

# ADAPTATION BEHAVIOR ON THE FRONTLINE OF GLOBAL CLIMATE CHANGE

**Survey Responses From Decision Makers Serving the Florida Keys:  
Federal, State, Regional and Local Management Personnel,  
Environmental Specialists, Policymakers and Community Leaders**



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# 1.0 Introduction and Background



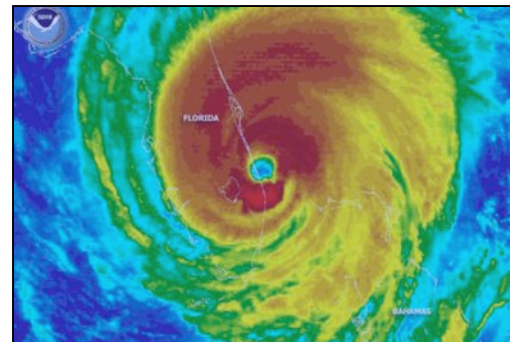
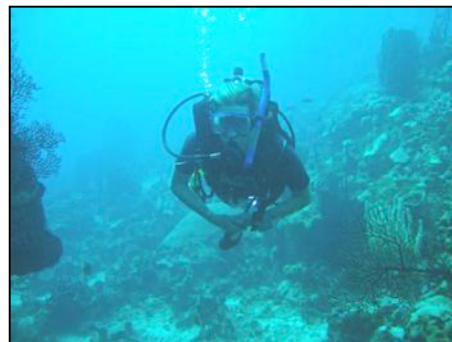
**Slivers of land amidst the nation's premiere marine ecosystem, the Florida Keys provide unique insights into the emerging challenges associated with adaptation to climate change.**

**Accelerating sea-level rise, extreme hydrometeorological events (with the potential for changes in frequency, intensity and duration), changes in ocean chemistry and circulation, new disease vectors and other adverse climate change related impacts**

**- threaten to exceed the resilience of numerous socio-ecological systems in the Florida Keys, including the world's third largest barrier reef**

**- with potentially severe economic repercussions**

**- while undermining traditional decision-making strategies and management regimes.**



# UNCHARTED WATERS

*Unprecedented...Unintuitive, Uncertain and Unfamiliar*

**Coastal communities should begin actively preparing for profound, multidimensional and unprecedented challenges to local socioeconomic and ecological systems.**

- **Challenges involving “novel, unintuitive processes,” including gradual, creeping changes (with delayed, indirect, even hidden impacts), manifested globally and over long time scales; punctuated by abrupt change and extreme events (with immediate and direct impacts), realized locally and over short time scales.**
- **Challenges “surrounded by uncertainty and couched in unfamiliar terminology in ways that are hard to grasp, much less evaluate (Fischhoff, 2001).”**

**A new physical environment and a new decision making environment...**

# THE ADAPTATION GAP

**A major information-action gap exists today in our conceptual understanding of climate change and how to proceed with practical adaptation.**

- Climate Change-related events have already cause significant adverse impacts in the Florida Keys.**
- G8 'agreement' (& House bill) to limit average temperature rise to 2°C (3.6° F) above 1900 with 80% reduction in GHG emissions by 2050 (by developed countries) will not prevent a significant sea-level rise.**

**Social and cognitive factors (and there link with institutional decision-making under uncertainty) will shape how effectively coastal communities adapt as profoundly as physical impacts.**

## **THE REAL CONUNDRUM WE FACE ...**

**“The problem, a large one, is that such harms [might] not be cognitively available... until it is too late (Sunstein, 2006).”**

- That is to say, by the time ‘we’ recognize the need to prepare, on the scale required, the time to act (most effectively) will have passed.**
- Reactive options will be limited and more costly than proactive efforts, and adverse impacts will be more painful.**

**“For these potentially catastrophic risks,  
whose prevention requires long-term investment,  
there are built-in obstacles to serious regulatory efforts”  
and adaptive solutions (Sunstein, 2006).**

**Particularly, if climate change continues to be perceived as *only* an environmental issue.**

**Moving from theoretical model-based risk assessments to real-world adaptation requires cognitive and behavioral changes at the individual and institutional level, among the general public, the private sector, as well as decision makers.**

- Human institutions [decision makers] will need to change the processes by which they interpret and use climate-related knowledge.**
- They will also need new kinds of information to help them change.**
- And this decision-support will need to be continual because the climate will continue to change, sometimes in foreseeable ways (as projected) and sometimes with surprises.**

## **2.0 Scope of the Study**





# **BAYESIAN UPDATING - PREDICTIVE INFERENCE**

**Given decision makers ability to ‘learn through experience’**

**(e.g., experimentation, observation, assessment and refinement),**

**and to tap reservoirs of institutional memory**

**(i.e., extrapolate from existing knowledge structures built upon previous learning),**

**their risk perceptions are more robust to detect the signal-to-noise of climate change.**

**In the context of survey research and climate change,**

**decision makers’ valuations can provide functional guidance**

**(e.g., interpretation, clarity, alternatives and innovations)**

**for integration along the individual and institutional learning continuum,**

**in the Florida Keys and in vulnerable coastal locations worldwide.**

# STUDY OBJECTIVES

**Analyze how decision makers serving the Florida Keys**

**(Federal, State, regional and local management personnel, environmental specialists, policymakers and community leaders) are anticipating and planning for climate change.**

- Examine cognitive and affective risk perceptions, climate-related knowledge, perceived adaptive capacity and preferences for adaptation;**
- Identify barriers to adaptation, including resource and information needs, and shed light on there priorities**
- Explore willingness to support specific information and programmatic approaches (decision-support tools) useful for reducing the information-action gap, enhancing adaptive capacity, and minimizing adverse impacts in the Florida Keys and beyond.**

# **RESEARCH METHODOLOGY**

## **The Survey Instrument**

- 5 sections, 40 questions**
- Including the latest peer reviewed science**
- Extensively tested**

