Florida condo collapse highlights concerns over stability of coastal buildings impacted by effects of climate change

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It has now been one week since the Champlain Towers South condominium collapsed in the beachside town of Surfside, Florida. The death toll has risen to 16, as four more bodies were uncovered overnight Wednesday. The number of residents still unaccounted for is now 147, according to Miami-Dade County mayor Daniella Cava.

As rescue operations continue and desperate families struggle to find missing loved ones, more questions have arisen as to the structural integrity of other high-rises similar to Champlain Towers South and the vulnerability of countless buildings adjoining the Florida shoreline. The catastrophe in Surfside has highlighted critical dangers facing other infrastructure in the region, built in unstable areas that are being subjected to the consequences of human-induced climate change.

While both the Democratic and Republican parties have largely presented the tragedy as an isolated issue, abundant evidence has emerged in recent years showing that Florida's geological base is threatened by rising sea levels and the erosion of its beaches, posing significant risks to buildings all along the state's coast line. The foundations of countless structures are made of material incapable of dealing with corrosive seawater.

Numerous articles in the press have referenced a 2018 engineering report examining the integrity of Champlain Towers South, warning of serious damage arising as a result of major breakage of concrete under the Towers' foundations and other significant cracks, risks that were greatly exacerbated by deteriorating waterproofing and existing design flaws.

The public document serves as one piece of evidence of the endangered future of other high-rise towers and apartments that are increasingly battered by rising sea levels.

In an interview with the *Guardian*, Professor Zhong-Ren Peng, an expert on sea-level rise at the University of Florida, said that the materials used for the building's base were not built to withstand salt water intrusion, which can corrode substantial amounts of steel and concrete. "Cracks in the concrete allows more sea water to get in, which causes further reactions and the spreading of cracks," Peng noted. Negligence of these critical defects can invariably lead to the type of structural failure witnessed in Surfside.

The entire Florida peninsula region sits on top of karst limestone, a porous rock that allows rising seawater to accumulate around the base of buildings. A weakness of limestone material is that cavities can form inside them in which percolating solutions, such as salty water, can mix with minerals inside the material, thereby dissolving the rocks and undermining the foundations.

Karst, a term used to describe an environment where the bulk of its rocks can dissolve, opening up sinkholes and caves, makes up about a fifth of the United States' landmass and is even more prevalent in Florida due to its own unique geology. One theory that has been floated as to the cause of the Champlain collapse has been a widening sinkhole underneath the structure. The theory is plausible, as large sinkholes have opened up elsewhere in the state, swallowing up roadways, vehicles and in a few cases, entire buildings.

While Miami-Dade County Mayor Daniella Cava said Monday that no evidence exists that a sinkhole was responsible for the fall, information and eyewitness testimony has hinted at a sinkhole being present around the time of the collapse. In reviewing video and pictures of the Champlain Towers, experts have said it seems as if the collapse started around the building's pool deck. This lines up with reports that one of those missing in the rubble called her husband just before the building fell, telling him that she saw a hole open up where the pool deck used to be moments before the collapse.

The inundation of limestone with seawater on a large scale can lead to significant outbreaks of sinkholes. This has dire implications for the state's infrastructure, since the foundation which virtually all of Florida's buildings are built on, including its major towers and high-rises, is subject to dissolution.

Already, experts are drawing a direct connection between the rise of sea levels caused by climate change and the susceptibility of Miami's coastal construction. Professor Peng noted in an interview that salt water accumulation around a building can lead to rusty decay absorbing the steel of the structure. The consequences include instances of corrosion so severe that it may cause many buildings to not be able to handle

the weight and eventually succumb to a pancake freefall.

Sea level rise has coincided with persistent king tide flooding and changes in soil consistency. Flooding has become such a frequent reality that Miami residents have become used to seeing their cars flooded inside garages and water seeping up from drains onto roads, even on clear weather days. A 2019 analysis by the National Oceanic and Atmospheric Administration found that high-tide flooding in 2018 broke records at more than a dozen locations throughout the US, including Miami and Cedar Key on the Gulf Coast. This has coincided with international trends, with global sea levels rising about one inch every eight years.

