

SCIENCE AND TECHNICAL SUBCOMMITTEE

Initial Recommendations for the August 20th, 2009 Climate Change Task Force Meeting

GOALS, ACTIONS AND RECOMMENDATIONS FOR DISCUSSION

GOAL: To provide the Task Force, its Subcommittees and the Broward Board of County Commissioners with the best possible scientific and technical information to use in developing strategies to mitigate and adapt to the potential impacts of climate change to include changes in sea level rise, weather patterns, temperature, precipitation and hurricane frequency and intensity.

FOCAL AREAS

Summary of Evidence

Mountain glaciers worldwide are retreating. Arctic ice is decreasing. Greenland ice is melting. Snow/permafrost is decreasing. Sea level is rising. Ocean heat content is increasing. More intense droughts are occurring. Atmospheric moisture is increasing. Heavier rainfall events are more frequent. Increased heat waves are being recorded. Decreased cold spells are noted. The consensus opinion of scientists around the world and unequivocal evidence is that climate change since the industrial revolution is due to anthropogenic activities.

Sea Level Rise

- 1) Based upon the review of the best available technical data and scientific modeling, a projection of 3-to-9 inches of sea level rise from the 2000 level by the year 2030ⁱ should be utilized in the development of task force immediate and short term recommendations.
- 2) Based upon the review of the best available technical data and scientific modeling, a projection of 10-20 inches of sea level rise from the 2000 level by 2060ⁱⁱ and a projection of 24-48 inches of sea level rise by the year 2100ⁱⁱⁱ should be utilized in the development of task force mid and long recommendations.
- 3) The porous geology of South Florida contains extensive preferential flow passageways in the Biscayne Aquifer. As sea level rises and salt water intrusion increases along coastal Broward County, the landward migration of salt water is likely to be concentrated along these passageways and then into the rock where it can displace freshwater currently stored there. The phenomenon provides additional challenges in adapting to sea level rise.

Immediate Recommendations:

- a) Continue monitoring and tracking of tidal gages in Broward County to establish a long-term period of record.
- b) Monitoring, data analysis and related resources should be maintained and managed adaptively to account for the possibility that sea level rise rates may change from projected trends.

SCIENCE AND TECHNICAL SUBCOMMITTEE

Initial Recommendations for the August 20th, 2009 Climate Change Task Force Meeting

- c) Support continued development of local hydrologic and integrated models and data collection including hydrologic, geologic and groundwater quality and levels which can better predict the impacts of sea level rise on groundwater levels, saltwater intrusion, and drainage infrastructure.
- d) Utilize the most recent LiDAR data to map potential impacts of sea level rise to the natural and built environments of Broward County at 1-foot, 2-foot, and 3-foot levels of increase and consider this information in long term planning.
- e) Establish and convene a science council of leading climate scientists living locally in 2010 and at regular intervals thereafter to inform policy makers/elected officials of the latest empirical data, results of modeling efforts and the potential resultant impacts from climate change on the South Florida region, particularly sea level rise, and to inform climate scientist of the policy makers' need for specific types of information and data upon which to base future decision.
- f) Coordinate regionally with other South Florida counties, academia, and government agencies in the analysis of sea level rise and the planning of adaptation measures.

Mid-Term Recommendations:

- a) Acquire updated LiDAR data or state-of-the-art elevation data every 10 years to improve available information needed to make informed decisions regarding adapting to the impacts of climate change.

Changes in South Florida Climate

Temperature and Rainfall Patterns

- 1) Based upon the review of the best available technical data, scientific modeling, local scientific expertise, future weather patterns are expected to be more extreme with more intense rainfall events, longer periods between rain events, seasonal shifts in rainfall, extended dry periods and more extreme and frequent heat events including high heat indices and heat waves. This information should be utilized in the development of task force recommendations.
- 2) Based upon the review of the best available technical data, scientific modeling, local scientific expertise, the average annual temperature is projected to rise 3-10°F by the year 2100. This temperature range should be utilized in the development of task force recommendations.

