

Sea level rise adaptive planning

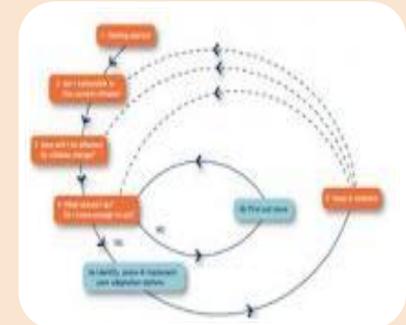
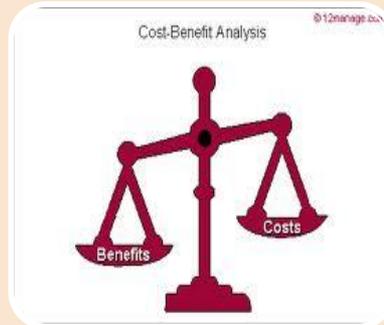
- the economic analysis of adaptive strategies,
- planning-support tool development with NOAA sea level rise reviewer

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May 4th, 2012

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Project Goals



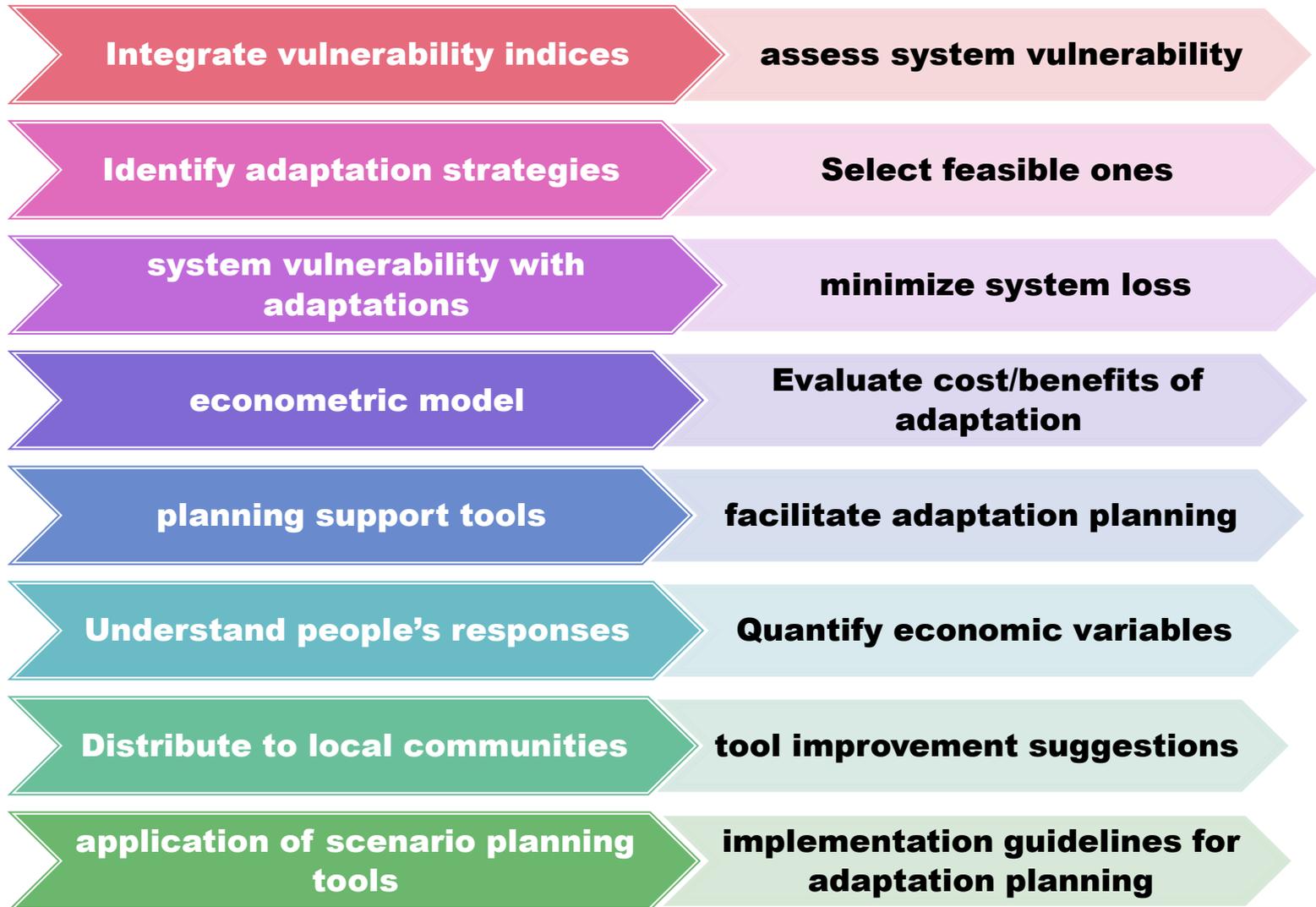
Estimate system vulnerabilities, identify optimal adaptation

Conduct cost-benefit analysis of different adaptation strategies

Establish a policy kit for local planners for adaptation planning

Develop a regional adaptation planning procedure and decision-support tools

objectives



Expected Results

- A adaptation planning procedure
- the procedure and results of cost-benefit analysis of major adaptation strategies.
- Policy toolkit
- Summary of the lessons learned

Report



- Internet GIS based planning support system
- access data and outputs
- incorporate risk and cost-benefit analyses

Web Application



- Understand local residents' response
- Temporal spatial cost benefits analysis of adaptation
- Web-based planning support tool development
- Application of web-GIS in planning process

Research papers



NOAA SLR Impact Viewer



Sea Level Rise and Coastal Flooding Impacts

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Sea Level Rise Confidence Marsh

Vulnerability Flood Frequency

Socioeconomic Vulnerability ?