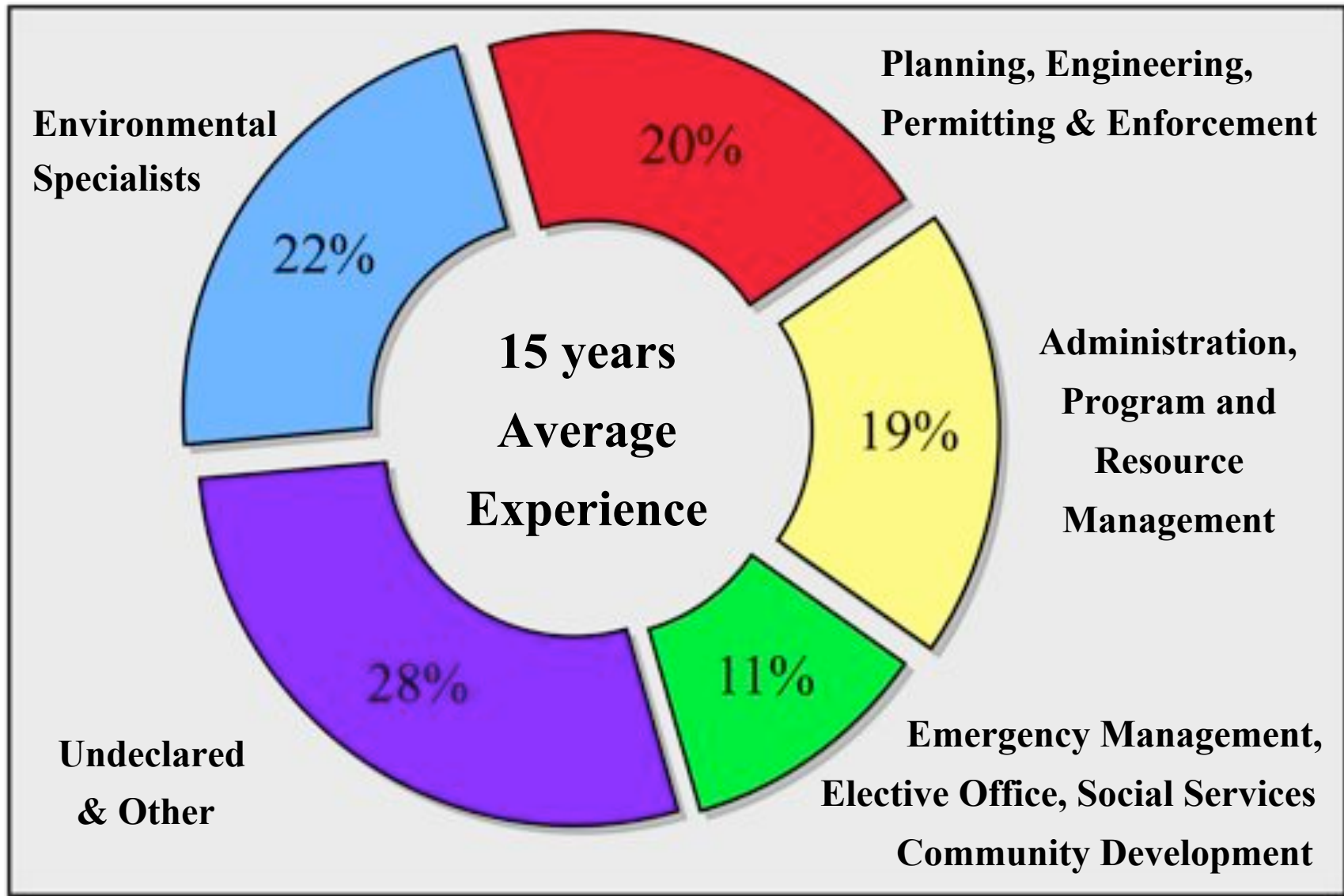
## **Sample Selection**

- 845 total personnel throughout the Florida Keys**

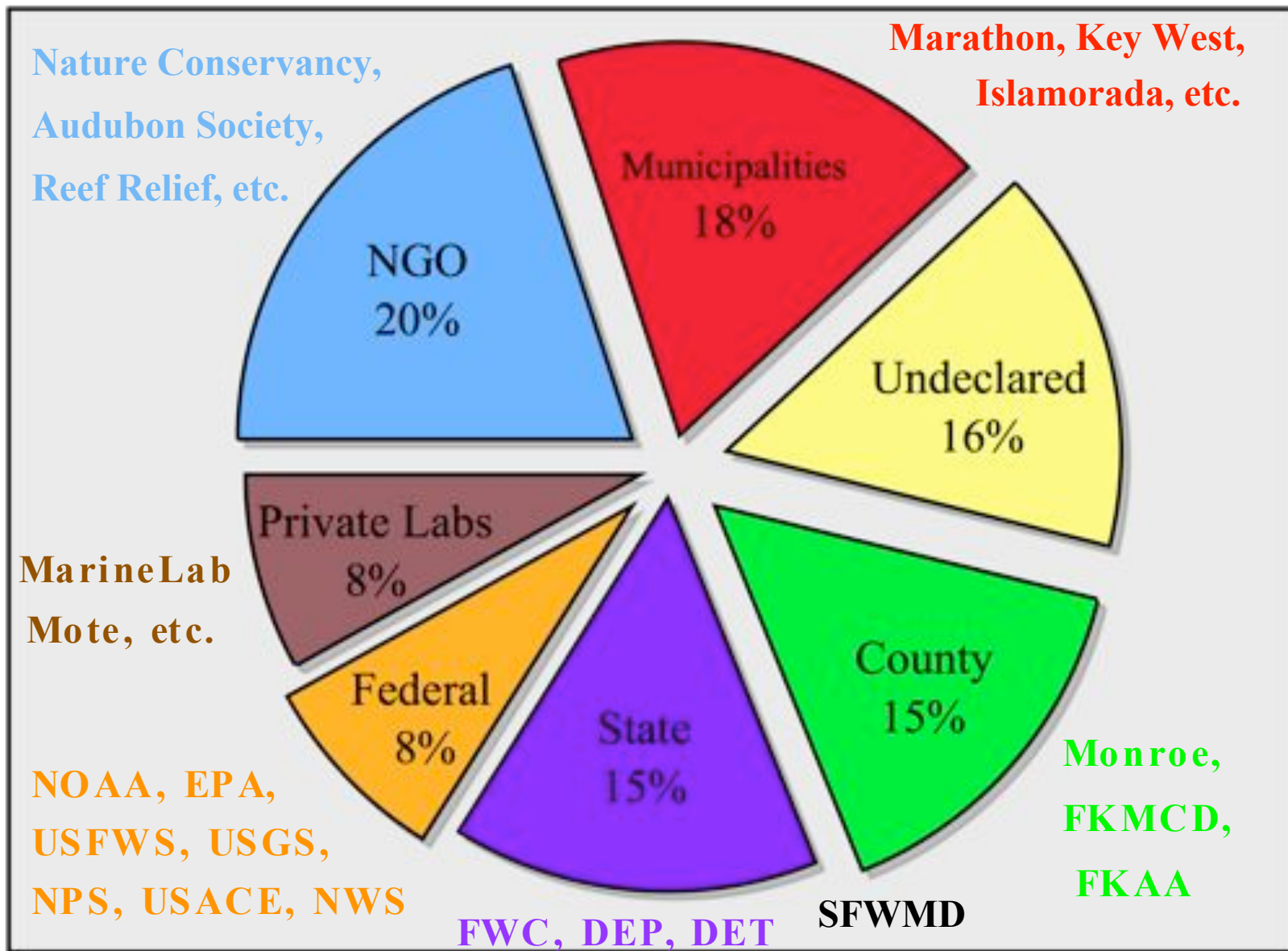
## **Data Collection**

- Online survey with anonymous participation**
- over a two month period (June and July, 2008)**
- 225 usable responses**

**Figure 1. Survey Respondents by Profession**



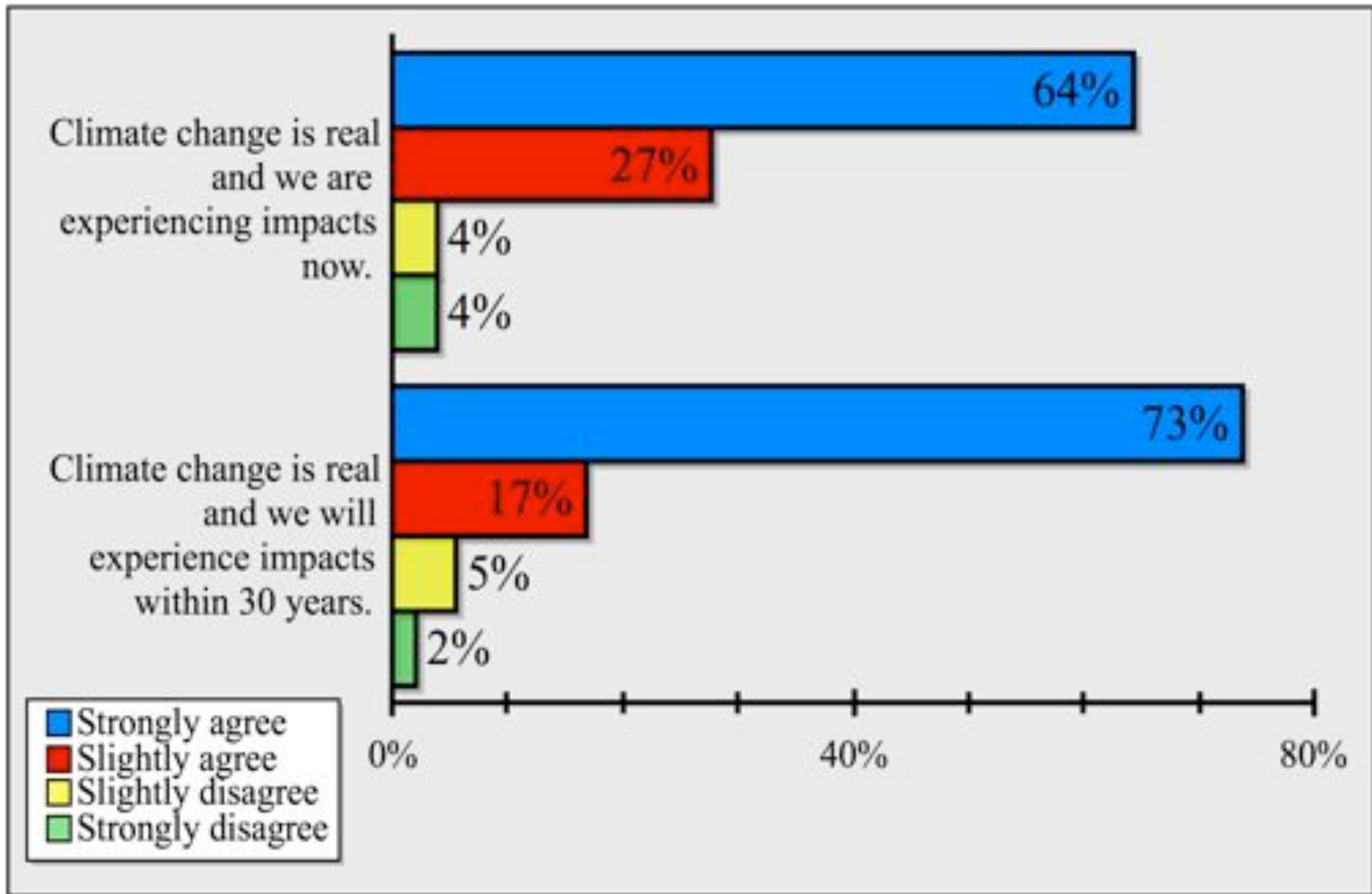
**Figure 2. Survey Respondents by Affiliation**



