4.

Preliminary Draft
Climate Change, Sustainability & Technology
December 19, 2006

Forecasts for Climate Change Impacts on Florida and Emerging Technologies to Reduce Greenhouse Gas Emissions

For

The Century Commission for a Sustainable Florida

By

The Institute for Alternative Futures

Preliminary Draft
Climate Change, Sustainability & Technology
December 19, 2006

Forecasts for Climate Change Impacts on Florida and Emerging Technologies to Reduce Greenhouse Gas Emissions

This preliminary report provides an overview of 1) potential impacts of climate change on Florida and 2) technologies essential for dealing with climate change that also hold the promise of being good for business and the economy, and good for the quality of life in Florida.

This preliminary version focuses on climate change impacts. The suggestions for improvement that emerge from reviews of this draft will be incorporated into the final version. It also includes one-paragraph descriptions of the technologies that will be covered in the final report. These technologies emerged from IAF's scan of emerging technologies as most important for responding to climate change without damaging Florida's economy.

Topic Areas	Technologies
Energy	- Solar – Photovoltaics - Biofuels - Advanced Coal Technologies with Carbon Sequestration - Fuel Cells/ Hydrogen
Transportation	- Hypercars - Smart Public Transit
Housing	- Green Development - Low-cost Housing
Industry/ Economic Development	- Green Manufacturing - Precision Agriculture
Environment	- Earth Systems Engineering

The final version of this report will include an introduction and summary, a review of probable impacts of climate change in Florida between now and 2100, and 1-2 page descriptions of these technologies. The descriptions will include a review of their present status, 10-year forecasts, and more speculative 50-year forecasts of how they could evolve over time and influence Florida's future.

Approach of this Report in Relation to the Commission's Approach

The Century Commission for a Sustainable Florida is charged to:

> *…envision a future of Florida; develop a shared image of our developed and natural areas; focus on essential state interests; serve as a repository for ideas; and, develop a report annually. The report is to make recommendations for addressing growth management, discuss the need for inter-governmental cooperation, balance environmental protection with future development, and make recommendations on issues, including dedicated resources for funding of infrastructure, environmental, and educational needs.*

In its first report, the Commission notes that one function of its work is to "force us to think about things we would rather not think about. It might involve some sacrifice and it might step on some toes." It has developed several operating principles, among which are commitments to:

1) think long-term and statewide without getting caught up in today's controversies,
2) focus on solutions, not blame,
3) make recommendations based on factual data,
4) gather existing knowledge where available, whether from people or completed studies,
5) explore fundamental changes

In developing this report, the Institute for Alternative Futures has tried to adopt the same approach as the Commission, following the same operating principles, being willing to think about potentially distressing things, but ultimately working to envision a positive future for Florida. We set out to identify technologies that would be important for sustainability over the next 50 years in Florida. We were asked to focus on what is almost certainly the most important trend affecting Florida's sustainability, namely climate change, and to focus on identifying technologies essential for dealing with the climate challenge that also *hold the promise of being good for business and the economy, and good for the quality of life in Florida.*

We believe that the fundamental scientific, technical and industrial know-how to solve the climate problem for the next 50 years either already exists or is easily in reach. Changes in behavior can play a part in meeting the climate challenge, but technological change to use energy and other resources much more efficiently is by far the biggest element of the climate solution. The technical changes needed to stabilize the climate are much larger than most people realize, but they are feasible and taken together constitute a Next Industrial Revolution that will take us to a far more advanced technology.

Florida obviously cannot stop climate change by its own actions. The State does have the opportunity, however, to join more actively with other states and cities to promote the technological progress that can slow and eventually reverse global warming. Given the extensive negative impacts climate change is likely to have on the state, Florida has every incentive to play a leadership role in moving forward into the Next Industrial Revolution.

Climate Change: Florida's Greatest Sustainability Challenge

There is no longer any serious doubt that global warming is occurring and is being driven largely by human activity. The uncertainties and debates now center on how severe the impacts will be, how rapidly they could unfold, and what to do to minimize them. The Intergovernmental Panel on Climate Change estimates that between now and 2100 the Earth's average surface temperature will increase by 4 to 10 degrees F. and sea level will rise by from 8 inches to over 2.9 feet[1], with some scientists estimating a rise by as much as five feet[2].

