

## CLIMATE CHANGE AND BUILDINGS—ADAPTATION OR CONSEQUENCES

*Global warming*, a component of climate change, drives *sea level rise*, which in turn increases the height of *storm surge*, a component of hurricanes.

Deeper waters mean faster flowing storm surge, higher waves above it, increased hydrodynamic pressure and much higher breaking wave impacts on coastal buildings and infrastructure.

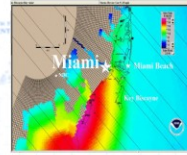
**Conclusion:** climate change is already exacerbating the impact of hurricanes on the coastal built-environment.

**Question:** what are we doing about this?

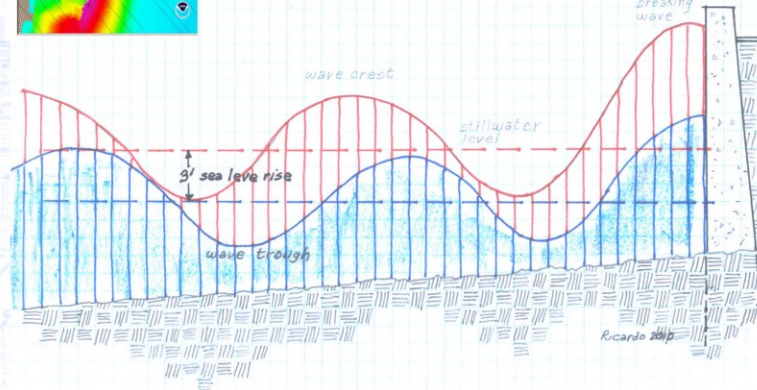
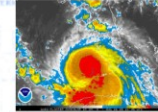
**Answer:** not very much!

Business-as-usual relative to building design for coastal locations is a formula for future disaster. We must adopt a new design paradigm where adaptation to climate change is central. Adaptation must also be central to urban redevelopment and the retrofitting or existing buildings and infrastructure!

Building codes must incorporate prescriptive adaptation to climate change!



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## ADAPTATION

The potential for damage to buildings and infrastructure from the impact of hazards generated or exacerbated by climate change is real.

Over the past ten years there has been a strong effort to design and build energy-efficient, so-called *green buildings*, to reduce the *carbon footprint* of a building and help mitigate the human impact on climate.

On the flip side, there is no evidence that equal attention has been given to designing buildings that will sustain the impact of climate change.

Given the critical role of the built environment in sheltering and supporting the full range of human activity, it is clear we must take action to ensure our buildings and infrastructure will be able to resist the impacts of climate change for as long as they remain in service.

It is time we incorporate the practice of ADAPTATION into the development and maintenance of the built environment!

ADAPTATION consists of cost-effective measures to improve the performance of and/or reduce the potential for damage to buildings under the impact of hazards generated or exacerbated by climate change.

### NEW BUILDINGS AND INFRASTRUCTURE

The most effective and simplest method for practicing *adaptation* is to incorporate these protective measures during the design phase of every new building.

### EXISTING BUILDINGS AND INFRASTRUCTURE

Much more difficult and urgently needed is the *adaptation* of existing buildings, not only because of the trillions of dollars in replacement value but for the even greater value of the function they provide for human activity.

### URBAN REGIONS

*Adaptation* of individual buildings, whether new or existing, is only a partial solution. More critically needed is *adaptation* to protect whole urban areas, especially those in coastal locations that are vulnerable to sea level rise, storm surge and the impact of other hazards exacerbated by climate change.

## HAZARDS



Several natural hazards are byproducts of or are exacerbated by climate change. Of special interest to vulnerable urban communities in the coastal regions of Florida and other states are the following:

- Hurricanes
- Storm surge
- Coastal floods
- Coastal storms
- Coastal erosion
- Extreme precipitation
- Extreme heat
- Higher humidity
- Drought
- Wild fires



## CONSEQUENCES

Adverse consequences to buildings from the impact of these hazards include the following:

- Higher, faster flowing storm surge resulting in higher wave impact and hydrodynamic pressure;
- External loads that exceed original design criteria for a building;
- Some buildings originally outside the floodplain become vulnerable to flooding;
- Undermining of foundations and ground floors due to coastal erosion;
- Extreme rain events exceed drainage capacity of roof creating excessive loads on structures;
- Higher more common incidence of mold;
- Higher cooling requirements resulting in higher energy/insulation demand;
- Water use restriction affect water pressure and operation of mechanical equipment & plumbing;