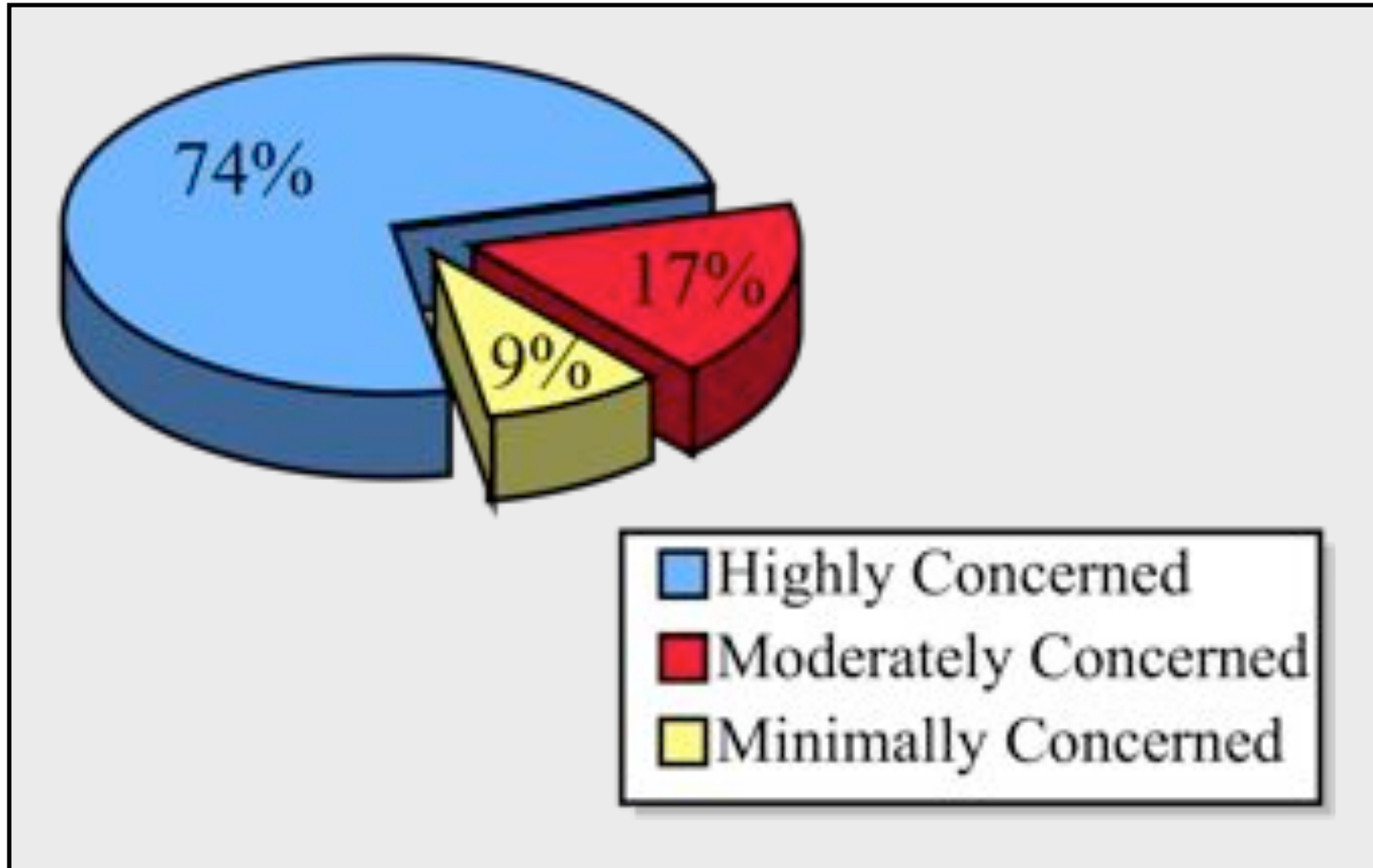
## 3.0 Analysis and Findings



**Figure 3. Perceptions of Climate Change and Impacts**

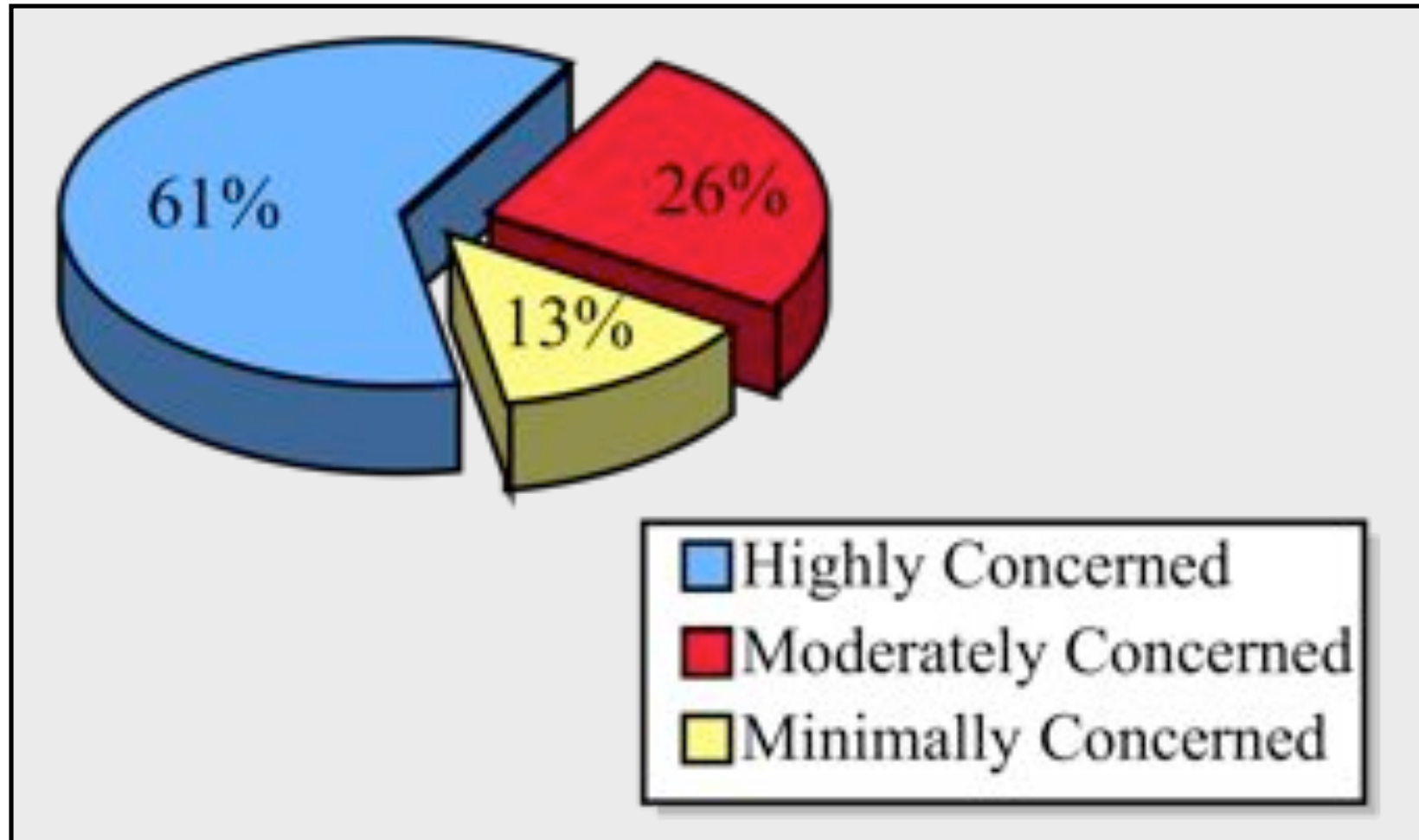


**Figure 4a. Concern About Climate Change  
in the Florida Keys**

