

A Case Study Review of Supply Chain Modifications to Minimize Community Impact from Hurricanes

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Abstract

Waffle House, a chain of restaurants primarily located in the southeast United States, is known for its resilience to hurricanes. The Federal Emergency Management Agency or FEMA even has a “Waffle House Scale” assessing the number of Waffle House locations that are either fully operational, running a limited menu, or are closed, assessing both the severity of the storm and how the surrounding community is doing. To enable this resilience, Waffle House has strike teams of workers who can assist restaurants with both cooking and infrastructure, operations analysts tracking weather patterns, cookbooks that outline what can be made without grills, and teams of people facilitating major supply chain adjustments to ensure restaurants have the supplies needed to operate. In past storms, in addition to the obvious of stocking extra food, Waffle House has brought bottled water, generators, porta-potties, and even tankers with fuel, all to ensure that these communities will have warm food. These tactics are not unique to Waffle House, with Home Depot, Lowe’s, and Walmart adjusting their supply chains to help communities prepare for natural disasters.

Keywords

Supply Chain, Hurricanes, Resilience, Disasters, Retail.

1. Introduction

According to the state of Louisiana, a hurricane is a tropical storm with winds that have reached a constant speed of 74 miles per hour or more. A hurricane can last for two or more weeks over open water and can extend inland for hundreds of miles. With the immense amount of wind and water that comes from these storms, there is a significant amount of damage that can be done to infrastructure from a hurricane. They can spawn tornadoes, create damage from high winds, and cause floods and even landslides. All of the effects that come from hurricanes can lead to a significant amount of damage and loss of life. Between 1980 and 2021, hurricanes cost the U.S. \$1.1 trillion, which is about an average cost of \$20.5 billion per event. Not only do they cause a mass amount of damage, but hurricanes have resulted in the most loss of life, with 6,697 deaths during this timespan (NOAA). 2021 was “the third costliest year on record,” with a total cost of \$145B for all weather related disasters, with hurricanes making up four of the 20 most costly disasters (NOAA).

From all of the damage that is done by hurricanes, the supply chain for many local businesses can be affected. The high winds and flooding can create long-term power outages that will affect the local stores, busy roadways can be flooded and blocked for long periods of time, and the high winds can make driving large trucks to become more difficult. Not only that, but the oncoming hurricane can cause a spike in demand for emergency resources like bottled water, dry ice, medical supplies, and batteries. All of these issues cause a major concern for local businesses in order to prepare for the storm and continue operations afterward.

1.1 Objectives

With the progression of climate change, hurricanes are only becoming more common and more destructive. Some businesses have figured out successful methods of adapting their operations that have allowed them to be much more resilient to hurricanes, helping out communities with recovery efforts while also turning a profit. Distilling these tactics into strategies that other businesses could adopt will also allow them to grow more resilient. While this is clearly not a solution to the root problem of climate change, the availability of retail and other necessary establishments will allow communities to recover from these disasters faster.

2. Literature Review

The Federal Emergency Management Agency (FEMA) is a government agency in the United States that coordinates responses to a disaster that overwhelms the resources of local and state authorities. This includes powerful hurricanes that cause significant damage to the community. In 2018, FEMA created a strategic plan to prepare for hurricanes and how to reduce supply chain vulnerabilities during them (Featherstone et al., 2020). In FEMA's Supply Chain Resiliency Guide, they recommend a five-phase resiliency cycle for managers to follow:



Figure 1. FEMA Supply Chain Resilience Phases (FEMA, 2019)

These recommendations allow managers to act quickly when they are being impacted by a disaster, which will in turn help with creating a plan to recover the supply chain after the event (FEMA 2019) representing in Figure 1. Some of the key entities of supply chains that managers should keep in mind in a disaster are:

- Supply Source - Managers should always keep in mind where their inventory is coming from and if they will be affected by the disaster as well. The manager may want to order additional inventory before they are affected by the disaster or have alternate supply sources.
- Distribution Points - Distribution Centers may be affected by the disaster, so creating other spots where items can be stored for easier access is highly encouraged. This will allow for items to be obtained at a faster rate.
- Inventory - Checking inventory levels is crucial when it comes to gathering emergency supplies or items that would be in high demand during a disaster. Gathering generators for the store is also highly recommended.
- Access/Re-entry - Security should be notified when it comes to shipments needed to ensure the shipment gets there safely. This could also include having an escort for travel.
- Routes - The routes drivers can take are very affected by hurricanes, whether it is flooding or debris on the roadway. FEMA recommends finding alternate paths or applying for waivers to continue to deliver in those areas.
- Fuel - Disasters can cause a shortage of fuel if fuel cannot be delivered or obtained from the disaster at hand. They recommend having stock on hand for transportation needs in order to continue shipments.
- Transportation Operators - The type of transportation mode you can use in a disaster can vary depending on the type of what is affected by the disaster. Some states will stop air cargo or ground shipment depending on how dangerous it is for both the community and the driver.

3. Case Studies

While initially exploring this topic, four companies were very well known for their quick responses to hurricanes and their infrastructure for doing so. These companies were researched to develop a profile for each, detailing their particular methods for sustaining their operations through hurricanes.

3.1 Walmart

Walmart is an American multinational retail company that operates about 10,500 department stores worldwide. Being such a large retail company in many different locations, the company needs to be prepared for any natural disasters that may hit any of the stores. Because of this, the Walmart corporation has a very strong system for preparing for hurricanes.

In order to detect when a disaster may affect Walmart, Walmart has a global emergency management team that is constantly ready to provide support for these locations. One of the functions in this group is the Emergency Operations Center which acts as the central command center for preparation and response activity and operates 24 hours a day. Walmart also has the Enterprise Resilience Planning team, which is responsible for putting plans and strategies in place to prepare for significant business disruptions and resume operations quickly (Disaster Preparedness and Response, 2005). These functions in the company are crucial to protect the safety of stores and keep the supply chain running during and after catastrophic events.

In August of 2005, Hurricane Katrina hit the Gulf Coast of the United States as a Category 5 hurricane. At the time, this was the most costly hurricane that had occurred and resulted in over 1,800 fatalities. This was a huge hurricane that directly affected 126 stores and two distribution centers. Twenty-four hours before the storm hit the coast, the emergency management team ordered emergency supplies to be delivered and staged in retail locations in order to reopen in a timely manner. During the storm, the program to manage Walmart inventory levels was also wiped out, so the team called each store and asked about what essential items they needed to be restocked, such as cleaning and emergency items.

A day after the storm, Walmart sent out a large fleet of trucks that were escorted and delivered emergency supplies to each retail location. This included 40 generators and dry ice to more than 60 stores that lost power from the storm. Only four days after the storm, all but 15 stores were reopened and running to full operation, along with sending additional emergency supplies to relief workers and citizens in need (Wal-Mart's emergency plan shines during Hurricane Katrina disaster 2022).

Having the emergency management team was crucial for Walmart stores to reopen quickly and act before the storm even hit any retail locations. Because of this, Walmart was not nearly as affected by Hurricane Katrina as the rest of the area was and was able to keep operations running smoothly, along with being an asset to the local community.

3.2 Lowe's

Lowe's is an American retail company specializing in home improvement. The company operates a chain of retail stores in the United States and Canada. They have 1,723 stores in the United States and 510 in Canada. They are a major retailer selling full lines of "products for maintenance, repair, remodeling, and decorating." Their typical store contains 40,000 items. They have 15 Regional Distribution Centers, 15 Flatbed distribution centers, and 7 specialty distribution centers for their Canadian stores (Investor Fact Sheet). With their own fleet of trucks and trailers, Lowe's can update the orders of deliveries to their stores instantly.

