wind field. These tools would be:

- Earliest likely arrival time of storm conditions
- Projected/forecast time of arrival of storm conditions
- Probability of wind impact

Often when I look at a plan I see a trigger such as "96 hours out" followed by a list of actions. At that point, I ask what the meaning of "out" is. How does the team responsible for activating the hurricane plan determine when 96 hours out has been reached? It could be 96 hours before the center of the storm is forecast to reach a location, or maybe it's the time until tropical storm force winds are forecast to reach the location. The problem with that kind of a trigger is that it assumes that all hurricane forecasts are perfect. The typical forecast track error at that 96 hours point is on the order of 150-250 miles. So it's quite likely that a hurricane may not be forecast to impact your business 96 hours before landfall, but the forecast changes over time and the hurricane turns toward you 2-3 days before landfall. If you're relying on a forecast arrival of the hurricane at your location, then you may be acting too late if the forecast track is in error.

Instead of relying on a perfect forecast, your business could assume that the hurricane might turn toward your location (a distinct possibility) and use a calculated earliest likely time of arrival should the hurricane turn and head toward your location. Your plan could be modified to say "96 hours before the earliest likely arrival of 39 mph winds". The trigger is much clearer, and it allows you to take some actions even when the hurricane initially is not forecast to impact your area. This calculation could be made by the layman, but there are so many variables involved that it would be best left to a trained meteorologist. Once the hurricane is within about 36-48 hours from reaching the coast, typical forecast error is low enough that the forecast arrival time of a specific wind field can be used in lieu of the earliest likely arrival time. It should be clear whether or not the hurricane is heading toward your location by that time.



Hurricane Preparedness for Business

But you cannot rely only on an earliest likely arrival time because there are many cases when it can be determined that a hurricane has little or no chance of turning in your direction. Accounting for typical forecast track error and wind field size, a probability of wind impact can be calculated for your location. You may have seen such probability calculations on the National Hurricane Center's website. If you know the relationship between time before landfall and the probability of a certain wind field impacting your location, then you can incorporate a wind probability value into the triggers of your hurricane plan. That "96 hours out" trigger would become "96 hours before the earliest likely arrival time of 39 mph winds and a probability of wind impact >XX%". This is an objective trigger based on sound meteorological data. It takes into account forecast error, hurricane size, and the probability of it turning toward your location. The probability value chosen depends mostly on hurricane climatology and partly on the level of risk that you're willing to take with your business.

Planning for Recovery

After meeting with several hundred businesses over the past decade, I've found that one thing many businesses don't plan for well is the recovery phase. What happens after the storm passes? How will your business continue to function after the storm when power and communications may be out in your area for weeks or perhaps a month or more? It's great if you have a backup location that your employees can work from during the recovery phase. But make sure that the backup location is far enough inland and far enough away from your main office so that it's not impacted by the same hurricane. I heard a story of a Mississippi Coast business that had a backup office in New Orleans. When Katrina moved ashore in August of 2005, the entire Mississippi Coast was destroyed and New Orleans was rendered uninhabitable. Both offices were destroyed.

Consider how you plan to communicate with your displaced employees after the storm. Many may have evacuated to distant cities, others may have lost their homes. Communication lines may be down over a large area. Some businesses set up a national toll-free number for employees to call for information on getting back to work. Such a number needs to be set up prior to the hurricane season and given out to all employees. Other businesses create a hurricane website that's based in another state, far away from the home base.



Hurricane Preparedness for Business

Employees with Internet access can check in and report their status and communication information.

Personal Preparedness

The last part of developing your hurricane plan involves preparing your employees for what to expect when a hurricane hits. Most people cannot comprehend the damage that a hurricane can do to a community. Even a Category 1 hurricane with winds of 74-95 mph can cause significant business interruptions. Hurricane Ike of 2008 produced such winds across the greater Houston, TX area, knocking out power to over 99% in a city of over 4 million people. Power was out for as long as 4 weeks after Ike hit. If your employees are not prepared to take care of themselves for a week or two then they will not be able to return to work. You should make employee education a top priority prior to each hurricane season. A well-educated employee will know how to prepare for a hurricane and survive in the aftermath, allowing the employee to return to work as soon as your business is back up and running.

Now is the time to take a good look at your current hurricane plan. Some of the changes I've suggested will involve sitting down with someone very familiar with hurricanes to go over the details of your plan's triggers. With the proper adjustments to your plan, you'll be confident that your business will react at the proper times as a hurricane approaches. And you'll be ready to handle the post-storm recovery phase, where many current plans fail.