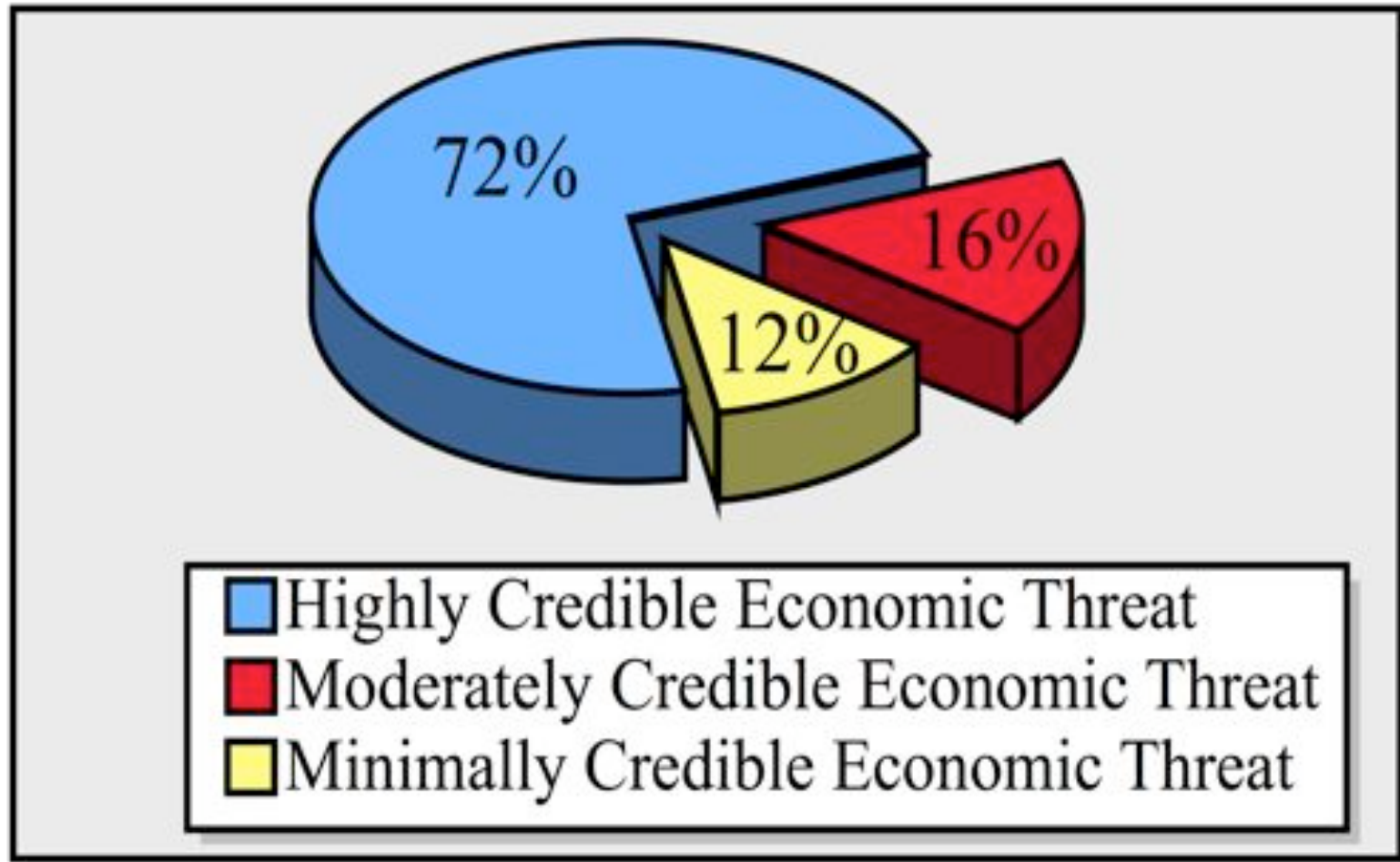




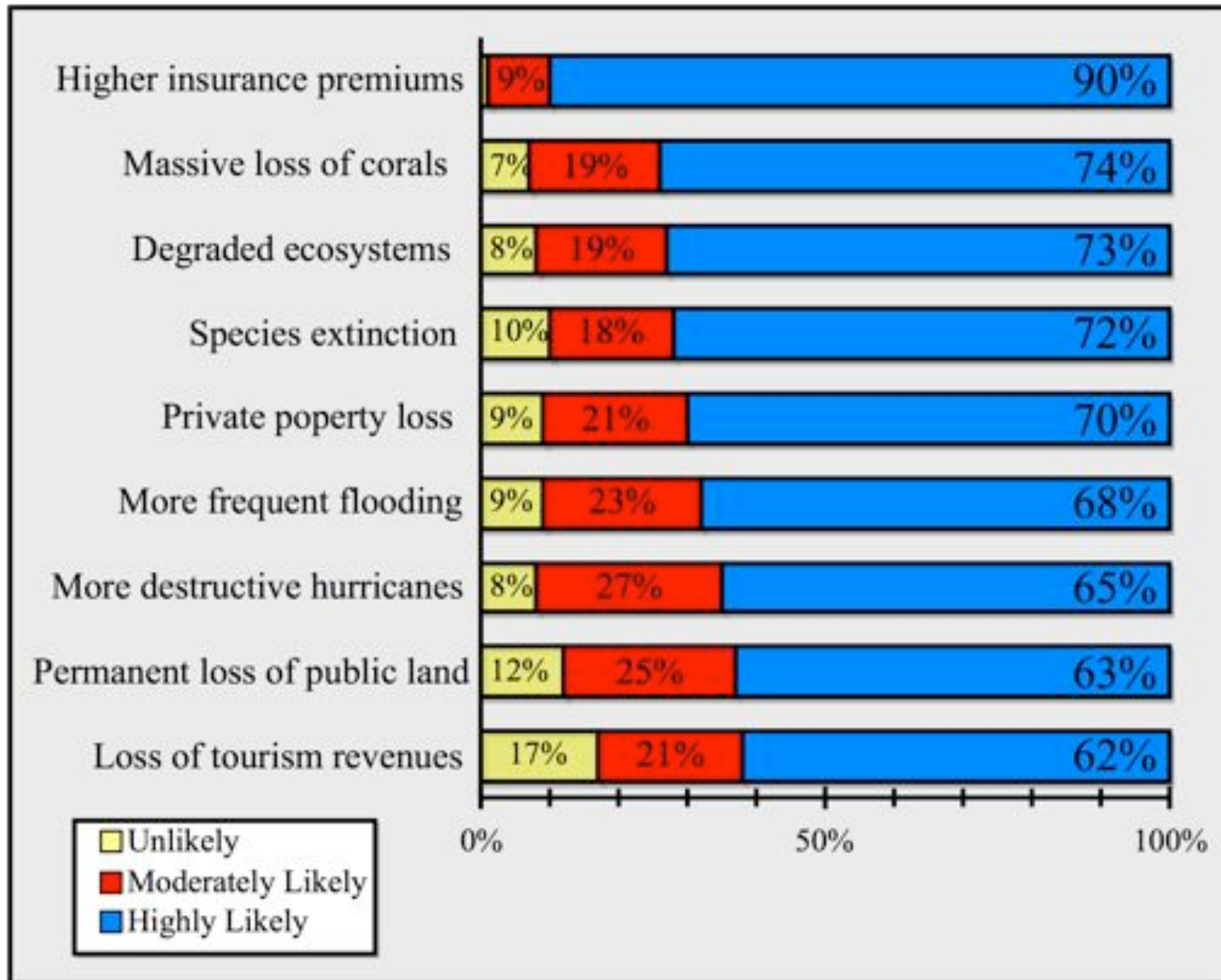
**Figure 4b. Concern About Climate Change Impacts  
on Household Well-Being in the Florida Keys  
(health, finances, property)**