South Florida has emerged in recent years as a central area of concern for the impact climate change is having on at-risk coastal infrastructure. In the island city of Key West, located at Florida's southernmost point, sea levels rose about 3.9 inches between 2000 and 2017, according to a 2019 report from the Southeast Regional Climate Change Compact. Experts are projecting South Florida's coastal waters will jump 10 to 17 inches by 2040 and another 21 to 54 inches by 2070. The report stresses that the region's sea level rise could be faster than the global rate because of the Gulf Stream current slowing down.

Professor Atorod Azizinamini, an engineering researcher at Florida International University, explained to the *Palm Beach Post* that the subtle increase in rising seas was not a concern in the 1980s, a time which saw an explosion of high-rise coastal development in Florida. This began in earnest in the 1980s and continued unabated into the 1990s. Warnings that had been issued in those two decades about the inevitable consequences of climate change on coastal developments, including along Florida's shoreline, were either ignored or suppressed by the political establishment, the major newspapers and sections of the corporate oligarchy.

In the 1980s, Shell Oil and ExxonMobil issued a slate of secret warnings that their fossil fuel activities were fueling climate change, forecasting significant global damage from their oil secretion. These consequences included the worsening of sea levels and the rapid disintegration of the Antarctic ice sheet from the buildup of carbon emissions. Shell's assessment foresaw a one-meter sea level rise by 2030, and noted that warming could also fuel disintegration of the West Antarctic Ice Sheet, resulting in a worldwide rise in sea level of "five to six meters."

Another warning was a report released in 1990 from the Intergovernmental Panel on Climate Change, which produced a remarkably accurate projection on the rise of sea levels for the first three decades of this century, and an approximately reasonable estimate for the rest of the 21st century. This has applied in particular to losses of water from Greenland and Antarctica.

Florida has appeared on the front lines of a growing climate crisis which the state, in particular its southernmost parts, is finding ever more difficult to extricate itself from. Behind this lies every aspect of social life being subordinated to the anarchy of the capitalist system and the prioritizing of wealth for the ruling class at the expense of the lives of the population. Efforts by officials to forestall the crisis by replenishing South Florida's seaside beaches with sand have proven to be inadequate panaceas unable to curtail rising sea levels.

According to the *Guardian*, Florida authorities have spent $1.3 billion since the 1950s refurbishing or "nourishing" beaches, periodically importing supplementary sand that has been consistently eroded by rising sea levels. Nearly half the state's 825 miles of beaches are now considered "critically eroded," as the state and US are coming to grips with a worldwide shortage of sand.

For Miami Beach, sand shortages have exacerbated the deluge of seawater ramming into the coastline, cutting divots into shores such as that seen in front of the Fontainebleau hotel. The US Army Corps of Engineers released a plan in July 2015 on patching up the eroded sections of Miami Beach, in which it noted Miami-Dade's sand resources had become "exhausted."

However, access to nearby oceans to replenish Miami's beaches immediately ran up against opposition from officials in neighboring Martin and St. Lucie counties, which rejected proposals for borrowing their sand resources because of the wholesale scarcity caused by rising seas.

St. Lucie commissioner Frannie Hutchinson declared that the Corps should "take its shovels and buckets and go home." She filed more than a dozen public comments on the Corps' proposal, saying that it failed to address sea level rise, while citing St. Lucie's own sand shortage.

Sarah Heard, a Martin County Commissioner, angrily asserted that Miami-Dade had "depleted their resources and now they want to come and take ours." Heard continued, "we don't know exactly how sea level rise is going to impact us, but we know it's accelerating rapidly, we know there's going to be inundation."

Blame for the climatic devastation now hitting Florida's coastline lies squarely with capitalism and its representatives in both corporate-controlled parties, who have signed off on coastal developments while ignoring the dangers rising seas pose to infrastructure. Massive profit interests are bound up with the construction and maintenance of high-rise towers similar to Champlain Towers South, which are a crucial component of Miami's lucrative tourism industry. In 2017, a record 116.5 million tourists visited Florida, generating commerce valued well over $67 billion.