

Protect Your Data Center from Flooding

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If you are a datacenter manager, nothing can ruin your day more than your data center flooding out. As impossible as this may sound, it does happen. It may not be your servers that are underwater. It may just be your backup generator or fuel pumps that are located in the basement of your building. However, the effect is the same. Your IT services are unavailable to your users.



You may think that your data centers are safe now. However, rising sea levels due to global warming will overtake many data centers in the next few decades. Now is the time to start planning for such an eventuality. Do you move your data center? Do you harden it? Do you provide a safe remote backup data center with tested failover procedures?

In this article, we look at some real-life datacenter floods. We review governmental studies that show that the probability of flooding will increase over the likely life of many data centers. And we suggest some of the actions that you might want to consider now to protect your data center if it becomes a victim to a flood.

Vodafone Suffers Multiday Outage from Flooding Over Christmas

Vodafone, the world's second largest mobile telecommunications company, suffered a devastating flood that took out one of its major data centers in the U.K. over the Christmas weekend of 2015. In December, a succession of severe storms hit the British Isles. Thousands of homes were flooded, wide-spread power outages occurred, and roads were blocked by landslides or were washed out.

After several days of storms, the Aire river rose to unprecedented levels. Cresting at over nine feet above flood stage, the highest ever recorded, it inundated the city of Leeds. In doing so, it flooded the Vodafone facility located in Leeds, taking out voice and data services for millions of people in the northern U.K.

Engineers were rushed to Leeds to repair the damage and to restore service. However, because of the flooding, they were unable to get into the Vodafone facility for several days. It was not until Monday, December 28th, that they were able to bring all voice and data services back online.

This was not the first time that Vodafone had faced a flood. In September, 2009, flash floods caused six-feet of water to sweep through Istanbul, Turkey. By the time Vodafone realized that something was wrong, it faced the loss of 25% of its network capacity in Turkey. Its major data center was well on its way to being submerged. Among other services provided by the systems in the data center were two Home Location Registers (HLRs). These are the systems that track the whereabouts of mobile customers and establish connections between them.

Repair personnel entered the flooded data center and found that the HLR disks had not been submerged yet. They were located on the top shelf of their server racks. The Vodafone personnel retrieved the disks

and installed them at another site in Ankara. Subscribers were rehomed to Ankara, and service was restored within 24 hours.

Superstorm Sandy Flooded Data Centers in Lower Manhattan

Superstorm Sandy was the largest Atlantic storm in recorded history. Hitting the U.S. East Coast on October 29, 2012, it inundated lower Manhattan. Lower Manhattan is one of the world's densest communication and computing hubs.

Some streets were awash in feet of water. New York City tunnels, subways, power substations, and basements were flooded. It took days to pump out the water. Many people and businesses across a wide swath of New York and New Jersey were without power for over two weeks.

There were 150 data centers in New York and New Jersey in Sandy's path. Flooding was catastrophic to a few. Many data centers had located their emergency generators in the basements of their data centers. If their emergency generators were on higher floors, often their fuel tanks and fuel pumps were located in the basement. As water poured into the basements and primary power was lost, these data centers could not bring up their emergency power; and they shut down.

Even in many cases in which emergency power kicked in, there was no additional fuel for emergency generators when they ran out of fuel after several days. Gas stations could not pump fuel because they had no power. What fuel was available was delivered to priority customers such as hospitals.

The Chance of Flooding is Increasing

A study by the U.S. National Academy of Sciences determined that the mean sea level has been rising steadily over the last century. The study's results were released in a report entitled "Multimillennial Sea-level Commitment of Global Warming."

The report concluded that mean sea levels will continue to rise unless the increase in the global mean temperature trend is reversed. Within a century, more than 1,000 cities will be all or partially under water.

In the U.S., Florida and Louisiana will be especially affected. It is expected that 150 towns in Florida and 114 towns in Louisiana will be threatened.

The higher sea levels will increase coastal flooding. Many data centers are located in these areas and may be affected.

FEMA Flood Zones

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk and type of flooding. It categorizes flood zones into two categories:

- A 100-year flood zone (the probability of a flood in any given year is 1%).
- A 500-year flood zone (the probability of a flood in any given year is 0.2%).

A 100-year flood zone is a moderate risk area. A 500-year flood zone is a minimal risk area.

Protecting Your IT Services

If flooding is even a remote possibility for your data center, there are several factors that you should take into consideration:

- If you have the option of relocating your data center or of building a backup data center, do not locate it in a FEMA flood zone. Furthermore, just being high is not sufficient. If the chosen

location can be surrounded by water, even if it is not flooded, you may not be able to get fuel supplies or people to your data center in the event of a flood.

- Plan the location of not only your servers, storage arrays, and network equipment to be out of a flood's way, but also all of the ancillary equipment that keeps a data center running. This includes emergency generators, UPS systems, fuel tanks, fuel pumps, and cooling equipment. Do not place them in a basement or even on the first floor of your data center, as first floors flood as well.
- Make sure that fuel tanks are topped off, generators can start, and power can be safely switched from utility power to backup power.
- Is a one-hundred mile separation of production and backup facilities sufficient when Sandy's hurricane winds stretched 1,100 miles from its center? Cities as far away from New York as Chicago were affected.
- Provide onsite living facilities for critical staff who may not be able to travel. This includes local hotel rooms if available, cots, nonperishable food, water, and other emergency supplies. Several days (or even weeks) should be accommodated.
- Customers should be offered redundant hosting on a backup site a safe distance away (facilities such as Amazon's Availability Zones, which are in fact collocated, may not be sufficient in a disaster of great magnitude).
- Buy backup mobile generators and store them in a safe distant location.
- Negotiate long-term fuel delivery contracts with at least two independent fuel suppliers. If one of these suppliers needs a bridge or tunnel to cross a river, make sure that the other fuel supplier does not.

Summary

Flooding is probably the data center disaster that is furthest from your mind. However, if there is even a slight chance that your data center could suffer the consequences of a flood, now is the time to consider how to avoid such a catastrophe or how you would recover should your data center be taken down by flooding.

Acknowledgements

Material for this article was taken from the following sources:

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[Underwater: Data Centers Nationwide Must Prepare for Flooding](#), *Government Technology*; August 28, 2014.

[Christmas Floods Take Out Vodafone Data Centre in Leeds](#), *Tech Week Europe*; January 4, 2016.

[Severe floods in Leeds hit Vodafone data centre](#), *CBR*; January 4, 2016.

[Vodafone UK data center suffers outage due to floods](#), *Datacenter Dynamics*; January 5, 2016.

[Flood Zones](#), *FEMA (Federal Emergency Management Agency)*