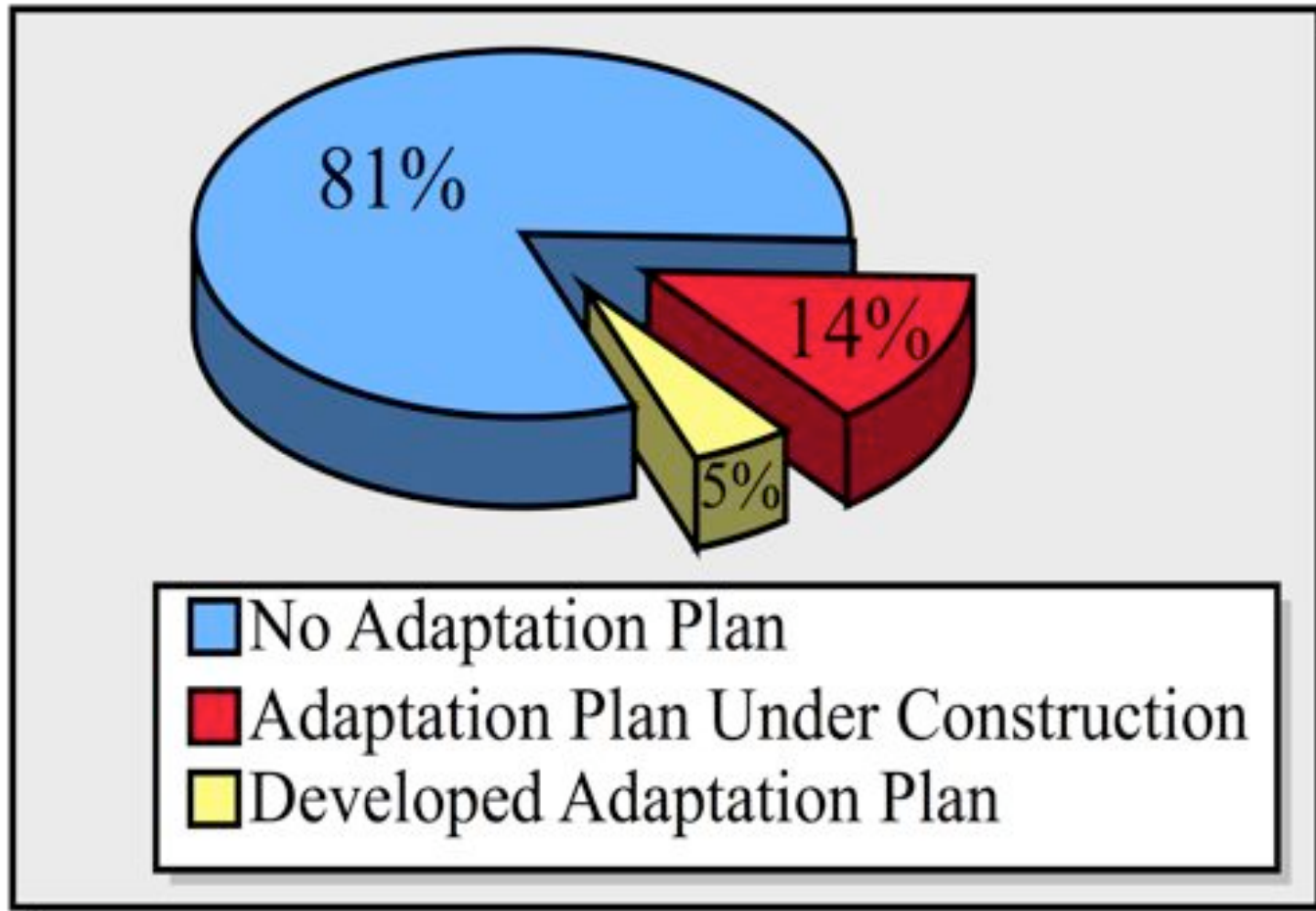
**Figure 5. On the Economic Threat of a Significant Sea-Level Rise in the Florida Keys**



# Figure 6. Perceptions of Climate Change Impacts Projected for the Florida Keys



**Figure 7. Development of a Formal Adaptation-Action Plan in the Florida Keys**



# **A 180° SWING FROM CONCERN TO ACTION**

**As they say on the NYC subway car doors:**

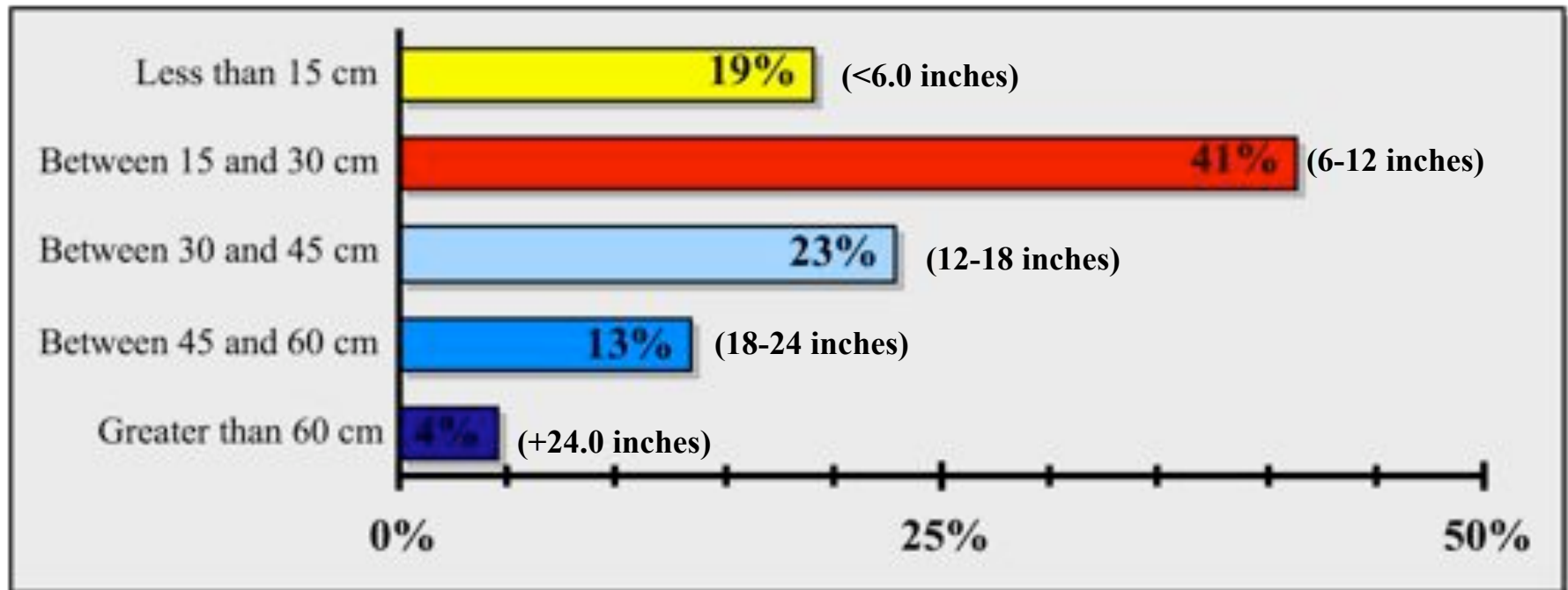
## **Mind the [information-action] Gap!**

