Sustainability Indicators for Coastal Georgia

A Report By

Center for a Sustainable Coast

June 2007

Funded in part by a grant from the M. K. Pentecost Ecology Fund.

Sustainability Indicators for Coastal Georgia

Introduction and Overview

This report was prepared by the Center for a Sustainable Coast for the purpose of exploring options to guide coastal Georgia's development, environmental quality (protection) and resource management using criteria that could effectively measure the region's progress toward a more sustainable future.

In developing this report, Center staff investigated the use of sustainability indicators in other locations, primarily urban areas, to determine what led to their use, what measures were adopted, and how well they worked. In the course of this research, we learned that a decade earlier some "**guiding principles**" had been developed to be used in measuring the value of development, social well-being, and environmental quality. Because of the depth of experience that had been applied in developing these guiding principles and the comprehensiveness of their scope, the Center decided to apply them in analyzing the context for using indicators in this region.

Each of the ten guiding principles were considered in terms of the anticipated obstacles and opportunities for using indicators as a device for charting and evaluating coastal Georgia's development, quality of life, and socio-economic conditions. This approach was known to be subjective, but the staff was convinced that any other method would be equally biased by the views of those conducting the analysis. Moreover, there was a distinct advantage provided by using guiding principles that had been developed by a team of experts – applying these principles would offer both the Center and those reading our report a more complete understanding of the complexity and the potential of an indicators program.

This improved understanding, we reasoned, would sharpen our ability to select and recommend a set of indicators for initial application in coastal Georgia. Likewise, by providing a broader foundation for weighing the options, our report could then help others grasp the concepts and imagine the possibilities for using indicators, whether they agreed with our analysis and recommendations or not.

Regardless of the accuracy of our analysis or the appropriateness of the sixteen indicators we recommended, what was initially believed has been reinforced by our research, and is of key importance.

(1) The value of an indicators program will depend on the majority of the elected officials in one or more local governments being convinced that such a program would help them in their community's efforts to achieve a desired future.
(2) To be most useful, such indicators should be applied at a regional level, meaning that they should be used in more than one county and preferably in at least six along the coast.
(3) They must not be viewed as a device for manipulating the outcome of local elections or as a threat to those holding office.
(4) The credibility of the process is essential for the indicators to provide their intended benefits. This credibility will depend on several conditions being met:
    (a) Belief in the legitimacy and motives of those administering the application of indicators;
    (b) General acceptance of the indicators as reasonable measures for determining "progress";
    (c) The perceived willingness of decision-makers to adopt or revise practices consistent with indicator results;
    (d) Continued support for the use of indicators for long enough to ensure that they provide relatively accurate findings and indicate sufficient change to determine trends.
    (e) Transparency in the objective evaluation and use of indicator results.

From this overview it should be obvious that a successful indicators program will require major effort. This report is just the first step toward that outcome, but we believe it is an essential one.

Sustainability Indicators

A Brief History of Indicator Development

Donella Meadows in the *Indicators and Information Systems for Sustainable Development* report stated, "We have many words for indicator – sign, symptom, omen, signal, tip, clue, grade, rank, data, pointer, dial, warning light, instrument, measurement. Indicators are a necessary part of the stream of information we use to understand the world, make decisions, and plan our actions." Throughout history, human beings have attempted to understand a complex world with a multitude of relationships through a variety of tools. The table below provides a brief overview of recent measurement system developments.

Timeline of Measurement Systems – Recent History	
1920s	Social indicators are developed
1940s	Systems of national accounts are established, the annual calculation of GNP and GDP were adopted, and economic indicators become prevalent
1960s	Quality of life indicators are developed
1970s	Health indicators are developed
1970s	Environmental indicators are developed
1980s	Healthy community indicators are developed
1985	Jacksonville Community Council launched Quality of Life Indicators, one of the longest running and highly respected programs in the US
1987	Brundtland Commission called for the development of new ways to measure and assess progress towards sustainable development
1990	Calvert Henderson Quality of Life Indicators introduced
1992	Agenda 21 of the Earth Summit in Rio de Janeiro echoed those sentiments
1993	President's Council on Sustainable Development under Clinton begins
1994	GPI program developed and launched by Redefining Progress
1995	Indicators of Sustainability Report for North Carolina was published (one time only)
1995	UN develops Sustainability Indicators program
1996	Bellagio Principles were unanimously endorsed
1998	Balaton Group met to discuss indicator systems, Donella Meadows was a key stakeholder in this effort
1999	President's Council on Sustainable Development under Clinton ends
1999	WellBeing Assessment launched (incorporates Barometer of Sustainability)
2001	ESI framework launched