When a natural disaster hits, Lowe's assembles the Emergency Command Center team that has over 100 employees deployed to assist their stores in the area of predicted disaster. The 1,000 warehouse employees work around the clock, 7 days a week, to transfer shipments immediately to meet the demand. Depending on the severity of the disaster, the emergency command center would track the weather forecasts to ensure enough supplies were shipped. Due to prepared products for the occurrences of natural disaster, Lowe's have products located 48 hours at furthest, but the majority are available within 24 hours to their stores. During the first phase of the crisis, they would send in their fleet of trucks full of supplies prepared for the disaster, but also based on feedback from the stores in the area. (Cain, 2019). During Hurricane Dorian, Lowe's sent out around 4,200 trailers of products to anticipated affected areas, which contained 220 of their stores. Required hurricane products during preparation are bottled water, grills, and charcoal, among other supplies. As an incentive and assistance to those communities affected, purchasing any of their products

would include a free bucket of donated cleaning supplies by Lowe's vendors, which their corporate employees assembled. (Giles, 2019). The first 72 hours are "the most critical" as they need to ensure enough supplies are sent to the communities as their priorities are based on "demographic, topographic, and other regional factors into consideration." Lowe's stores' leadership teams have daily calls to update on the situation to prepare for the operations after the disaster is settled.

After the disaster, Lowe's priority was to reopen the stores affected to provide their services, including volunteered employees from nearby stores. They shift from selling recovery supplies to rebuilding supplies immediately after the event for a few weeks. Hurricane Irma and Hurricane Harvey impacted their communities after each other. It only caused a strain on the supply chain for construction supplies (Kaplan, 2017). In the following weeks, they sell the required supplies for a flood event and a wind event. These include tarps, drywall, power tools, and wheelbarrows. The restoration and rebuilding period ranges usually starts after a month to 3 years to begin rebuilding homes in the affected communities. The rebuilding time has a large range as the federal government assistance takes time to process, but according to the leader of Lowe's Emergency Command Center, Rick Neudorff stated that "a lot of our professional service providers will immediately start buying the supplies, so they have them at their warehouses and trucks. As they're awarded jobs, they have the supplies, which can be in short supply".

3.3 Home Depot

As the largest chain of home improvement retail stores in the U.S., with 1,994 stores, Home Depot is a major resource for communities before and after hurricanes. Stocking pre-hurricane supplies like plywood for boarding up windows, sandbags for blocking water, and generators to keep the lights on when the power is out, Home Depot stores are often fighting to keep these supplies stocked as a hurricane approaches.

Hurricanes and how to respond to them are nothing new for Home Depot, having "first identified hurricane response as a strategic need after Hurricane Andrew" (How Home Depot Braced for (and Profited From) Harvey's Impact). This was over 30 years ago, and their refined plan helps them keep shelves stocked as best as possible. Home Depot's Hurricane Command Center is activated as soon as a hurricane is determined to be enough of a threat. This is exactly what happened before Hurricane Delta, where over "250 associates from the company's merchandising, operations and supply chain teams" were assembled (virtually, due to COVID) to coordinate the distribution of "products like generators, flashlights, plywood and batteries" (The Home Depot Activates Hurricane Command Center in Response to Hurricane Delta). Members of this team help identify what areas will be impacted and what products will be needed and then work to bring the two together. Some of the team works with suppliers and warehouses to assess what inventory is available to them, and others determine how distribution centers can best handle the massive amounts of inventory that needs to be packed onto trucks. As Home Depot does not own its fleet of trucks, the Command Center also includes "eight less-than-truckload (LTL) and full truckload (FTL) carrier representatives" to help coordinate how merchandise will reach stores and distribution centers after being sourced by others in the command center (Kaplan 2017). In an interview, Home Depot V.P. of Transportation Michelle Livingstone stressed the importance of having good relationships with their transportation partners, especially while responding to hurricanes. She compared the Command Centers to "the open outcry system on Wall Street," saying that "Someone calls out 'I need 10 trucks,' and one of Home Depot's select carriers will respond 'I have seven available' and another carrier partner will say, 'I can give you three.'" (An Inside Look at the Hurricanes and The Home Depot).