Even at the midrange of these estimates, climate change stands out as the most serious long-term threat to Florida's economic, environmental and social sustainability. Many changes consistent with early stages of climate change have already been observed in

1 Leatherman, S.P., Zhang, K., and Douglas, B.C. (2000) "Sea Level Rise Shown to Drive Coastal Erosion," in *EOS Transactions*, American Geophysical Union, 81: 55–57.

2 Sea change coming for Everglades. *USA TODAY*. May 31, 2006

Florida, including erosion of shorelines, salt water intrusion into freshwater aquifers, increased forest fires, dying coral reefs, and warmer air and sea temperatures[3]. The potential range of impacts that climate change could ultimately have on Florida has been fairly well documented, but there are still uncertainties about their timing and magnitude.

No matter how severely the effects of global warming ultimately manifest themselves, Florida's latitude, low-lying geographic profile and peninsular geography with extensive coastlines ensure that it will shoulder a highly disproportionate share of the climate-related costs imposed on the U.S. Understanding this creates an incentive for Florida to be a leader and model in the adoption of technologies that can dramatically reduce greenhouse gas emissions and minimize damages from climate change.

Impacts on Tourism

Tourism is likely to be hit harder by climate change than any other sector of Florida's economy. Over the century ahead, the state's famous beaches will be eroded by sea level rise and many ocean-front hotels and homes will be flooded. In the lowest areas, a thirty inch increase in sea level would translate into a horizontal movement of the oceanfront by as much as 400 feet[4]. Roughly 30 percent of Florida's ocean beaches and two-thirds of its estuarine beaches would disappear[5].

Despite the small regional cooling currently taking place in the southeastern U.S., rising temperatures will make Florida more unpleasant for more of the year. The projected increase in the summer heat index of 8 to 15 degrees F. by the end of the century will be the highest increase in the nation[6].

Sea level rise and hotter temperatures will degrade all the coastal ecosystems that make Florida such a unique and appealing tourist destination. The lower Everglades could be completely inundated by 2100. Saltwater fishing and sport diving could nearly disappear as ocean warming causes Florida's coral reefs to die off.

Impacts on Urban Areas

With over 15 million of Florida's 16 million residents living and working within 35 miles of the coast[7], sea level rise impacts on urban areas are a key concern. Miami Beach, Pensacola, St. Petersburg, Tampa and other densely populated areas near the ocean will face enormous expenditures for elevating areas, building sea walls and other flood control structures, and encouraging relocation.

As sea level rises, storm surges from hurricanes and northeasters will cause more flooding because they will come in from a higher base of water. A FEMA report to

---

3 Natural Resource Defense Council. (2001) *Feeling the Heat in Florida*.

4 Leatherman, S.P., Zhang, K., and Douglas, B.C. (2000) "Sea Level Rise Shown to Drive Coastal Erosion," in *EOS Transactions*, American Geophysical Union, 81: 55–57.

5 The National Wildlife Federation & The Florida Wildlife Federation (2006) *An Unfavorable Tide: Global Warming, Costal Habitats and Sportfishing in Florida*. Retrieved November 22 from: http://www.nwf.org/nwfwebadmin/binaryVault/An_Unfavorable_Tide_Report.pdf

6 The heat index measures the perceived temperature to the human body based on both air temperature and the amount of moisture in the air.

7 U.S. Census Bureau (2000). Retrieved November 30, 2006 from: http://quickfacts.census.gov/qfd/states/12000.html

Congress estimates that with a 1-foot rise in sea level, annual damages to existing development in the U.S. Coastal Zone would increase by 36-58 percent, and a 3-foot rise would cause up to a 200 percent increase in annual damages[8]. Climate change impacts are fast becoming a central concern within the insurance industry and areas subject to damages can expect sharply rising rates or even refusal of coverage[9].