**(literally and figuratively...  
conceptually and practically)**



## Figure 8. Awareness of 2050 Sea-Level Rise Projections

**60% significantly underestimate rate!**



**Miami-Dade Task Force Science Committee:**

**“at least 18 inches, possibly more”**

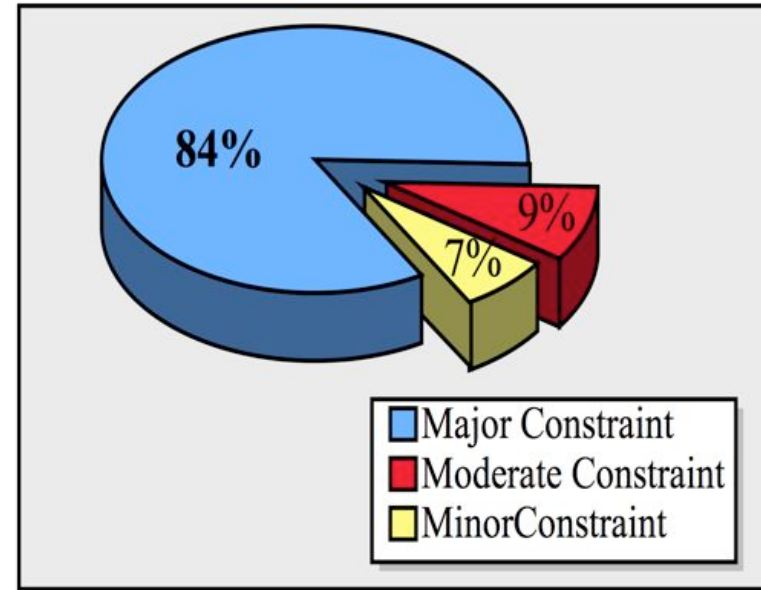
**Peer-review might be closer to**

**12-18 inches**

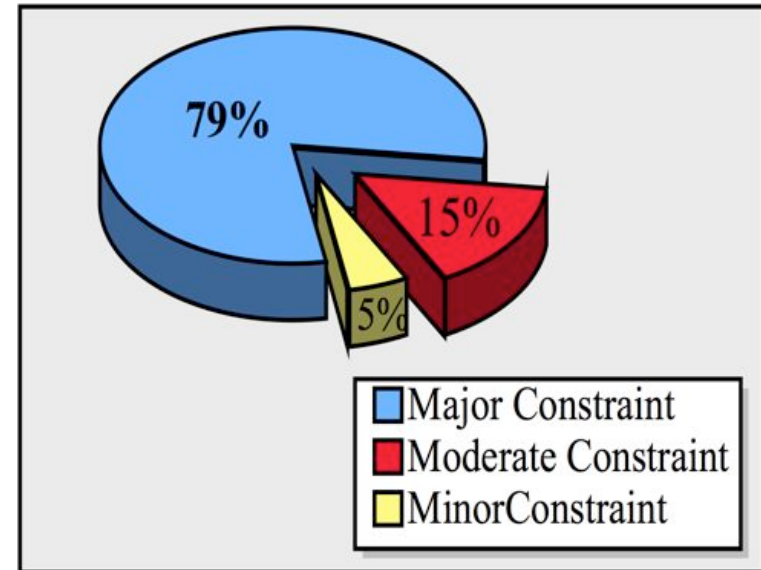
**even so...**

# Figure 9. Barriers to Adaptation in the Florida Keys

## 9a. Insufficient Budget

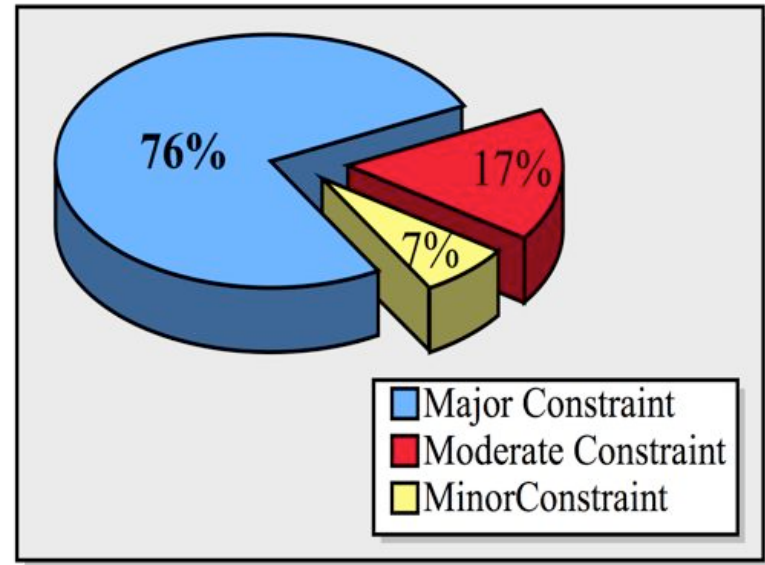


## 9b. Lack of Direction and Leadership

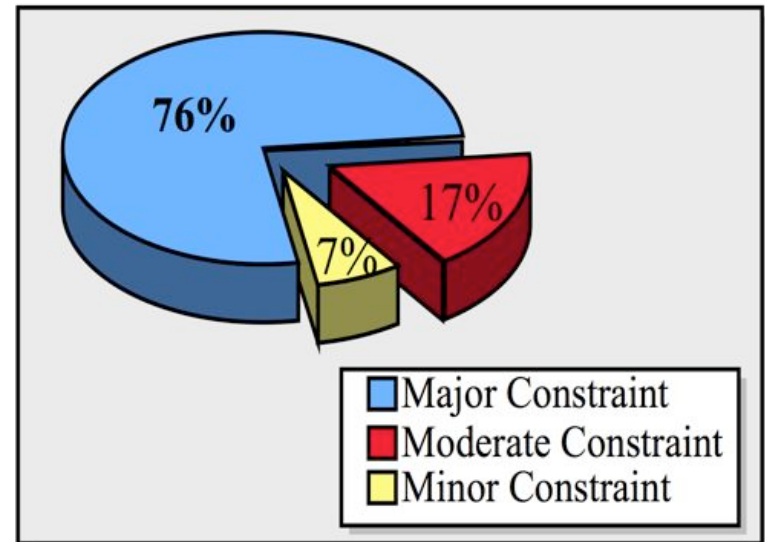


## Barriers to Adaptation (Continued)

### 9c. Insufficient Staff Time & Resources



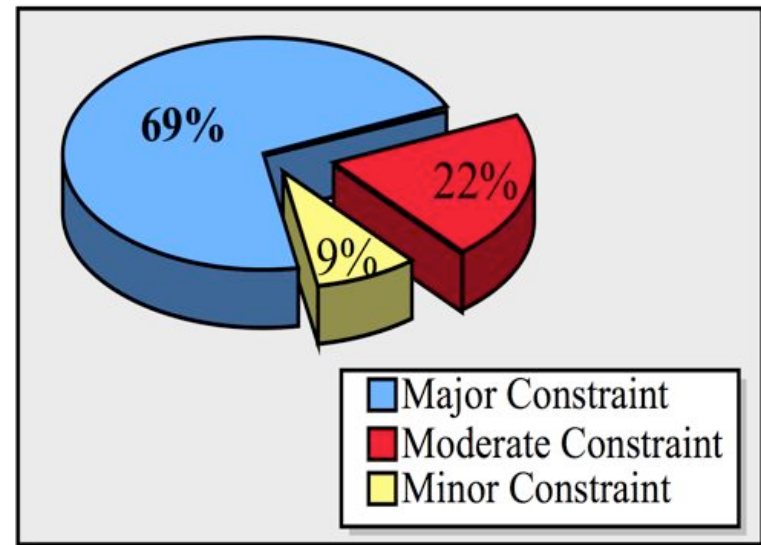
### 9d. Lack of Perceived Importance to Public Officials