5 ft SLR

Legend

Water Depth

Disconnected Areas

Number of Businesses

High Med Low

Social Economic

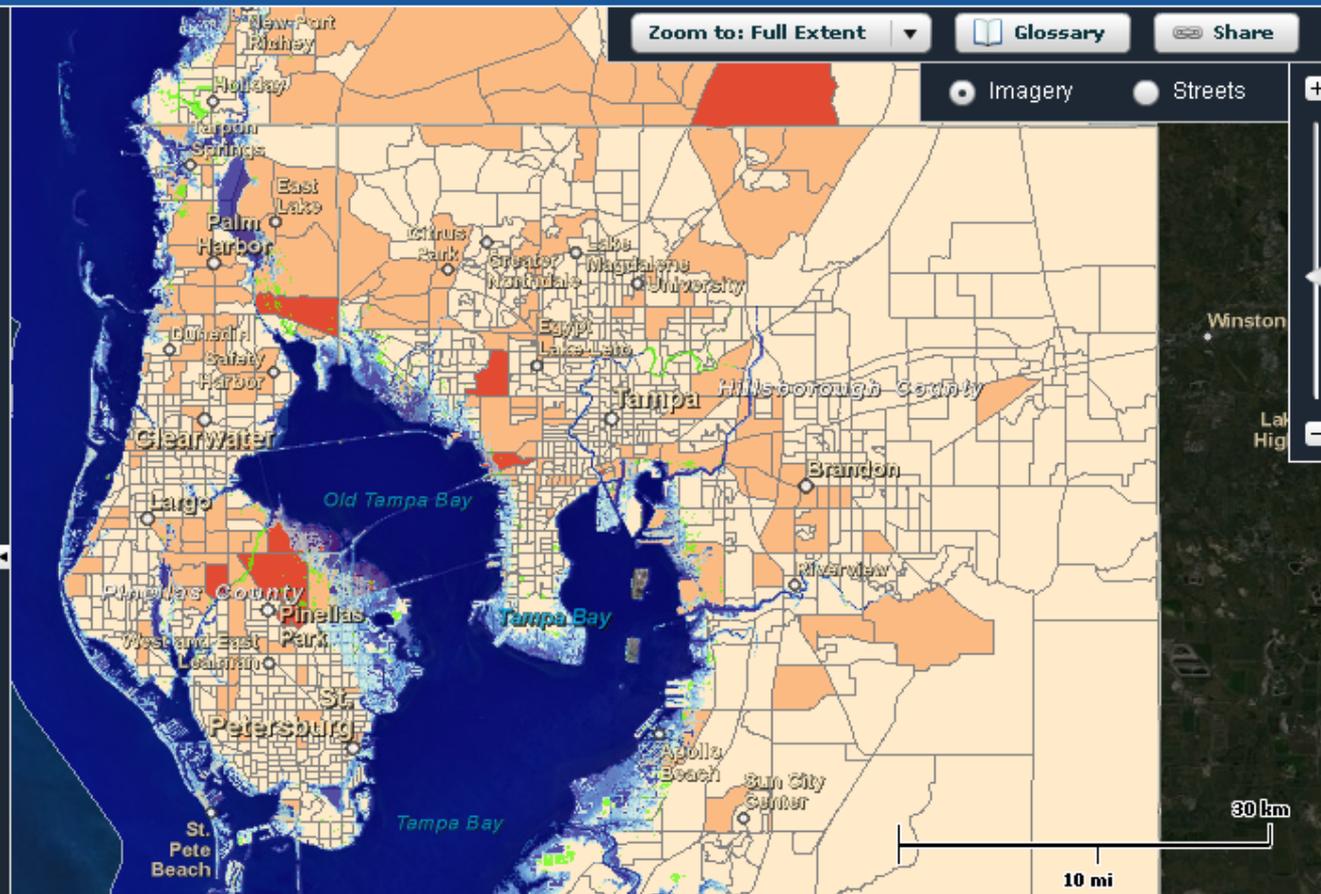
Businesses Employees Wages

Overview

By overlaying social and economic data on a map that depicts sea level rise, a community