Immediate Recommendations:

- a) Encourage dedicated state and federal funding sources for modeling efforts and data gathering that improves our knowledge of potential temperature changes and alteration of rainfall patterns

SCIENCE AND TECHNICAL SUBCOMMITTEE

Initial Recommendations for the August 20th, 2009 Climate Change Task Force Meeting

that will impact the South Florida region due to climate change. Support down-scaled models that would enable increased awareness of climate change predictions for Broward County.

- b) Establish or enhance existing programs to monitor and determine trends in other climate-related impacts that could have consequences in South Florida including increased droughts, wildfires, flooding, storm water runoff, inundation of gravity sewers, water quality, heat waves, problems with invasive species and insect-borne disease resulting from changes in temperatures and rainfall regimes, adverse effects on native terrestrial species including major shifts in phenology affecting pollinators and other wildlife, natural communities and marine life, saltwater intrusion into aquifers, more frequent and intense storms, storm surges, tidal regimes, bleaching of coral reefs owing to oceanic acidification and consequent fisheries impacts and coastal erosion.

Hurricanes

- 1) Based upon the review of the best available technical data, scientific modeling, local scientific expertise, hurricane activity is recognized to be episodic on multi-decadal timelines and, in the future, is expected to be similar to historical levels with the possibility of a slight increase in storm intensity, increased impact from storm surge due to sea level rise and hurricane intensity, increased rainfall associated with those storms and a slight decrease in average annual number of storms.

Immediate Recommendations:

- a) Re-evaluate hurricane evacuation plan after utilizing Storm surge models that include increased contributions from sea level rise and increased hurricane intensity.
- b) Conduct damage projections of hurricanes with various levels of adaptation as a means of identifying cost/benefit ratios for implementation of various adaptation measures.
- c) Establish a joint program with SFWMD/FEMA/NOAA and others to determine the impact of climate change on drainage in the County as affected by both sea level rise and hurricane impacts.^{iv}

Uncertainties

Uncertainty is associated with our limited understanding of selected natural processes, the limited data with which to predict long term changes, the current limitations of global models and the lack of regional climate models. One should consider uncertainty in developing adaptive management strategies for resources and infrastructure planning. For mid and long

SCIENCE AND TECHNICAL SUBCOMMITTEE

Initial Recommendations for the August 20th, 2009 Climate Change Task Force Meeting

term planning, peer-reviewed science needs to be revisited regularly to incorporate the latest information to ensure projections which provide a reasonable range of expected values.

ⁱ Sea level rise range was based on using a lower boundary of the current sea level rise rate at Miami Beach extrapolated to 2030. The upper boundary was calculated by taking IPCC 2007 maximum sea level projection for 2030 (which fails to take Greenland ice shelf melting into account) and multiplying by the ratio (1.41) of the South Florida sea level rise rate as compared to the global rate for the past century.

ⁱⁱ The projected range for sea level rise for 2060 is based upon a method proposed by Barry Heimlich (Heimlich et al, FAU, in press) that assumes: 1) sea level will rise according to a quadratic acceleration equation, which Church and White (2006) reported gave a good correlation for sea level rise data over the past 150 years; 2) current rate of sea level rise of 3.1 mm/yr, the latest estimate based upon satellite altimetry data (Bindoff et al, IPCC, 2007), and 3) projected sea level rise of 24-48 inches for the 100 year period from 2000 to 2100 (Karl et al, NOAA, 2009).

ⁱⁱⁱ A consensus for 2-4 feet of sea level rise by 2100 is growing in the scientific community. This projection can be found in the US Global Climate Change Research Program's 2009 report entitled "Global Climate Change Impacts in the United States". This values fall within the range of that predicted by the June 2009 synthesis report for the IARU International Scientific Congress report entitled "Climate Change: Global Risks, Challenges and Decisions".

^{iv} An increase in sea level has the potential to exacerbate flooding for two reasons. First, coastal flooding caused by storm surges is expected to worsen as sea level rises. Not only may hurricane intensity increase but overtopping of coastal embankments may occur more frequently as sea level increases. Secondly, rainfall driven flooding may occur more frequently as the canals system loses effectiveness in draining excess groundwater from the Biscayne Aquifer. This type of flooding could become widespread throughout Broward County if sea level rises at the upper end of projections. Storm surge models and rainfall driven hydrologic models should be developed to predict and help minimize the impacts of these types of flood events.