Hurricanes

Warming of the ocean will increase tropical hurricane intensity. This could be very significant by the end of the century, but over the next several decades the effects of climate change will be small compared to other cyclical weather patterns, which are also expected to intensify hurricanes. Fortunately, global warming is not expected to increase the number of hurricanes[10]. Thus, there will be more hurricanes in the future because of factors other than global warming. But global warming effects, particularly higher ocean surface temperatures, will lead to more severe hurricanes.

Impacts on Agriculture and Citrus Growing

The best current estimate is that over the coming century climate change will make it impossible for about half of the American land to sustain the types of plants now on that land[11]. In Florida, agriculture could actually benefit for several decades from increased carbon dioxide in the atmosphere and a modest amount of warming. Warming could also protect citrus crops from freezing. But if the average temperature increases beyond 3 to 4 degrees F., farmers and growers will face declining yields from that point on[12].

The key uncertainty is rainfall. Some climate models forecast reductions in precipitation which would limit crop growth by decreasing soil moisture and water availability, but other models predict increases in precipitation. Whether rainfall decreases or increases, it is expected to come increasingly in the form of more intense downpours followed by longer periods of drought[13].

Impacts on Water Resources

Heavy rains and extended periods of drought make it more difficult for water managers to provide reliable water supplies, control flooding, and protect natural areas. Shallow coastal aquifers will be increasingly at risk from salt water intrusion. For example, the Biscayne aquifer, a primary water source for all of South Florida, is recharged by the freshwater Everglades. As rising water levels submerge low-lying areas of the Everglades, growing areas of that aquifer will be infiltrated[14].

---

8 Environmental Protection Agency. Costal Zones and Sea Level Rise. Retrieved November 20, 2006 from: http://www.epa.gov/climatechange/effects/coastal/index.html

9 Joel Garreau, "A Dream Blown Away: Climate Change Already Has a Chilling Effect on Where Americans Can Build Their Homes." *The Washington Post*. December 2, 2006, C01.

10 RA Pielke, *et al*. (2005) Hurricanes and Global Warming. *Bulletin of the American Meteorological Society*.

11 James Gustave Speth, "Creating a Sustainable Future: Are We Running out of Time?" in Robert Olson and David Rejeski, eds., *Environmentalism and the Technologies of Tomorrow: Shaping the Next Industrial Revolution*. Washington, DC: Island Press, 2005, pp.12-13.

12 Natural Resource Defense Council. (2001) *Feeling the Heat in Florida*.

13 Natural Resource Defense Council. (2001) *Feeling the Heat in Florida*.

14 Environmental Protection Agency. Costal Zones and Sea Level Rise. Retrieved November 20, 2006 from: http://www.epa.gov/climatechange/effects/coastal/index.html

Impacts on Commercial Forests

Dominant tree species will change over time as the climate warms. Higher temperatures and more prolonged periods of drought will make forests more vulnerable to damage from wildfires. Indeed, there is statistical evidence of the beginnings of such an increase over the past few decades[15]. Warming may also increase the threat of invasive species and pests. In the long run, unchecked climate change would turn Florida into a treeless savanna.

Impacts on Commercial Fishing

Florida's coral reefs are the underpinning for the state's commercial fisheries. These reefs are already in decline as a result of disease and coral bleaching, a process directly tied to rising ocean temperatures[16]. Recently both Elkhorn and Staghorn Caribbean coral were added to the list of threatened species under the Endangered Species Act. Both species have declined by 97 percent since the late 1970s[17].

A recent survey commissioned by the Florida Wildlife and National Wildlife federations forecasts that if global warming continues, sea level rise and warming temperatures would dramatically alter the extent and composition of important coastal habitats and that fishing, as we know it, could disappear in a matter of decades. Among the species most at risk are Bonefish, Flounder, Gag grouper, Gray snapper, Permit, Pompano, Redfish, Snook, and Tarpon. Essential habitat would also be reduced for prey species such as shrimp, crabs and smaller fish[18].

Impacts on Health

The projected 8° to 15° F. increase in Florida's heat index over the next century will pose a growing health threat, especially to the elderly population most vulnerable to heat stroke and other heat-related ailments. Warmer temperatures also contribute to higher ground level concentrations of harmful ozone and to smog formation[19]. As warming alters global disease patterns, both humans and wildlife in Florida will be exposed to more tropical strains.

