

Time to run before the storm

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GALVESTON will sigh with relief at the official end of the Atlantic hurricane season on 30 November, but it may never fully recover from September's hurricane Ike. Perhaps it shouldn't try.

This wasn't the first time that the city, sited on a low-lying barrier island off the Texas coast, has been devastated by a hurricane. In 1900, Galveston was the US's third busiest port, with a population of 38,000, when a category 4 hurricane hit on 8 September. Winds reached 215 kilometres per hour, a massive storm surge flooded the city and heavy waves smashed buildings. The hurricane killed between 6000 and 10,000 people, making it by far the deadliest in US history.

After that Houston - 80 kilometres inland - became Texas's main port. But Galveston survived, by building a massive 5-metre seawall along the Gulf of Mexico and raising the land level. Only 11 people died when another category 4 storm hit in 1915. The city weathered eight more hurricanes in the 20th century, each time staggering to its feet afterwards.

Ike hit Galveston and the Texas coast with comparable power to Katrina when it hit New Orleans three years earlier, but it drew far less attention despite also causing serious damage in its larger neighbour, Houston. A city of 58,000 people, with some of the best hurricane defences in the US, Galveston was thankfully far less vulnerable than New Orleans. Yet preliminary estimates put insured damage at up to \$21 billion along the Texas coast, including offshore oil rigs. That total is the third highest from a hurricane in US history, exceeded only by Katrina, and Andrew in 1992.

Three-quarters of Galveston's buildings were flooded, and city officials have asked for \$2.3 billion in federal funds to rebuild. The city's biggest employer, the University of Texas Medical Branch, suffered \$710 million in losses when 84 of its 88 buildings flooded and its hospital had to shut. Officials hope to reopen the hospital within six months, but it will be downsized from 550 beds to 200.

It could have been much worse. Ike weakened from category 4 to category 2 before it hit Galveston, and its storm surge fell short of the predicted 6 metres, which would have topped the seawall. The peak intensity of the storm, which occurred north-east of the eye, also just missed the island. But with hurricanes sure to keep coming, the future looks grim. According to Rob Young, director of the Program for the Study of Developed Shorelines at Western Carolina University in Cullowhee, the city is unlikely to exist in its present form a century from now. "There's a good chance Galveston is doomed," he says.

It is not alone. As sea levels rise, severe storms pose an increasing threat to low-lying coastal cities all along the Gulf of Mexico and Atlantic coasts. For more than two decades, coastal geologists have been urging the US to slow shoreline development. Of particular concern is the risk of a hurricane hitting a heavily developed barrier island along south-eastern Florida, where retirees are packed into high-rise seafront condos.

So why do we insist on building - and rebuilding - in such high-risk sites? In his book *The Control of Nature*, John MacPhee writes of geologists working at the California Institute of Technology who have built their homes on unstable soil in the hills above Pasadena. The hills offer a beautiful place to live, so it's easy even for those who know the risks to block out the danger. It's even easier for residents and public officials to ignore the vulnerability of coastal cities that have been settled for a century or more. The US and Texas together spent \$174 million to build the Galveston National Laboratory to study the most hazardous diseases and biological warfare agents; Ike hit just days before its planned dedication. The building survived and the lab is now preparing to begin operations, despite calls to move it to safer ground.

Geologists such as Young don't advocate abandoning the shore, but say we should recognise that it is not a place where structures can last. Building a vacation cabin behind the dunes is reasonable; erecting a multi-storey condominium right on the beach is not. They also point out that massive coastal defences such as Galveston's seawall only accelerate erosion of the beach and will ultimately fall to storms and rising seas.

They argue that governments should not use public money to rebuild on coastal sites where previous structures were destroyed by the sea and storms. Private landowners can rebuild on danger zones if they choose to, with restrictions to ensure that their new structures don't damage the coast or speed erosion elsewhere, but the government should not help them. If a storm damages vital infrastructure such as a power plant, it should be rebuilt at a less vulnerable location.

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That isn't what Galveston wants to hear, but it is what Galveston and the rest of the US needs. The unpleasant truth is that we have built - and continue to build - too much in sites vulnerable to storms, fires and floods. Tax dollars spent on disaster relief should be used to help people move to safer places, not repeat old mistakes.

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