Indicator Models and Systems

There are a number of indicator programs and systems in development and use. At this point, no one type of indicator has emerged to dominate the category. In general, the emphasis is on deciding what the appropriate measures should be and then on how to organize them in a meaningful way. A side, but important, concern is how to effectively communicate the result to the general public, as well as to decision-makers in civil society and in government. It is clear, however, that those organizations that build their indicator model and system on the Bellagio Principles (or similar guidelines) will be more successful.

There are five overall groups of models that appear to be emerging within the sustainability indicator community and are regarded as influential in assessing progress toward sustainable development. The first two of these models are regarded by practitioners as partial system models that do not effectively capture or convey the interconnectivity of the world. The latter three are viewed as full system models that attempt to capture and reflect all aspects of the system, including people and the environment. The five models types are:

1) Models with roots in economics
2) Stress and stress-response models
3) Multiple capital models
4) Various forms of the three-part or theme "social, economic, environment" models
5) The linked human-ecosystem well-being model.

Within these broad categories of indicator models, a number of systems have been developed. Consensus has not yet emerged among practitioners about which of these offers the "best" approach. For example, the cost of traffic accidents (a component of the GPI) may be a useful measure in a developed nation, but a fairly meaningless metric in a third world country. Much of the debate around appropriate systems of measurement is focused on a global and national scale. Individual communities in the United States – by and large – have adopted the three-part "social, economic, and environment" system and adjusted it to reflect regional concerns. The Indicator Systems in the United States section of this document provides information on the various initiatives underway on a regional basis in the United States.

These specific indicator systems embedded within the five categories of indicator models are:

Genuine Progress Indicator (GPI)	The Genuine Progress Indicator tries to build from Gross Domestic Product, expanding the set of measures to include the economic contributions of the family and community to the society and to measure the contribution of the environment to human well-being. It seeks to present all this in monetary terms.
Ecological Footprint	The footprint concept helps to communicate estimates of the human demands on the environment by calculating the impacts of certain forms of consumption and pollution. Although not a precise measurement, it provides a very effective snapshot and allows comparisons among regions. The Living Planet Index is a subset of the Ecological Footprint model. It is a measure of the natural wealth of the earth's forests, freshwater ecosystems and oceans and coasts. Developed by the World Wide Fund for Nature, it is being used in conjunction with the Ecological Footprint to produce the WWF's Living Planet Report.
Barometer of Sustainability	This approach uses a graph to show how well a given society is doing in achieving sustainability. It does this by plotting various countries in terms of human and ecosystem well-being and seeing where the two lines meet. This approach is currently included in the Wellbeing Assessment.

The Dashboard of Sustainability	A cluster of indicators is presented visually in a form resembling a dashboard with the goal of letting people see measures of the status of the environment, the economy, and the social well-being of a nation at a glance.
Wellbeing Assessment	The Wellbeing Assessment is a method of assessing sustainability that gives people and the ecosystem equal weight. It combines a series of indicators into four indices: a Human Wellbeing Index, Ecosystem Wellbeing Index, Wellbeing Index, and Wellbeing/Stress Index—the ratio of human wellbeing to ecosystem stress. Together, these four indices provide a measurement of sustainable development.
Quality of Life Indicators Calvert & Henderson	This system for measuring quality of life is for the United States. The indicators include: Employment, education, shelter, public safety, national security, infrastructure, income, human rights, health, environment and energy and recreation.
Environmental Sustainability Index (ESI)	An initiative of the Global Leaders of Tomorrow Environment Task Force, World Economic Forum Yale Center for Environmental Law and Policy Yale University Center for International Earth Science Information Network Columbia University. With 68 variables rolled into 20 core "indicators," the ESI creates overall environmental sustainability scores for 142 countries.
UN Sustainability Indicators	An initiative established by the UN to identify each country's overall progression towards or away from sustainability. This measurement system takes into account four overall factors: social, economic, environment, and institutional capacity. There are a total of 15 major subcategories from the initial four dimensions and a total of 36 individual metrics within. Separate indicators are defined for each of the individual metrics within.
Indicators of Sustainability and Economic Welfare (ISEW)	This method is primarily grounded in economics. Similar to the GPI, this approach starts with a traditional economic fundamental and then adjusts for various social and environmental constraints. ISEW = Cadj + P + G + W - D - E - N
"Three Part" Model	This method is the one that seems to be the most commonly used by organizations and regions to assess their progress towards sustainability. The group picks those indicators that lend the most insight into the region's health along the three dimensions of sustainability: economic welfare, community health, and the environment. Organizations adopting this approach gather points of data, set goals, and then indicate whether or not the state is meeting these goals (usually through a rating, grade, or number system). This allows the individual community to tailor the assessment to the regional requirements and concerns. The National Neighborhood Indicator Partnership and US Working Group on Sustainability Indicator systems are part of this approach.