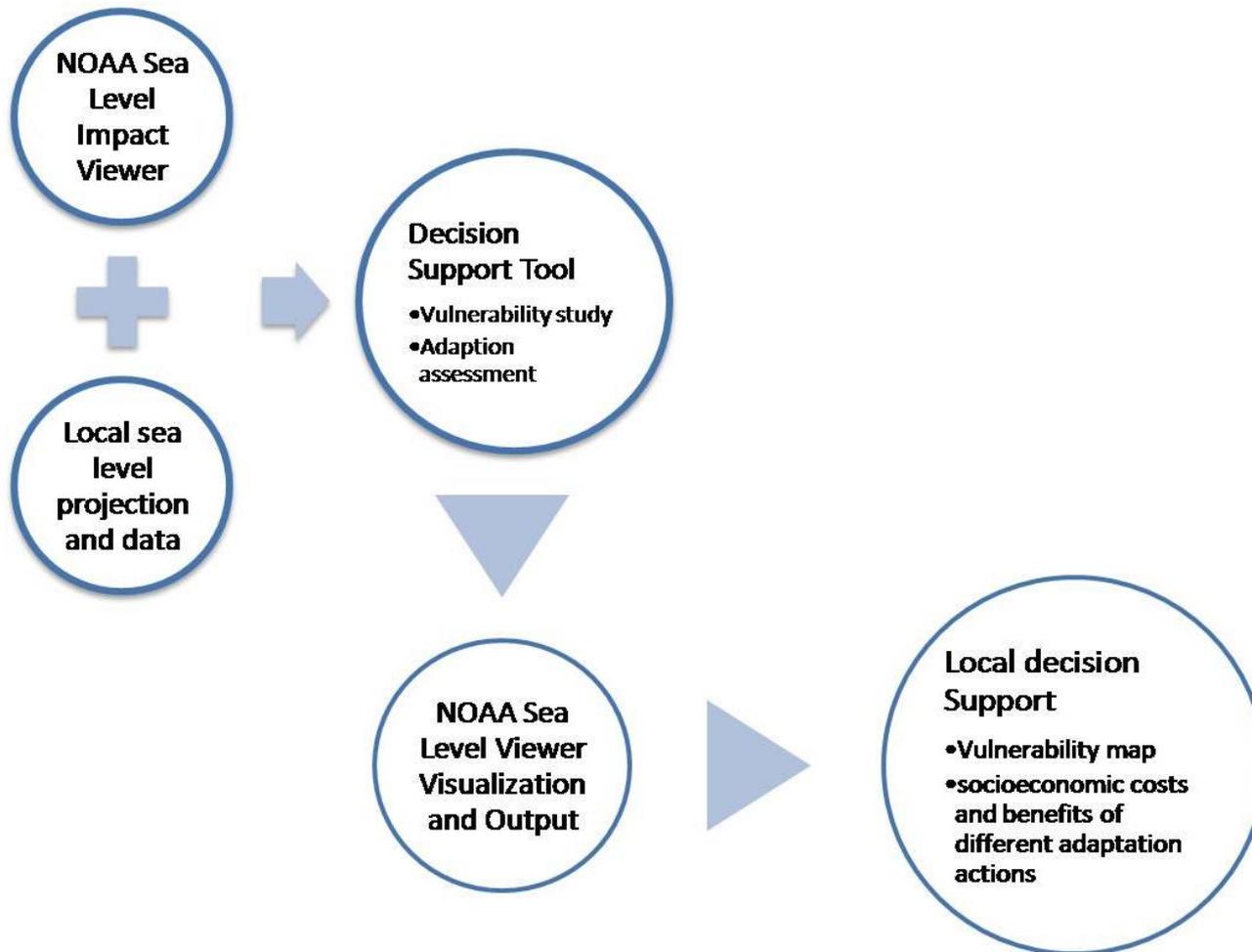
Understanding the Map

Additional Information



<http://www.csc.noaa.gov/slr/viewer/#>

Outreach

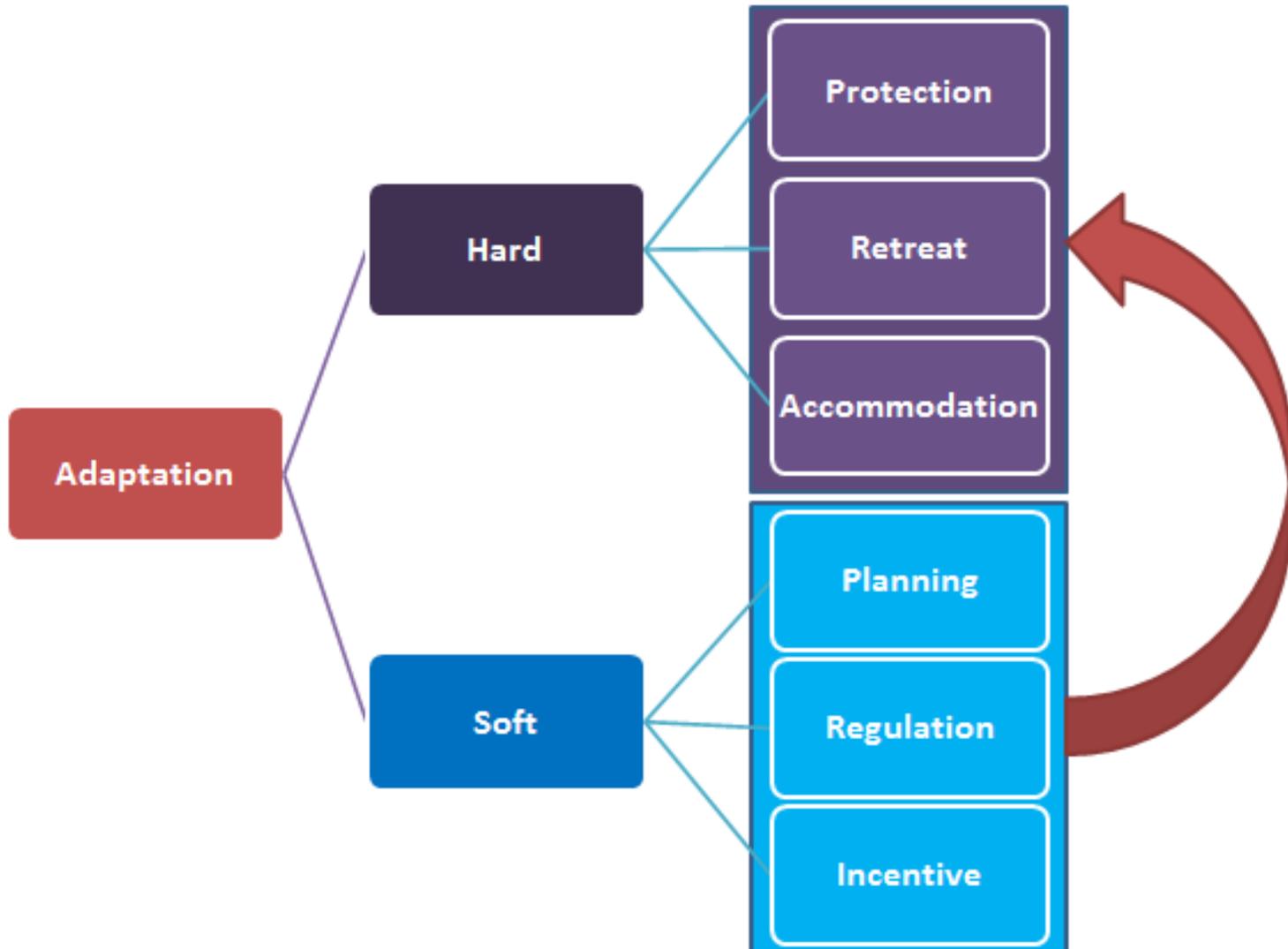


Tampa Bay the Regional Planning Advisory Committee, the Tampa Bay Estuary Program,

Tampa Bay Area Regional Transportation Authority (TBARTA) Land Use Working Group, Agency on Bay Management, ONE BAY Regional Visioning outreach process.