Impacts on Natural Systems

Natural ecosystems are likely to fare worse than agriculture, commercial forestry and other intensively managed systems. Sea wall projects and other flood control structures to protect highly populated areas may actually increase damages to ecosystems in unprotected areas. Low lying areas and shallow water areas will be particularly affected by sea level rise. A 15 inch rise in sea level would inundate 50 percent of Florida's salt marshes and 84 percent of its tidal flats[20]. Current plans to restore the Everglades rest on the assumption that sea level will rise by no more than one foot by 2100, which may be overly optimistic[21].

15 Natural Resource Defense Council. (2001) *Feeling the Heat in Florida*.

16 Rising Ocean Temperatures Threaten Florida's Coral Reef. *The New York Times*. May 22, 2006

17 Ibid.

18 The National Wildlife Federation & The Florida Wildlife Federation (2006) *An Unfavorable Tide: Global Warming, Costal Habitats and Sportfishing in Florida*. Retrieved November 22 from: http://www.nwf.org/nwfwebadmin/binaryVault/An_Unfavorable_Tide_Report.pdf

19 Natural Resource Defense Council. (2004) *Heat Advisory*

20 The National Wildlife Federation & The Florida Wildlife Federation (2006) *An Unfavorable Tide*

21 "Sea Change Coming for Everglades." *USA Today*. Interview with Everglades National Park chief Dan Kimball. May 31, 2006.

Emerging Technologies to Reduce Greenhouse Gas Emissions

ENERGY

Solar Photovoltaics

Of all the renewable energy technologies, Florida has by far the most potential for harnessing direct solar energy. Direct solar technologies, photovoltaic cells in particular, have begun to improve at a rate so accelerated that developers are calling it a "second silicon revolution," following the first silicon revolution of ever more powerful integrated circuit chips. Indeed, a growing number of the Silicon Valley venture capitalists and entrepreneurs who led that first revolution are now investing in solar start-ups. In October 2006 Silicon Valley-based SunPower announced the development of a silicon cell with a record 22% efficiency in converting sunlight to electricity (solar cells in use today are generally about 12% efficient). Two months later, Boeing-Spectrolab achieved a world record conversion efficiency of 40.7% with a solar cell that uses an optical concentrator to increase the sunlight intensity falling on the cell. Other companies like Nanosys and Nanosolar in Palo Alto are developing a new kind of photovoltaic technology that incorporates nanotechnology and results in thin rolls of highly efficient light-collecting plastic that can be spread across rooftops, built into building materials, or even sprayed on to other materials or woven into clothing. A recent economic analysis of declining costs of electricity from solar cells estimates that solar-generated electricity will become cost competitive with grid electricity in Miami by 2016.

Biofuels

When biomass is used to create ethanol or other liquid fuels, the carbon dioxide released when the fuel is burned is roughly balanced by the carbon dioxide captured through photosynthesis as more fuel crops are grown. Biofuels, therefore, are relatively "carbon neutral." Secretary of Energy Samuel Bodman recently announced the goal of making ethanol a practical and cost-competitive alternative by 2012 (at $1.07/gal) and displacing 30% (60 billion gallons) of current gasoline consumption by 2030. If fuel efficiency can be tripled over time (see the Hypercar description below), then most of the U.S. light vehicle fleet will be able to run on biofuels. Almost all the ethanol produced today is derived from corn grain, and it will remain the dominant feedstock for the next few years. But rapid progress is occurring in the production of "cellulosic" methanol derived from fibrous, generally inedible plant matter such as post-harvest corn stalks and other agricultural residues, switchgrass and poplar. A recent study at Oak Ridge National Laboratory concludes that Florida has a significant potential for producing various types of biomass. It estimates that at a price of $20/dry ton Florida could produce 2,761,950 dry tons of biomass, and at a price of $50/dry ton it could produce 9,533,398 tons.