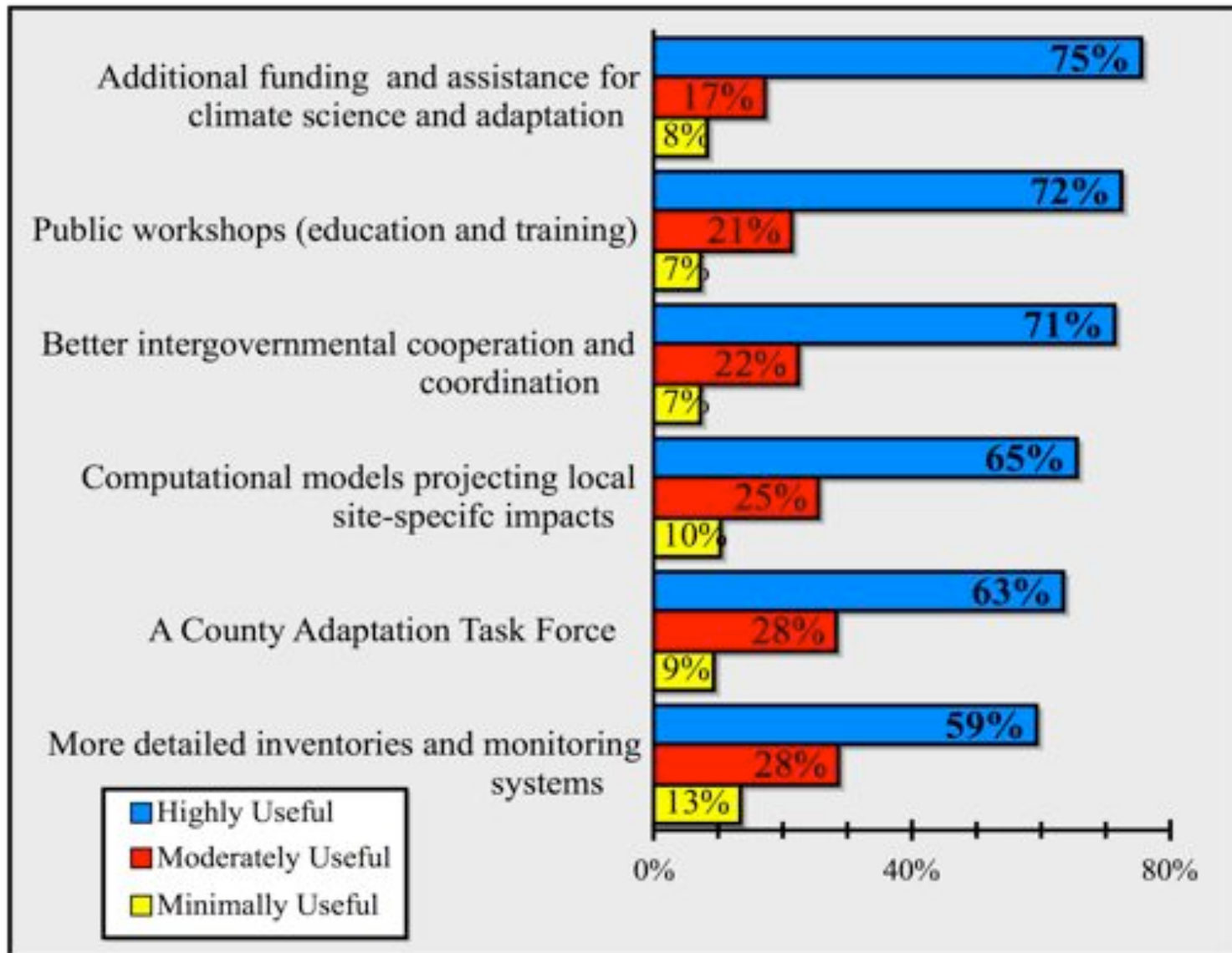


## Barriers to Adaptation (Continued)

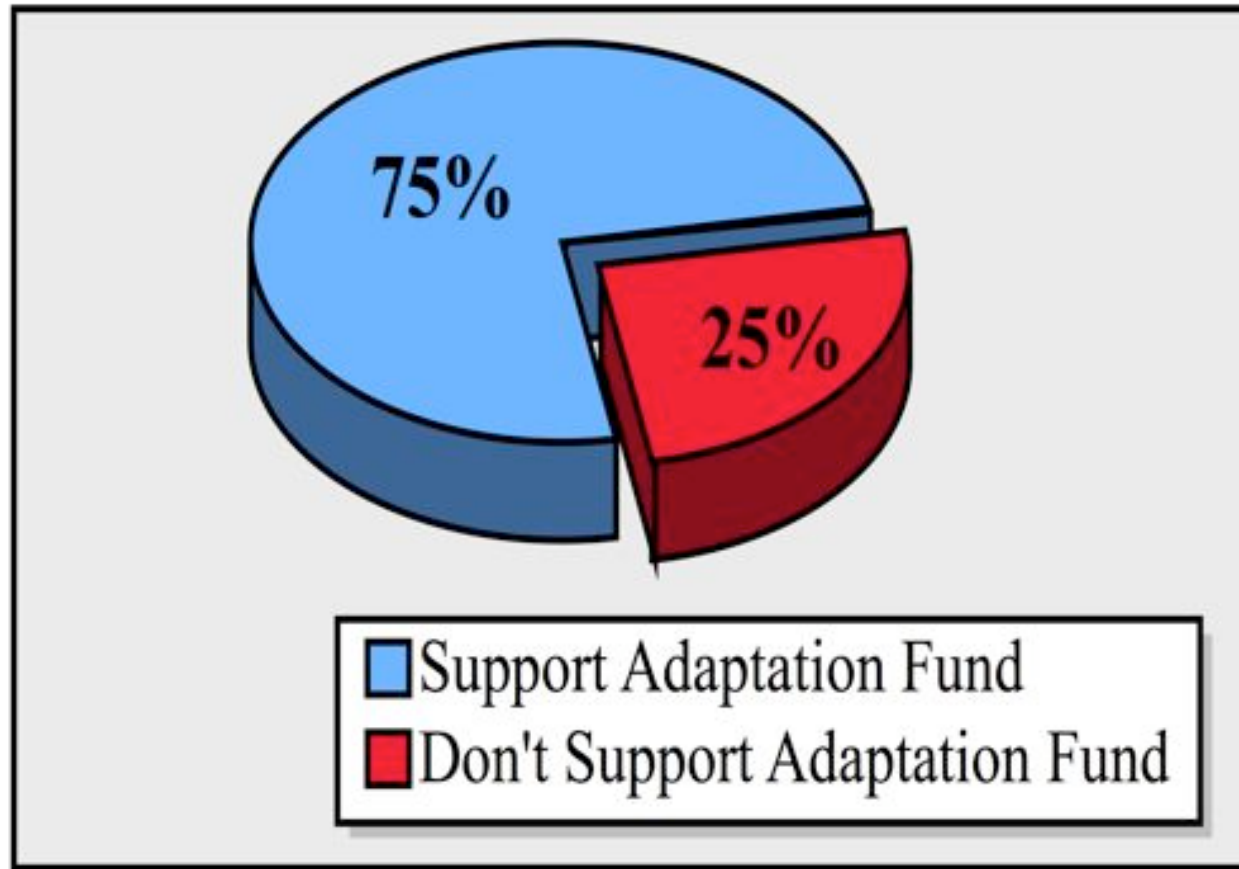
### 9e. Lack of Public Demand for Action