Guiding Principles for Indicator Programs

In 1996, an international group of measurement practitioners and researchers from five continents came together at the Rockefeller Foundation's Study and Conference Center in Bellagio, Italy to review progress to date and to synthesize insights from practical ongoing sustainability indicator program efforts. The result of this work was the **Bellagio Principles, a list of 10 guidelines to ensure successful indicator programs**. The Principles were unanimously endorsed at the conference and are regarded as the definitive list by leaders within the sustainability community, such as Donella Meadows and members of the Balaton Group.

The Bellagio Principles for Successful Indicator Programs are:

1) **Guiding vision and goals** – be guided by a clear vision of sustainable development and goals that define that vision.
2) **Holistic perspective** – include review of the whole system as well as its parts; consider the well-being of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts; and consider both positive and negative consequences of human activity, in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms.
3) **Essential elements** – consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption and poverty, human rights, and access to services, as appropriate; consider the ecological conditions on which life depends; and consider economic development and other, non-market activities that contribute to human/social well-being.
4) **Adequate scope** – adopt a time horizon long enough to capture both human and ecosystem time scales thus responding to needs of future generations as well as those current to short term decision-making; define the space of study large enough to include not only local but also long distance impacts on people and ecosystems; and build on historic and current conditions to anticipate future conditions – where we want to go, where we could go.
5) **Practical focus** – an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria; a limited number of key issues for analysis; a limited number of indicators or indicator combinations to provide a clearer signal of progress; standardizing measurement wherever possible to permit comparison; and comparing indicator values to targets, reference values, ranges, thresholds, or direction of trends, as appropriate.
6) **Openness** – make the methods and data that are used accessible to all; and make explicit all judgments, assumptions, and uncertainties in data and interpretations.
7) **Effective communication** – be designed to address the needs of the audience and set of users; draw from indicators and other tools that are stimulating and serve to engage decision-makers; and aim, from the outset, for simplicity in structure and use of clear and plain language.
8) **Broad participation** – obtain broad representation of key grass-roots, professional, technical and social groups, including youth, women, and indigenous people – to ensure recognition of diverse and changing values; and ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action.
9) **Ongoing assessment** – develop a capacity for repeated measurement to determine trends; be iterative, adaptive, and responsive to change and uncertainty because systems are complex and change frequently; adjust goals, frameworks, and indicators as new insights are gained; and promote development of collective learning and feedback to decision-making.
10) **Institutional capacity** – clearly assigning responsibility and providing ongoing support in the decision-making process; providing institutional capacity for data collection, maintenance, and documentation; and supporting development of local assessment capacity.

How Sustainability Indicators Could be Applied in Coastal Georgia

For the purposes of this report, the Center for a Sustainable Coast analyzed the application of the Bellagio Principles for successful indicators be used in developing an indicator program for coastal Georgia.

1. Guiding vision and goals – be guided by a clear vision of sustainable development and goals that define that vision.

Goal One
Achieve broad support for the need to adopt and apply the principles of sustainability in coastal Georgia through education, public awareness, and strategic advocacy.

Goal Two
Adopt, test, evaluate, and administer a set of provisional sustainability indicators and refine as needed.

Goal Three
Adopt a program of incentives and penalties to achieve compliance with the principles of sustainability through local and state government policies.

2. Holistic perspective – include review of the whole system as well as its parts; consider the well-being of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts; and consider both positive and negative consequences of human activity, in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms.

A. Consistent with the goals and vision outlined above, indicators will serve multiple purposes that reflect a holistic perspective.

B. To evaluate costs and benefits in non-monetary terms will require both public surveys and a well-conceived strategy for converting non-monetary measures into monetary ones, such as accounting for the value of eco-system services and functions provided by natural resources.