Advanced Coal Technologies with Carbon Sequestration

Coal burning in Florida, primarily for generating electricity, releases over 68 million metric tons of carbon dioxide emissions per year into the atmosphere. Only ten other states have larger emissions from coal. Florida can continue to use this abundant energy source – if its environmental impacts can be sufficiently reduced. In the 1980s, amid concerns about acid rain and particulate emissions, a federal effort was undertaken

to develop Clean Coal technologies. In recent years, concerns about carbon dioxide emissions and global warming have prompted a renewed effort. Integrated Gasification Combined Cycle (IGCC) and other advanced combustion technologies, combined with carbon capture and sequestration, could make coal a sustainable energy technology. Some industry analysts believe it may be possible to burn coal with zero emissions at competitive prices by 2020. If these more advanced coal technologies are not pursued, growing use of coal will become the main driver of climate change.

Fuel Cells – Hydrogen

Hydrogen fuel cells are just now starting to enter specific market niches. Microcells for powering portable electronic devices will enter the U.S. marketplace in 2007. Larger stationary fuel cells will soon be able to compete on cost to provide backup power for industrial, commercial and even residential applications. Large investments are being made by both business and government to improve performance and reduce costs enough to make fuel cells practical for running electric cars. If this proves possible, fuel cells will revolutionize the auto industry and its vast network of suppliers. The only emission from running fuel cells on hydrogen is water vapor, so shifting from oil to hydrogen could dramatically reduce carbon dioxide emissions from transportation as well as all other kinds of auto-related urban air pollution. But how clean hydrogen really is depends on how it is produced. Energy is required to produce hydrogen, and if that energy comes from fossil fuels there will still be carbon dioxide emissions. For many people involved in hydrogen development, the Holy Grail is a Solar Hydrogen Economy based on extracting hydrogen from water using solar energy.

TRANSPORTATION

The Hypercar

Florida has the third highest carbon dioxide emissions from transportation of all the states, exceeded only by California and Texas. Technology that can cut these emissions sharply through major improvements in fuel economy is evolving rapidly. Fuel-electric hybrids and advanced diesels can already allow mid-sized cars to achieve around 50 mpg in normal driving. Growing use of biofuels in the fuel mix will further reduce CO2 emissions. The next major jump of progress is likely to be "lightweighting" by making car bodies out of carbon composites and substituting electronic components for bulky mechanical systems. Carbon composites five times stronger than steel by weight could make cars safer while cutting their weight in half. Eventually, it may prove feasible to power vehicles with zero-emission hydrogen fuel cells, which are twice as efficient as the best internal combustion engines. All of these possibilities have been brought together in the Hypercar concept originated at the Rocky Mountain Institute to demonstrate how the transportation aspect of the climate change challenge can be solved. Rigorous technical modeling suggests that the combination of hybrid-electric drive, ultralight construction, low-drag design, and efficient accessories can achieve a 3 to 5-fold improvement in fuel economy with equal or better performance, safety, amenity and affordability, compared to today's vehicles.

Smart Public Transit

Public transit is far more energy-efficient than travel in single-passenger automobiles, so greater transit use can reduce CO2 emissions. Transit will play a larger role over time as higher energy prices and public policy converge to promote more clustered Smart Growth development patterns. Light rail technology and the reintroduction of trams (trolleys) in urban cores are likely to expand. Demand-Responsive Transport

systems that offer on-demand call-up door-to-door service from any origin to any destination in a service area will become more common and sophisticated as Intelligent Transportation Systems technologies come into widespread use. Emerging technologies are likely to blur the very concept of public transit. Cars coordinated by GPS and traffic monitoring sensor systems, for example, could function as 'personalized public transit' well before the actual functions of driving are automated. As virtual connectivity becomes ever more sophisticated, telecommuting will likely reach a tipping point, reducing the need for many types of physical travel. Flexible telecommuting combined with improved transit, more walkable neighborhoods, and higher energy prices could begin to reduce vehicle miles traveled.