Outside of the Command Center, much work is done by Home Depot's various distribution centers, which are faced with massive increases in throughput. During the immediate response to Hurricanes Irma and Harvey in 2017, Home Depot sent out over 7,000 shipments to affected areas (Kaplan 2017). To meet these sharp increases in demand, Home Depot has a "Supply Chain Disaster Travel Team" of almost 500 workers to help distribution centers manage the additional work (Supply Chain: Answering Disaster Needs). Home Depot also has teams to help warehouses and stores handle demand spikes due to hurricanes, which often last weeks. After Hurricane Florence, "75 additional associates helped the Savannah, Georgia, distribution center for several weeks" until the demand came back to normal (Supply Chain: Answering Disaster Needs). Meeting demand is also made easier by Home Depot's "four distribution centers with hurricane-specific goods within easy reach of hurricane-prone coastal areas," allowing them to better respond to hurricanes on short notice (How Home Depot Braced for (and Profited From) Harvey's Impact). These distribution centers were first set up about 15 years ago and are constantly stocked with buffer stock for these hurricane-related items. This allows for at least some of the demand spikes to be easily dealt with, reducing the strain on standard distribution centers, warehouses, and upstream suppliers, in terms of both labor and inventory. At these distribution centers, trucks are often pre-packed with hurricane supplies and are ready to be sent out at a moment's

notice. Home Depot also works with vendors to ship especially high-demand items directly to stores, reducing the strain on the already bustling distribution centers. Home Depot has also recently started tracking their trucks, allowing stores better assess when to reopen.

3.4 Waffle House

The Waffle House is a restaurant chain based in Georgia that FEMA has recognized for its exceptional preparedness during hurricanes. Their effective and reliable preparedness made them recognized and utilized by FEMA as an informational metric known as the “Waffle House Index” to determine how badly the storm may have affected a given area (Waffle House Hurricane Response). According to Waffle House executive Pat Warner, “It started really when we first were founded. In 1955, Joe Rogers, Sr., and Tom Forkner opened the first Waffle House, and from day one, we’ve been open 24/7. Joe has said that if you want to serve your community, you need to be there for them 24/7... After each disaster, we do an after-action report where we look for lessons learned. We are always working to improve. After Hurricane Hugo in 1989, we learned that we needed a more systematic way of closing and reopening restaurants. And from that came a hurricane playbook that we update each year with the latest protocols for taking care of our associates and for better ways of responding. After Hurricane Katrina in 2005, we learned that we need similar systems for caring for our associates and families.” (Disaster Preparedness: The Waffle House Way).

The Waffle House has proven time and time over its efficiency in informing communities in danger, and it is all coordinated from its “war room” located in its Georgia headquarters. This team of Waffle House executives and experts monitor not only the radar, ready to begin preparations the minute a storm appears, but their headquarters is also tapped into local news reports and government websites (Smith, 2016). So as Hurricane Dorian took aim at the southeastern coast of the United States, Waffle House had already begun planning and strategizing its aid for stores scattered across the region. The first course of action is delegating “jump team” members to the areas that most need it. Waffle House’s “Jump Teams” are comprised of managers and experienced Waffle House Employees whose job is to enter affected areas to help manage the transition into emergency operating procedures and allow the workers to better care for their guests. The Jump Teams also bring in important supplies to keep the restaurant running and care for any guests, such as medical supplies and Porta-Potties. Commands come down from the War Room to redirect supplies and strike teams as new information becomes available (Blanks, 2019). An important element is limiting the menu so the company’s supply chain can focus on keeping certain items stocked and chilled or frozen (How to Measure a Storm’s Fury One Breakfast at a Time). According to Food Safety Director Larry Sigler, “The health department didn’t want to let us open any of our restaurants because they’ve never experienced anything like that before. The flooding was horrific,” Sigler said. “We said, ‘I understand you haven’t dealt with this before, but we have, and maybe by working together, we can get some stores open and get this place back to normal a little bit.’ So they let us open one of our restaurants, and they were happy with what we were doing, and we opened our five other restaurants, and we were able to help bring the community back to normalcy, which is really our only goal.” (Blanks, 2019). Waffle Houses V.P. of People, in charge of coordinating with servers, operators, and contractors, summarizes their hurricane response policies as, “We want them to be safe, but get back to work as soon as possible because it’s in their best interests as well for everything to start opening back up,” he added. “When people realize that we can get back up and running, everybody can get back to work, and it helps the entire community” (Blanks, 2019).

4. Discussion

4.1 Strategies

Given the similarities of the three retail brands discussed, the optimal solution tends to be found in the common practices we can find between them. The most effective of these common strategies are running operations centers, effectively managing transportation, and the utilization of strike teams. With these, any large retail brand would be able to help ensure the strength of their supply chains in the face of large-scale environmental threats like Hurricanes.