Gulf of Mexico Climate Community of Practice

Sea Level Rise Adaptive Strategies



Major adaptive strategies for analysis

Protection

- Build dikes, seawalls. Etc.
- Build up marsh areas and non-structural- Shore nourishment.

Retreat

- Discourage building new structures.
- Allow beaches and wetlands to naturally migrate inland.
- Land acquisition.

Accommodation

- Elevate buildings.
- Elevate facilities and infrastructures.
- Change building codes and regulations to reduce risk.

Survey Objective— planner/professional

- Obtain suggestion for existing tool
- Determine Internet GIS tool functionality
- Finalize analysis scenarios
- Determine weight of different vulnerability index
- Understand current adaptation practice and research needs

Survey Questionnaire— planner/professional

Sea Level Rise
Perception
and response

Focus Area in
Planning
Practice

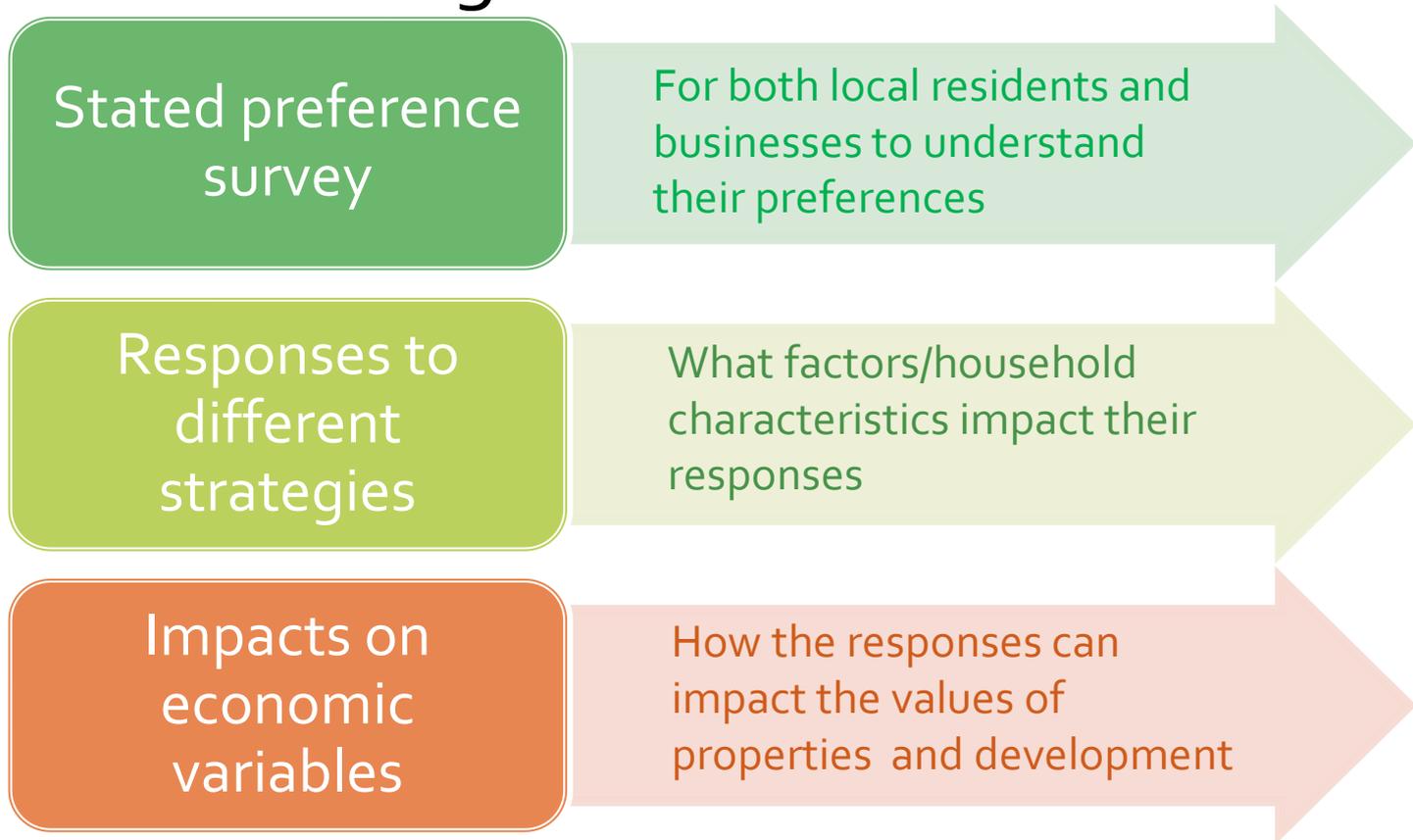
Research
Needs

Adaptation
Plans

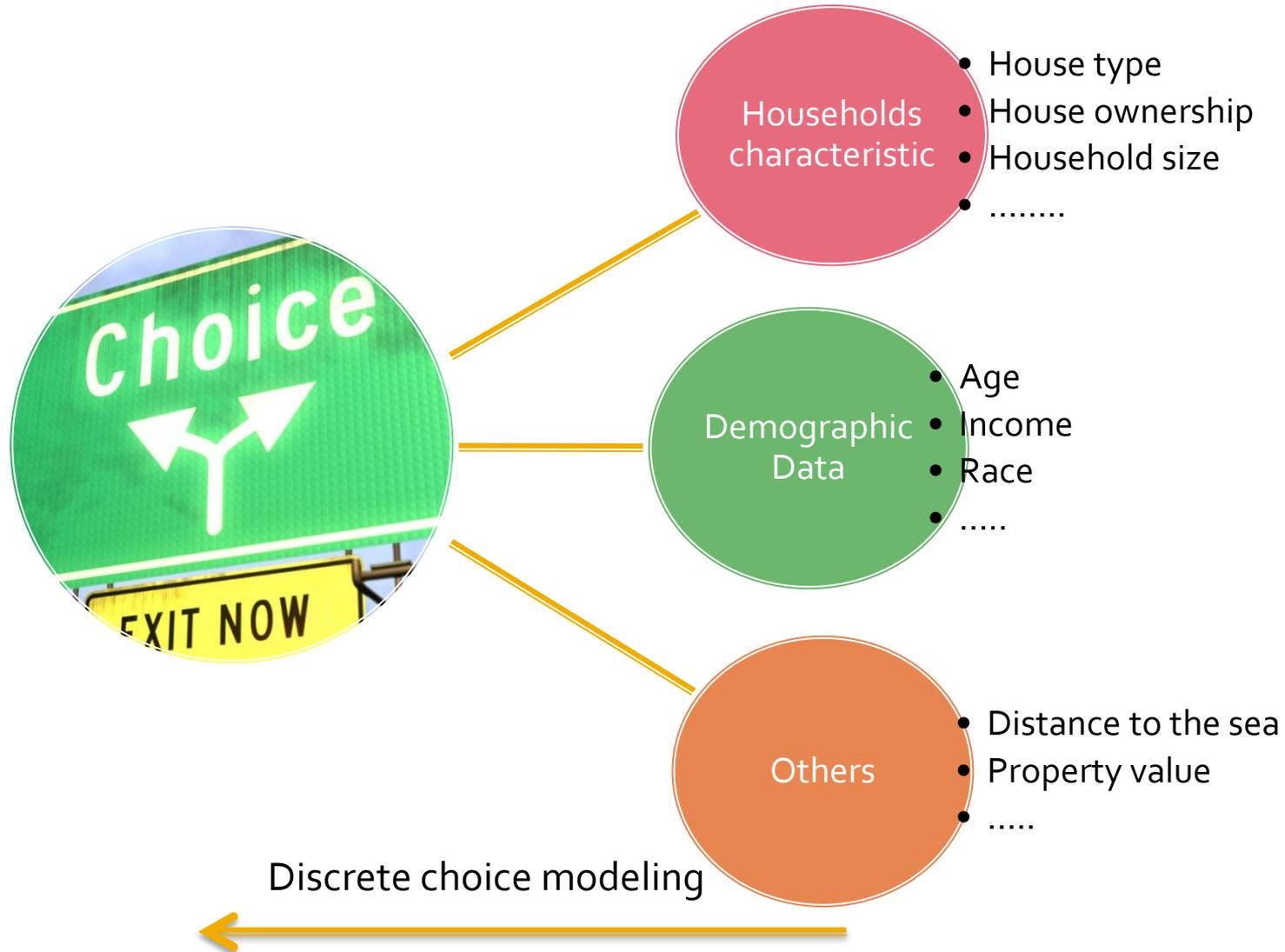
Suggestions
for Sea Level
Rise Viewer

Survey Objective— Residents/businesses

- Estimate residents/businesses responses to different strategies



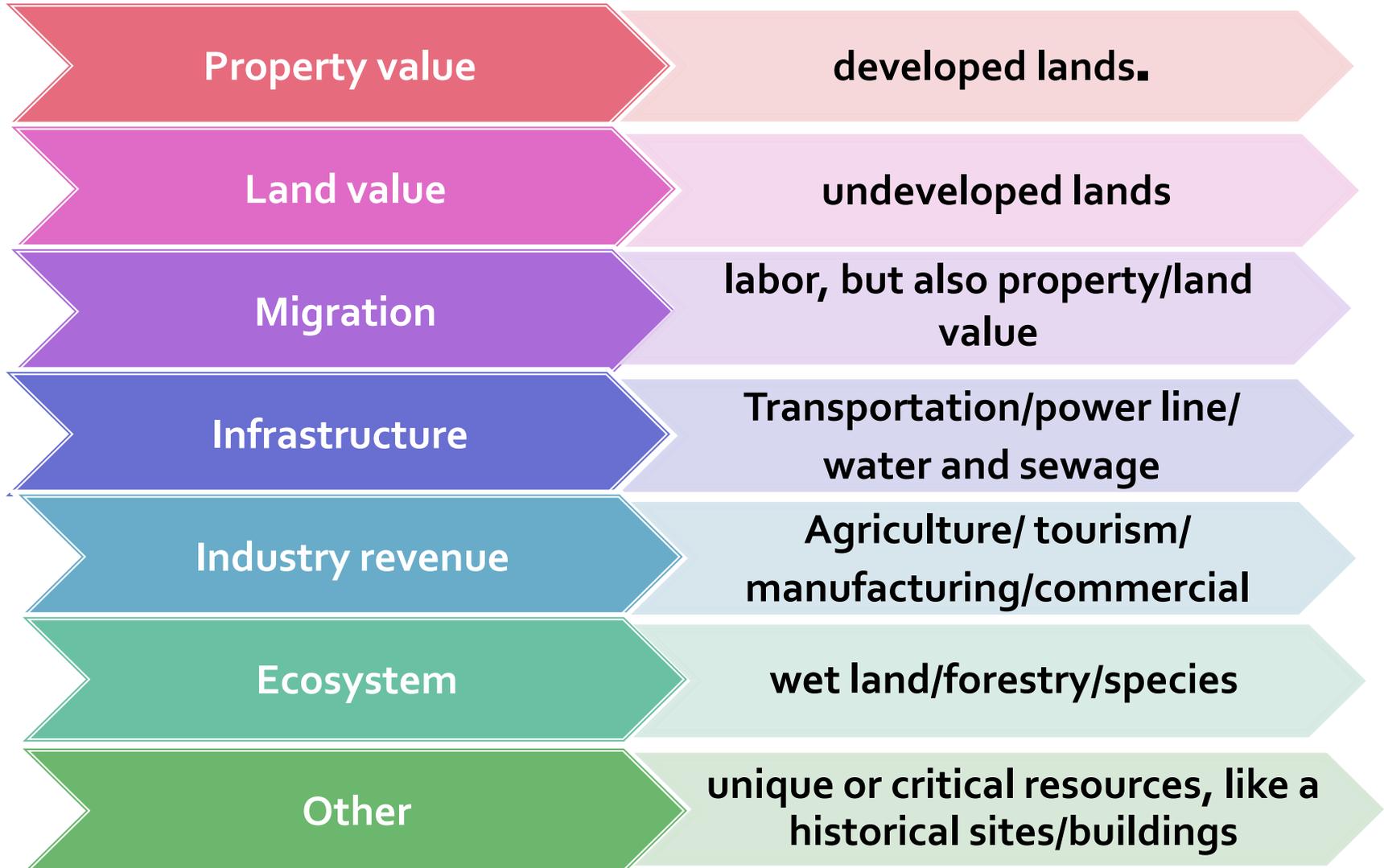
Modeling of survey results



Cost-benefit analysis

- Evaluate the cost-benefit efficiency of each strategy.
- Spatial-temporal econometric model