HOUSING

Green Development

Buildings consume nearly a third of Florida's energy, much of it wasted by inefficient design. Real-estate development therefore offers major opportunities for using energy more efficiently and reducing greenhouse gas emissions. Well designed green buildings typically use from one-half to one-quarter of the energy used in conventional construction. Done well, green development involves analyzing interconnected issues like building site and design, resource efficient construction, energy and water efficiency, lighting and mechanical design, and the potential toxicity of building materials. Then it strives to optimize all these aspects in so far as possible in an integrated design. While this approach requires more knowledge than conventional development, it is not proving to be more costly. Features that have higher individual costs, like better windows, can actually reduce the whole building cost because other elements such as the heating and air conditioning system can be downsized. The U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) rating system is a tool to evaluate building performance from this kind of "whole-system" perspective. It provides the definitive standard of what constitutes a green building. The Council states that a LEED Silver-rated building should not cost more than a conventional building, while outperforming conventional construction by all of its measures. Over the past year or two, green development has passed a threshold where many developers are realizing that this approach is good business as well as good for the environment.

Low Cost Housing

Low cost housing will be revolutionized by advanced design and fabrication methods and innovative materials that allow high energy efficiency to be achieved at low costs. One technology that illustrates the possibilities ahead is Contour Crafting (CC). Developed at the University of Southern California, CC is a rapid production technology which uses robotic mechanisms to assemble building substructures much as robotics is used in car assembly today. As a result, total building times can be accelerated by an order of magnitude. The technology is already being considered as an option for emergency reconstruction and disaster relief. A wide range of inexpensive, energy-efficient construction materials are being developed for prefabricated housing, including Expanded PolyStyrene (EPS) wall and roof panels with cementitious coatings, ferrocements, calcium silicate products, wood-based composites, and a variety of recycled products.

ECONOMIC DEVELOPMENT – INDUSTRY & AGRICULTURE

Green Manufacturing

Developments in pollution prevention, green chemistry, computer monitoring and

control, recycling and other areas are coming together into a new image of the potential for 21st century manufacturing. Leading companies pioneering super efficient "green manufacturing" are already demonstrating fundamental changes in production design and technology that extract two, five or even ten times the work out of each unit of energy and materials used, minimizing the release of carbon dioxide and other pollutants. They are striving to avoid hazardous substances like toxic heavy metals and chlorinated hydrocarbons. Over the decades ahead, advanced green manufacturing will move toward closed-loop production systems, modeled on nature's designs that return every output harmlessly to the ecosystem or create valuable inputs for other manufacturing processes. Waste and pollution will come to be viewed as a design failure, not an inevitable product of industrial production.

Precision Agriculture

Precision agriculture is the application of information technology to farming processes. It allows water, fertilizers, pest control agents and other inputs to be precisely applied, where needed and as needed, minimizing waste. For example, satellite information can be analyzed by computer programs designed to detect evidence of pest damage and the information relayed to farmers for corrective action. Drip irrigation systems linked to soil moisture sensors can provide water when and where needed, reducing water use while optimizing soil moisture. Agricultural inputs require surprisingly large amounts of fossil fuels to produce, transport and apply, so optimizing their use will reduce carbon emissions.

Appendix: Technology Forecast Information Sources

In the initial environmental scan that served as the basis for choosing the technologies reviewed in this report we consulted the publications of the organizations and individuals below to identify which emerging technologies they thought would be most significant for shaping a sustainable future over the next 25 to 50 years:

- Battelle
- British Telecom
- Foresight Institute
- Future Survey/World Future Society
- GW (George Washington University) Forecasts
- Hudson Institute
- MIT's Media Lab
- MIT's Technology Review
- National Academy of Engineering
- National Renewable Energy Laboratory
- RAND Corporation
- Rocky Mountain Institute
- SRI International
- Woodrow Wilson International Center for Scholars
- World Business Council for Sustainable Development
- World Resources Institute
- Forecasts of individual visionaries: Arthur C. Clarke, Paul Hawken, and Ray Kurzweil

ATTACHMENT C

Summary of the Final Report "Assessing Florida Citizens Attitudes Towards Growth, Growth Management, and Quality of Life Issues."