**Figure 10. Resource & Program Needs to Support Adaptation in the Florida Keys**

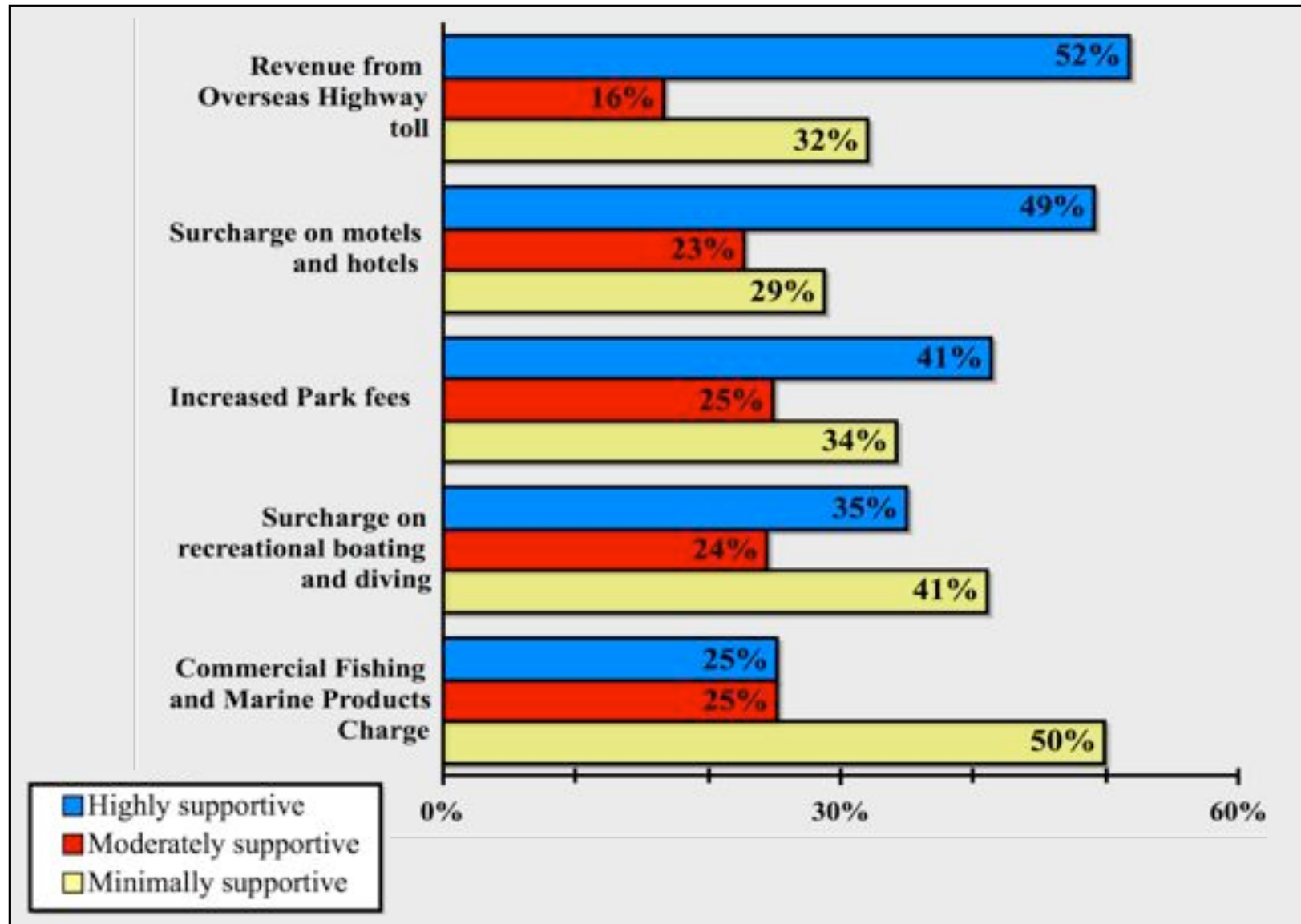


**Figure 11. Willingness to Support a Proposed ‘Community Adaptation Fund’ for the Florida Keys\***



**\*National Adaptation Fund in recently passed House Energy and Security bill..will that be enough?**

**Figure 12. Willingness to Support Proposed Funding Mechanisms to Contribute to ‘Community Adaptation Fund’ for the Florida Keys**



## **4.0 Looking North To Miami-Dade**

**the largest metropolitan area in the SE**

**the fifth largest urban area in the U.S.**

**the third largest skyline in the U.S.**



# **MIAMI-DADE: AMERICA'S GROUND ZERO FOR CLIMATE CHANGE**

**The combination of rapid coastal population growth**

**(increasing development, pollution and environmental degradation),**

**aging and strained infrastructure systems**

**(growing demand multiplied by increasing deterioration),**

**accelerating sea-level rise and extreme hydrometeorological events**

**(increasing storm intensities and more frequent flooding)**

**portends an impending coastal crisis, for which Miami-Dade is not immune.**

**“A collision course of social and sea level trends (Leatherman, 2001).”**

# **AREAS FOR FURTHER RESEARCH TO ADVANCE CLIMATE CHANGE ADAPTATION IN MIAMI-DADE**

- **Integrate the climate change and emergency management communities** via a series of workshops and by establishing a permanent seat(s) at the Task Force, including the State and Federal Government partners.
- **Develop and ‘game’ in-depth scenarios and simulations (i.e., war games),** not just static flood maps of discrete parcel data, but County-wide and detailed case studies (e.g., Downtown, Kendall, Miami Beach, Hialeah, etc.)
- **Study the factors that make the County more or less vulnerable to sea-level rise and extreme events including existing property, development, systems.**
- **Conduct a detailed County-wide Transportation-Climate Change study.**
- **Examine the impacts of climate change on recreation and tourism.**
- **Analyze adaptation options including costs and benefits of proaction compared with potential response and recovery costs from related hazards.**

**WHAT CHANGES OUR PLANET IS CONSCIOUSNESS.  
WHAT CREATES CONSCIOUSNESS IS EDUCATION.**

**- Establish a baseline...Explore risk awareness and adaptation preferences  
within society, among the general public and key stakeholder groups**

- Household awareness and preferences for adaptation.**
- Willingness to support a Dade 'County Adaptation Fund'.**
- Willingness to support specific measures to contribute to the fund.**
- Willingness to support 'Business Contingency Planning options'**

**- Develop an on-going and comprehensive education and outreach plan,  
including bilingual, K-12, University partners, local media, including  
celebrity endorsements/spokespeople, host special events, workshops, etc.**



## **5.0 Discussion and Conclusions**



# **ADAPTATION NEEDS AN INSTITUTIONAL ARCHITECTURE**

**In the face of rising vulnerability, bold new strategies, regulatory mechanisms and institutional arrangements must be pursued to assist coastal communities adapt in a sustainable fashion, including:**

- **Expanded vulnerability and resilience knowledge**
- **Updated decision-making criteria**
- **Organization of long-term decision-support**
- **Development of professional adaptation training**
- **Adaptation of tax, subsidy and insurance policies**
- **Investment in physical and social infrastructure systems (transportation, water)**
- **Adaptation of landuse, zoning laws and building codes**
- **Adaptation of Water Management Practices**
- **Design of public outreach, education and adaptation training initiatives  
(distinct from GHG mitigation programs)**
- **Secure permanent funding**

***Back to basics: Investment in community (ESH)***

# THE CLIMATE CHANGE COMMITMENT: NEAR AND LONG-TERM

“How well we manage long-term environmental risks depends on how well we understand them.

Perceptions regarding how painful their realization would be, what opportunities exist for controlling them, and how costly control would be are critical to the management of long-term risks.

Doing so requires a commitment to humility

(i.e., we experts still have something to learn)

and to democracy

(i.e., the public needs to grow as we do).”

Fischhoff, 1990

**Moral courage, political will, financial and human capital**



# FUNDING SUPPORT

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**Thank You**

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**Questions, Comments, Discussion...**