 - Consider the study area as interdependent rather than isolated.
 - Consider sea level rise as a chronically continuous process.
 - Include both direct and indirect costs.

Major variables



Vulnerability and Impact Assessment Integration

Infrastructure Vulnerability

- Transportation infrastructure
- Petroleum infrastructure
- Hospitals
- Emergency medical service institutions
- ...

Social Vulnerability

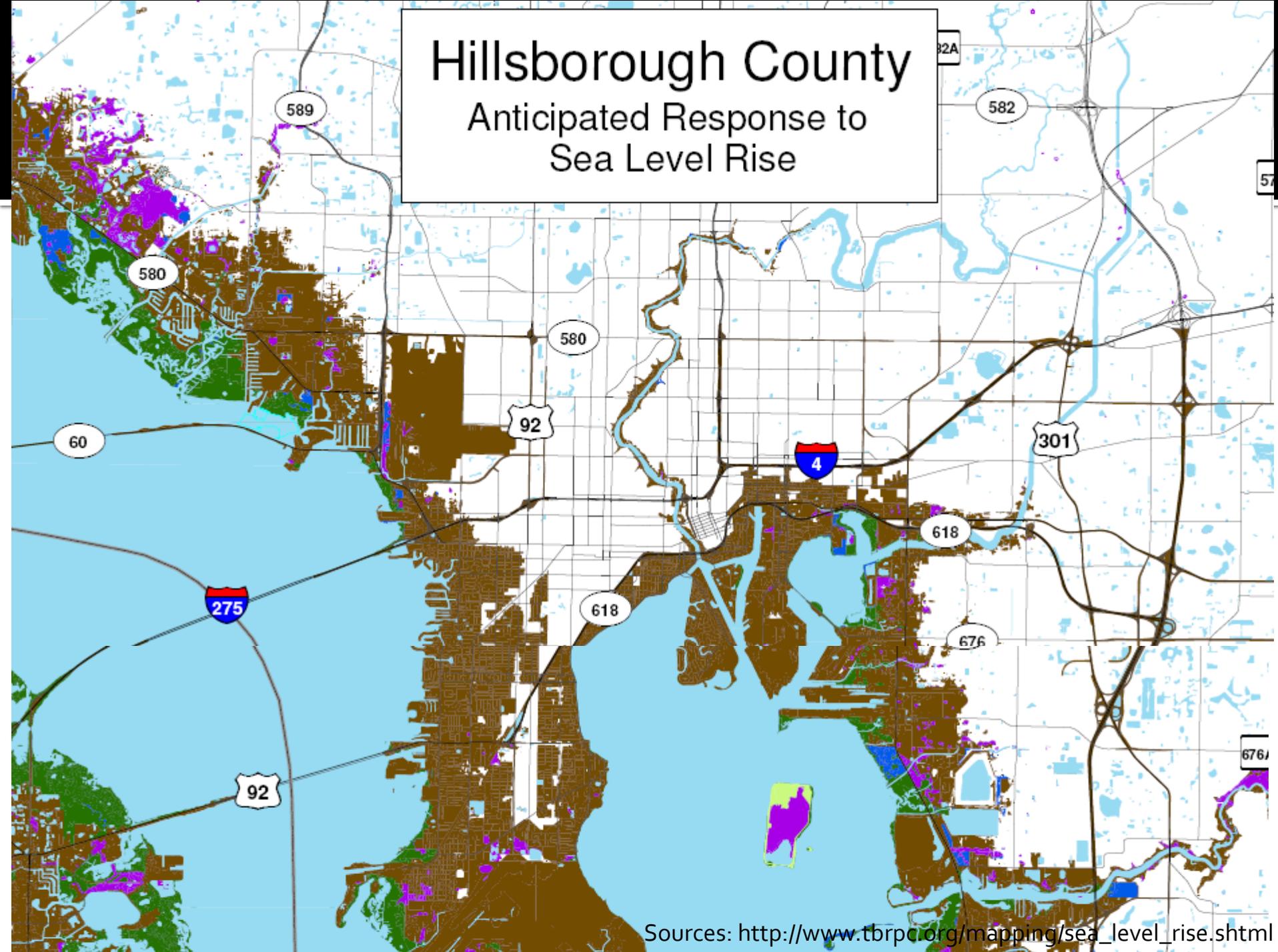
- Population class and poverty
- Age
- Rural, special needs
- Wealth
- Race and gender
- Female
- Service workers
- Ethnicity and unemployment
- migrants

Economic Vulnerability

- Business establishment
- Employment
- Quarterly wages
- ...