September 6, 2006

by

Dr. Tim Chapin and Heather Kahn
Department of Urban and Regional Planning, Florida State University

This purpose of this project, commissioned by the Century Commission, was to identify and review extant statewide (Florida) survey data and reports on citizens' attitudes toward growth and growth management in Florida and to write a summary of the key findings and trends regarding Floridians' values and views on this topic. Tim Chapin, Ph.D., was chosen as principal investigator because he had analyzed longitudinal survey data of this nature and had published articles on this subject in professional journals.

The investigators identified a total of thirty-four surveys, survey reports, and other materials that provide insights into Florida citizen attitudes towards growth and how these have changed over time. The materials acquired for this study came from many sources including the library of Dr. Chapin, local governments, the Regional Planning Councils, The Nature Conservancy, 1000 Friends of Florida, Florida Chapter of the American Planning Association, Leadership Florida and Myregion.org.

Two research questions guided their analysis of the materials gathered:

1. Is there a sufficient body of sound survey data available to provide a clear understanding of Florida citizen views and values regarding growth and how it is managed in Florida?

2. Does the available evidence indicate an ability by the Century Commission to determine what Floridians like and don't like about growth and development, what their related concerns or desires are, and whether they perceive their quality of life to be getting better or worse over time?

The investigators stated seven **primary findings**, based on their review:

Finding 1. There is a substantial amount of information available on citizen attitudes towards growth, growth-related issues, and state and local government responses towards this growth.

Finding 2. Overall, evidence indicates that Florida's citizens have substantial concerns with the pace of growth in their communities.

Finding 3. Related to Finding 2, there is strong evidence that Florida's citizens perceive ongoing population growth as negatively affecting the state and slowly compromising their quality of life.

Finding 4. Studies reveal several growth-related issues as major citizen concerns, including transportation, environmental quality, provision of education, and the management of growth.

Finding 5. Studies suggest that citizens view growth management, in some form, as an important ongoing activity for government.

Finding 6. While citizens indicate general support for growth management, there is evidence that citizens are unhappy with the progress of government in managing growth and mitigating the impacts of this growth.

Finding 7. There is evidence of a willingness to pay for those amenities that a majority of Floridians perceive as contributing greatly to their quality of life.

These findings were summarized into four **conclusions**:

1. *A great deal of information on citizen attitudes is available*, offering a detailed picture of citizen views towards ongoing population and economic growth in the state, impacts associated with this growth, and perceptions concerning the effectiveness of the state's growth management approach.

2. *Florida's citizens express major concerns about the pace and form of growth in the state,* with many of the issues associated with growth identified as major problems facing the state. There is some limited evidence that Floridians perceive their quality of life to be declining, in large part because of growth-related issues.

3. *There appears to be a set of five "core values"* that receive broad-based support:

- Environmental Protection
- Safety and Security
- Personal Time
- Affordability, and
- Commitment to Collective Action

Finally, as the investigators were asked to also identify knowledge gaps (specifically, what important questions were **not** asked in prior surveys that should be explored in future research), their fourth conclusion answers the knowledge gap question:

4. Despite the large number of surveys, survey reports, and articles that have investigated citizen attitudes, *our current knowledge regarding these attitudes remains incomplete*. Specifically, our knowledge base falls short in the following areas:

- Insights into attitudes and values in the North Florida region (the Panhandle of the state is generally not well-represented in surveys),
- Insights into attitudes and values in rural areas of the state,
- Insights into what citizens want (versus what they don't want), as almost all surveys attempted to discern what respondents didn't like about their communities, not what they most enjoy or are committed to protecting,
- Insights into tradeoffs when pursuing those state and local attributes valued by citizens. Beyond determining what attributes (of communities) are valued most, there is also a need to determine what people are willing to possibly pay or give up or change (in their own behavior) in return for protecting highly valued attributes, or obtaining what they want to have.

The full report, which includes an annotated bibliography and detailed listing of all survey information reviewed in this study, is posted under "Current Projects" on the Commission's website: **www.centurycommission.com**, or may be accessed by this link: https://www.commentmgr.com/projects/1148/docs/CC%20FSU%20Survey%20on%20Citizen%20Attitudes.pdf