4.1.1 Operations Centers

Each of the companies has an emergency operation center which is activated once a disaster hits. Leaders in each section of the company, including store managers, stay in constant communication in order to evaluate the necessities to supply to their locations. They work around the clock to send in the right products, track the weather and the stores’ operational status, and coordinate with other disaster relief organizations. The companies partner with each other and government entities, including FEMA, Homeland Security, NORAD, and the Red Cross, to create operationally sound plans for their employees to assist the communities. In turn, the companies have priority to enter the area of disaster

as the government relies on the quick reactions from the command centers to provide quick relief to the areas with access to supplies, generators, and nearby store volunteers with their more flexible supply chain. Each company has its own team of experts to prepare for each type of disaster and negotiate contracts to provide flexibility in its supply chain for unexpected incidents to ship out at a moment's notice.

4.1.2 Managing Transportation

After determining what is needed, getting these goods from one place to another becomes the next hurdle. Regardless if the transportation is done by the company or contracted out, those in the operation center need to be able to quickly coordinate the transportation of specific shipments.

For companies that own their fleets, shifting more trucks towards these areas is very important, as hurricanes can result in hundreds of additional shipments, and being able to meet these stochastic jumps is critical to meet demand. If a company's internal fleet is too small to meet these changes in demand, it will be unable to keep stores stocked with critical supplies. For large companies like Lowe's and Walmart, while these jumps in demand are definitely impactful, the overall fleet is large enough to absorb this. For a smaller company with a smaller fleet, this could be problematic.

Suppose transportation is being contracted out to a large freight company. In that case, the problem is no longer whether the fleet can absorb the spike in demand but whether the carrier can communicate and coordinate the company's transportation needs. A very large transportation company will have a large enough network of drivers and trucks to be able to provide the extra transportation needs. Instead, the difficulty becomes making transportation arrangements on a tight timeline with a freight company that also serves many other businesses. For Home Depot, which contracts out most logistics to J.B. Hunt, this means having multiple representatives working with Home Depot's team to coordinate shipments. Home Depot also works with representatives to determine when to use FTL and LTL to get supplies where they are needed fastest.

4.1.3 Strike Teams

In the event of a hurricane, it is important to remember that the employees of that area are under just as much duress as the customers that are in need of support. Employees could be dealing with anything from destroying their homes to even losing close friends or family.

Strike Teams are essential in properly managing multiple locations over a large affected area. Usually composed of managers and experienced employees from unaffected areas neighboring the disaster, Strike Teams offer much-needed workforce and expertise. This is essential not only to relieve those employees who might be struggling with their duties, but to ensure that the customers are also taken care of, and facility operations can continue as close to normal as is appropriate. Strike Teams also play a pivotal role in ensuring that necessary supplies are delivered to the areas that most need them, as well as maintaining communication with operation centers to ensure that those in charge are able to assess the larger situation and delegate them accordingly properly. Without the Strike Teams, Operation centers would have no way to take immediate actions to address a constantly changing situation.

4.2 Applications Outside of Retail

Of the four major US companies discussed, Waffle House stands apart from the others because it is not a retail brand. As a restaurant, the chain itself actually does not stand to gain much profit-wise from its extraordinary efforts to remain open in the face of natural disasters. "Waffle House managers say sales volume can double or triple in the aftermath of a storm. The company, whose annual sales are estimated to exceed \$600 million, won't discuss the costs or benefits of reopening quickly after disasters. Instead, it says its strategy is more about marketing and building goodwill than profits." Waffle House has adapted this goodwill into a core pillar of its brand, turning its image into one of reliability and community.

5. Conclusion

Hurricanes impact the areas they affect, taking down power lines, flooding streets, and destroying homes. Before a hurricane, being able to secure plywood and sandbags can prevent thousands of dollars of damage, and having a generator can save lives. Afterward, having building supplies helps people start returning their homes to normal, and a hot meal can elevate spirits. This would not be possible without these businesses having plans to adjust their supply chains to stay operational as best they can. Adopting effective strategies like having Operations Centers, effectively

managing transportation, and using strike teams allows businesses to be more resilient to hurricanes and helps better serve communities.

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