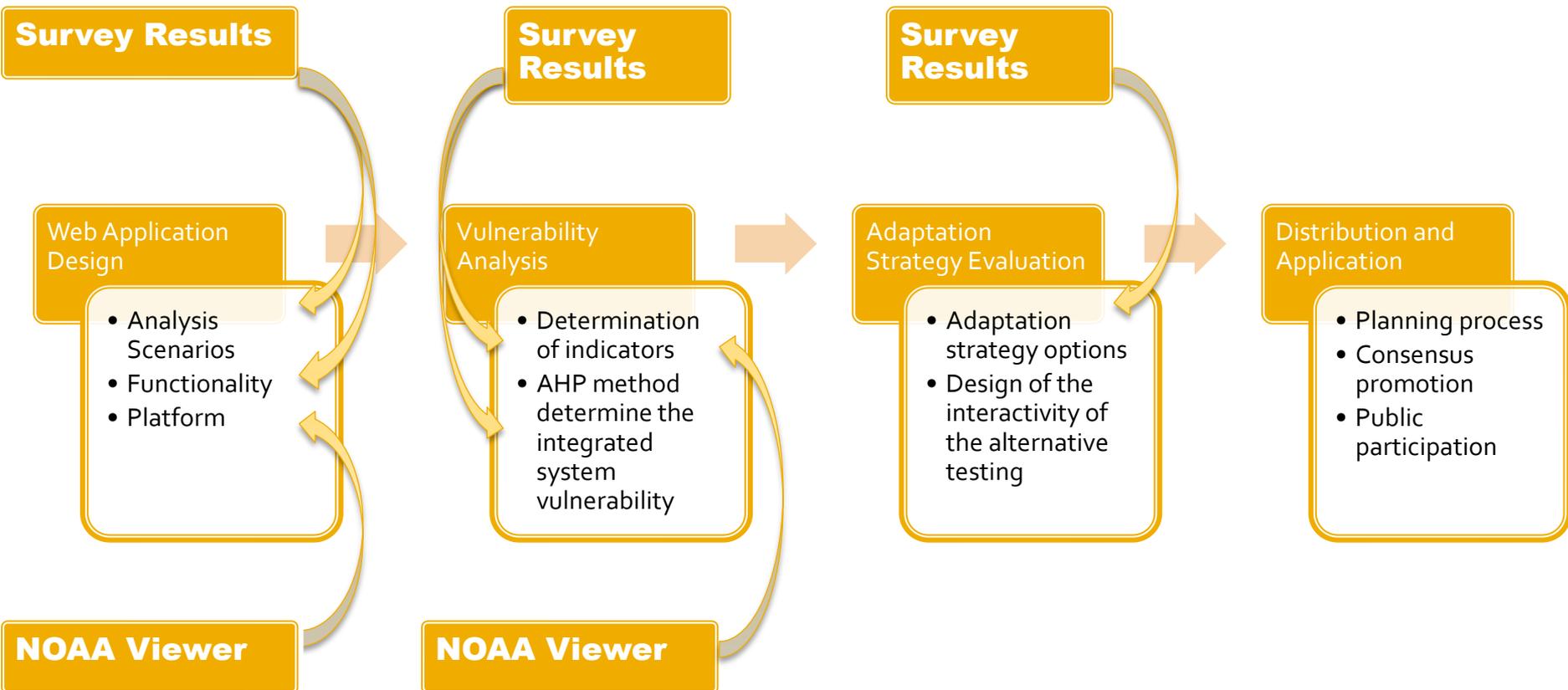
Hillsborough County

Anticipated Response to Sea Level Rise



Sources: http://www.tbrpc.org/mapping/sea_level_rise.shtml

Tool Development Procedure



Tool Development and Application in Participatory Planning

- Web based public participatory system (WPPS) functions

Exploration

Evaluation

Scenario building

Forum

Tool Interface: An example

The screenshot shows a web browser window displaying the NOAA Sea Level Rise and Coastal Flooding Impacts tool. The browser address bar shows the URL <http://www.csc.noaa.gov/slr/view>. The page title is "Sea Level Rise and Coastal Flooding Impacts" and the organization is the "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION".

The interface includes a navigation menu with "Sea Level Rise", "Confidence", and "Marsh". Below this are "Vulnerability" and "Flood Frequency" tabs. A "Sea Level Rise" slider is set to "Current MHHW". An "Address Finder" section has input fields for "Street:", "City:", "State:", and "Zip:", with a "Map It" button.

The "Overview" section features a table and a bar chart. The table shows the following data:

Bay Area:	Estimated Acreage in 2000	Estimated Acreage in 2100	Percent Change
	13,050	14,490	+10%

The bar chart shows two bars: a blue bar representing 13,050 acres and a yellow bar representing 14,490 acres.

The main map displays the Tampa Bay area with various locations marked. Two pop-up windows for "New Port Richey Entrance" are visible, each containing a photo of a building and the text: "Use the slider to view a simulation of sea level rise at this location."

On the right side, there is an "Adaption" panel with three options:

- Build a sea wall
- Planned retreat
- Rezoning

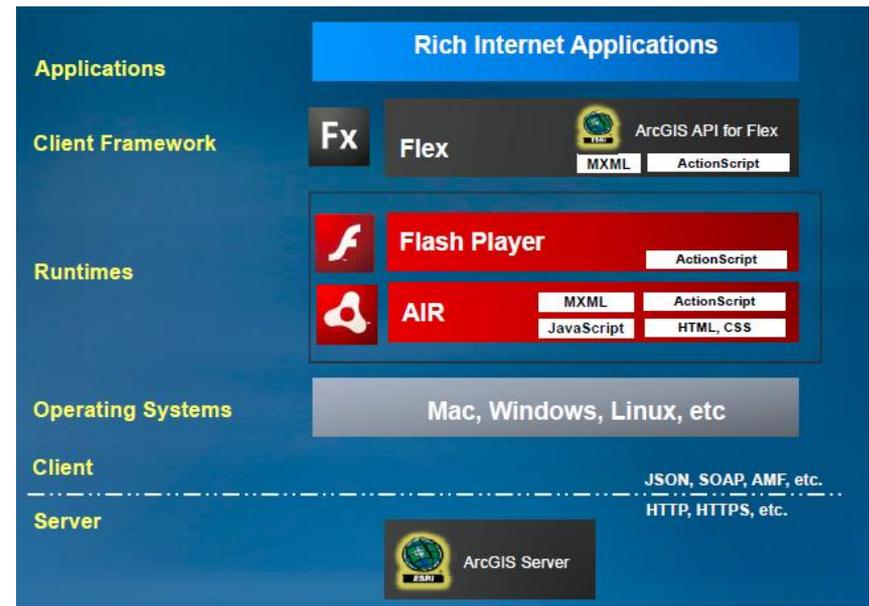
The footer contains the following text: "United States Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service" and "Contact Us | Privacy Policy | Link Disclaimer | USA.gov".

Tool Developer Platforms

- Google Map API + ArcGIS Extension for the Google Maps API
 - If audience knows how to use Google Maps
 - If the audience like the look and feel of the Google base maps
 - Different interface from NOAA Viewer
 - Special requirement for map services
- Example
 - http://help.arcgis.com/EN/webapi/javascript/gmaps/samples/utilities/util_measurepoly.html

Tool Developer Platforms

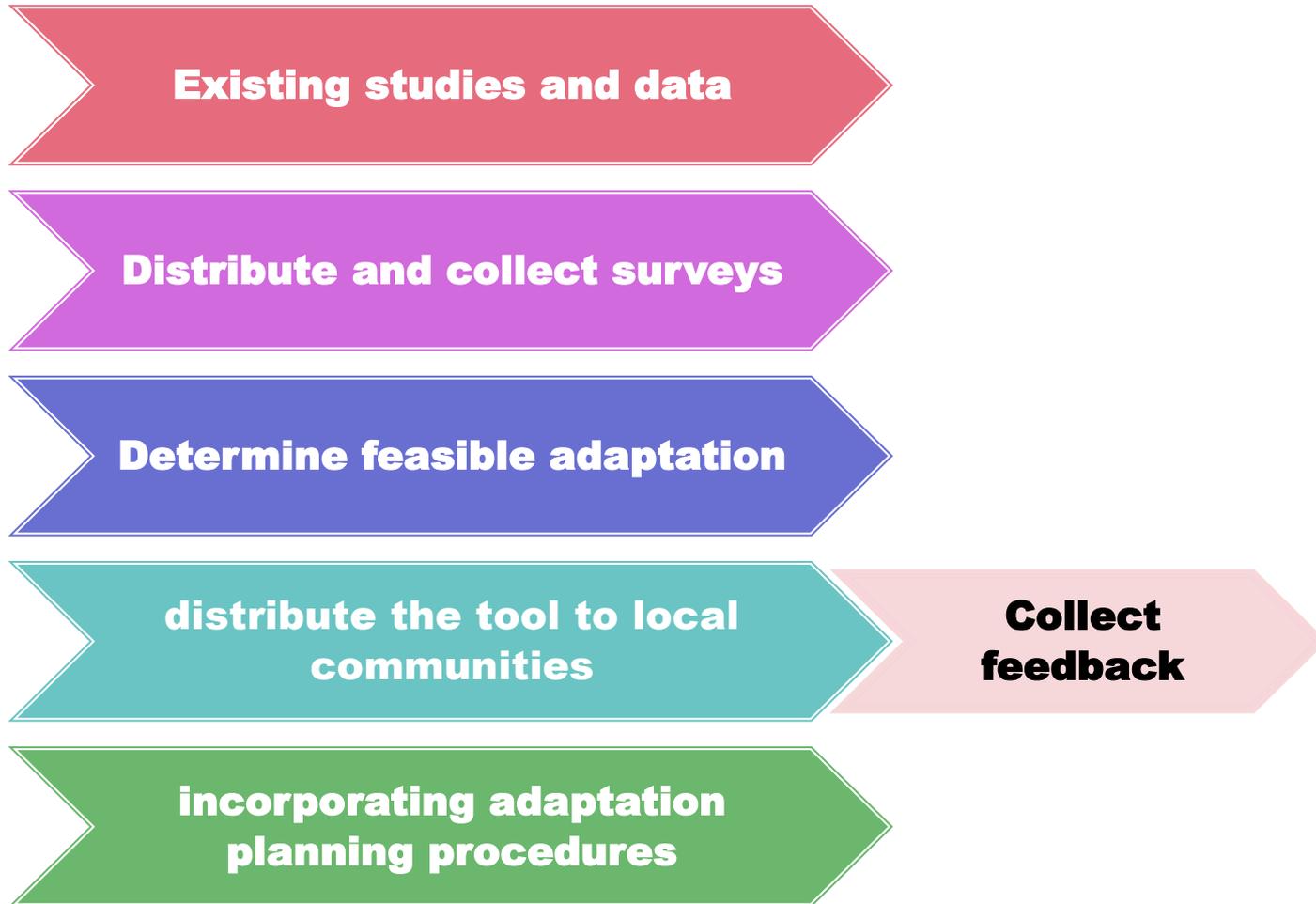
- ArcGIS API for Flex + Adobe Flash Builder 4
 - dynamic rich Internet applications
 - Example
 - <http://gis.calhouncounty.org/FlexViewer2.5/index.html?config=config-eSearch.xml&search=2&slayer=4&exprnum=0>



Further Steps

- Complete survey and analyze survey results
- Collect data
- Develop econometric model
- Develop system vulnerability index
- System Framework Design
 - User interface design
 - Analysis components design
 - Map server functions design
 - Database management design
 - Data sharing and communication design
- Design methodology to analyze the effectiveness of web based planning support system

What do we need



Thank you
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