



## SCENARIOS FOR THE KEYS

### CLIMATE CHANGE AND THE FLORIDA KEYS

#### FACT SHEET 6

#### FKNMS/NOAA SOCIOECONOMIC RESEARCH AND MONITORING PROGRAM

*The views and recommendations are the author's and are not necessarily endorsed by NOAA.*

#### HOW THE SCENARIOS WERE DERIVED

The four original global scenarios published by the Intergovernmental Panel on Climate Change in 2000 were critically reviewed and updated for the project report. The question was posed whether the original IPCC storyline would have been written differently in 2010, and how current physical, economic and technological changes could influence the storyline. After establishing a global path through the 21<sup>st</sup> century the United States was brought into the global context before zooming in on the Florida Keys.

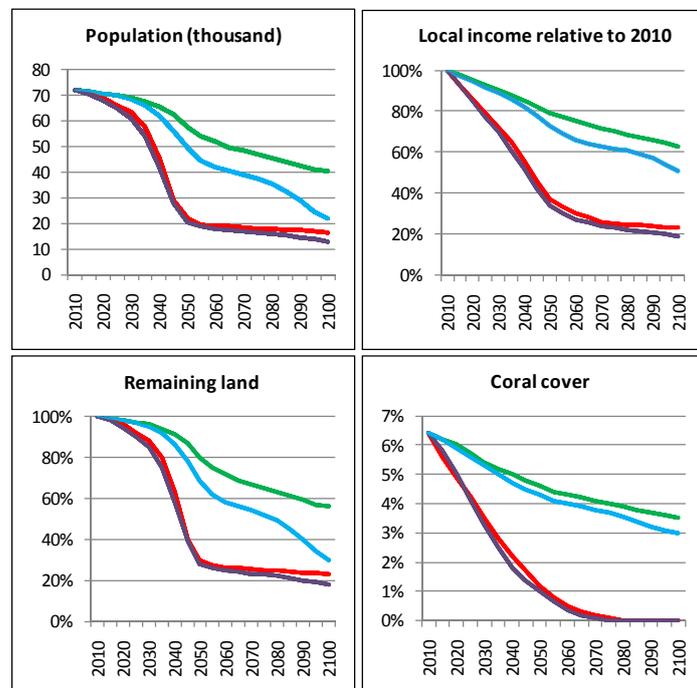
Each scenario contains projections of average warming, sea-level change, ocean acidification and change in the global economic product. These variables were used to derive projections for the Keys, based on a series of statistical relationships linking global and local conditions.

Generally, sea-level rise is recognized as the worst threat for the Florida Keys, and sea temperatures and acidification for the marine sanctuary. The projections for the Keys include population, remaining land area, coral cover, and total income in the Keys. These variables are shown on the summary chart to the right.

The Keys stories derived from each global scenario are summarized below.

Comparative scenarios, Florida Keys

A1: — B1: — A2: — B2: —



#### A1: GLOBAL ECONOMIC FOCUS

The high global economic growth during the initial 20-30 years of Scenario A1 might initially be thought to benefit the Florida Keys, but this would soon be dissipated by the physical

reality of sea-level rise. The population is assumed to fall in proportion to the loss of land, and the remaining wealth will probably be increasingly absorbed elsewhere.

A striking result of TNC's research into sea-level change is a dramatic land loss between 2035 and 2050 in the A1 scenario as the temperature increases from 2°C to 3°C above pre-industrial levels, and the sea level rises from 12 to 37 cm. This is estimated to cause the remaining land area in the Keys to decline from 80% to 30% of currently existing levels.

With little carrying capacity left, the Keys population is assumed to be directly correlated with the remaining land area, which means a reduction from 72,000 persons in 2010 to 57,600 in 2035 and 21,600 in 2050, after which the decline becomes less dramatic. By 2100, the local population has fallen to 16,600, 23% of the 2010 level. The total value of the remaining land area will fall less steeply, but an increasing proportion of the remaining wealth will be owned outside the Keys.

The coral cover is estimated to decline to 1.2% by 2050 and to disappear by 2075, from 6.4% estimated for 2010. Temperatures will increase to very unpleasant levels at least from 2050, requiring better and dearer building insulation. The oceans will become progressively more acid. A decline in pH to 7.7 would have disastrous consequences not only for coral reefs but for a broad range of other calcareous organisms, especially in the Southern Ocean.

In summary, even the "balanced" fossil fuel/renewable growth scenario will leave the Keys devastated. Furthermore, there is no light at the end of the tunnel in the 22<sup>nd</sup> century if the global Scenario A1B is allowed to run its course. By then, not just the Keys but the whole A1 world will have gone into reverse.

## **B1: GLOBAL ENVIRONMENTAL FOCUS**

This is clearly the best-case scenario despite the need to strengthen it globally to meet more stringent atmospheric CO<sub>2</sub> targets. It is supported in the Keys by the prevailing community spirit, with sufficient people being attracted to the lifestyle. Young people also respond by more of them staying rather than abandoning the Keys.

Due to good management and local community support, the resilience work is as successful as can possibly be expected, and helps allowing much of the coral cover to remain despite the ocean warming. Sea-level rise will happen but to a relatively limited extent. Efficient sanctuary management and land-based conservation work is crucial in this scenario.

The average global temperature is assumed to rise by 2.5°C above pre-industrial levels by the end of the century. The sea-level rise compatible with this scenario is 22 cm, at which level 44% of the Keys would become unfit for habitation. Hence, the population declines from 72,000 currently to 40,300 in 2100.

Ocean acidification is projected to intensify at a lower rate than in other scenarios, but it remains a threat even in the most benign scenario. The relatively high projected coral cover (3.5% in 2100) is assumed to be consistent with the assumption on acidification, as well as being dependent on the continued resilience policy of the FKNMS and other organizations, and the community's active involvement.

It is assumed that there will be a viable tourism industry with some coral cover in place through the century, backed up by land-based activities associated mainly with Key West. It is important that Key West remains a crucial part of tourism, and there is cooperation between the historical and nature-based part of the industry.

## **A2 AND B2: SCENARIOS FOR REGIONALIZED WORLDS**

The growth-driven scenario A2 is to be strenuously avoided. The Keys will probably be abandoned as a lost cause. The population is projected at 13,000, with 82% inundation, and total income reduced to 19% of the level in 2010. Any remaining coral cover will disappear by 2075. All four variables represent a case worse than the A1 scenario.

While not as positive as B1, its community-based support and ecological orientation makes the environmentally friendly B2 the second-most positive scenario. It demonstrates that social cohesion and a strong sense of community and respect for the environment will go a long way. It assumes that the work on coral reef resilience will continue under an active and strong sanctuary management supported by other organizations and groups, and that the natural land-based and historic environment will be preserved to the maximum extent in the face of the rising sea level, all actively backed by the community.

There will be a viable tourist industry based on Key West's historic attractions and the nature-based activities of the Keys, and local residents will dominate, rather than outsiders.

HHG November 6, 2010

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### **Further reading:**

*Climate Change and the Florida Keys*, Chapter 7

Fact sheets 1 (*Scenario planning and the IPCC*) and 2 (*The aggravated threat of global climate change*).

Pictured: The State Endangered Bahama strongback (*Bouyeria succulenta*), featured as a native plant in Roger L. Hammer's *Florida Keys Wildflowers* (The Globe Pequot Press, 2004). Photo (HHG) from Tina and Dennis Henize's garden, Cudjoe Key, 2009.