C. To refine the accuracy of a growing "holistic perspective' will require not only more thorough and consistent data sources, but a clear analytical rationale for setting research & assessment priorities, as in a "triage" process.

D. Sustainability measures and their evaluation must be applied using systemic analysis of the relationships among the major components of the region's environment, economy, and social characteristics. Projects affecting the same resource systems should be evaluated as a group whenever possible to account for interactive and cumulative impacts.

3. Essential elements – consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption and poverty, human rights, and access to services, as appropriate; consider the ecological conditions on which life depends; and consider economic development and other, non-market activities that contribute to human/ social well-being.

Our proposed vision is to realize a future in which all the region's resources (economic, environmental, and cultural) are used in a sustainable and equitable manner.

NOTE: This is one of the most difficult of the principles to apply, for several reasons that follow.

A. Existing government programs, whether local, state, or federal, are targeted to meet specific needs, and have been organized to operate largely, if not entirely, independent of seemingly related but different programs. This makes a 'holistic' approach unprecedented, because of the difficulty of encompassing the interactive, cumulative, and distributional effects of multiple programs and the activities they permit.

3. Essential elements, continued

some segments of the public that conditions that currently appear to be unjust from an inter-generational standpoint will be corrected by future engineering advancements, now non-existent. However, consistent with the need to exercise precaution, especially in dealing with the importance and complexity of natural systems, we must discourage unreasonable reliance on future technology. We must consciously avoid substituting good intentions or wishful thinking for reliable analysis and practical strategy.

C. History and current events are littered with evidence of injustices caused by economic disparity and the violation of human rights, whether pronounced or subtle. For example, in a global economy, the degree to which we may benefit economically from the subjugation of the working poor, both domestic and foreign, remains significant but largely unknown by individual consumers and voters. Public policies continue to actively promote economic development and trade without understanding, or even considering, the distribution of related costs and benefits. Even in projects supported by taxpayers, like the deepening of the Savannah harbor, there are unevaluated factors related to how the alleged benefits of the projects are distributed, compared with the environmental risks, costs, and long-term consequences. It is quite likely that benefits, such as they are, will be widely distributed but the costs will be incurred locally, even after all mitigation efforts are completed.

D. There is a prevailing tendency for environmental protection and conservation proponents to presume that the 'baseline' against which these activities are measured is the current condition of the natural resources in question. Preventing further degradation of natural systems is important, but it alone is not sufficient. Too seldom is there any serious, thorough effort to restore ecosystems that have been compromised. In part, this is because natural resources in areas that are already developed can only be reclaimed and restored to a limited extent. Moreover, because public funding is constrained, damage control is usually given higher priority than upgrading functional, though compromised, ecosystems. Even when funds are available for restoration, there is often a lack of existing information to use in guiding restoration to achieve the greatest benefits. This indicates inadequate understand-ing about the urgency and importance, as well as the systemic and distributional characteristics, of alternative restoration projects.

E. Economic motives and methods for measuring success are often unrealistically isolated from the larger social and environmental contexts within which they are applied. "External" costs of doing business, such as air emissions and wastewater discharges, are likely to be indirectly imposed on other parties who either do not benefit in proportion to the costs of lower quality of air or water. Likewise, in common practice, the universal benefits of ecosystem services provided by wetlands and fisheries habitat, for instance, are implicitly discounted, while the short-term exploitation of land and water resources by commercial activities is given priority because it is directly translated into income.

B. Regarding the disparity between this and future generations, continually evolving technology convinces

4. Adequate scope – adopt a time horizon long enough to capture both human and ecosystem time scales thus responding to needs of future generations as well as those current to short term decision-making; define the space of study large enough to include not only local but also long distance impacts on people and ecosystems; and build on historic and current conditions to anticipate future conditions – where we want to go, where we could go.

A. Part of the problem in convincing business owners, public officials, and citizens to support and implement sustainable practices (including the use of indicators) is due to the contradictions between ***perceived*** short-term economic certainties compared with unknown or marginalized long-term risks. A more effective long-term policy may require short-term constraints (such as regulations or revised taxing policies) that are currently believed to be unjustified, especially when compared with more immediate financial advantages.

B. Similarly, most people base their behavior and perceptions on relatively short-term horizons and nearby circumstances. Accounting for downstream water users, future requirements for maintaining ecosystem services, and distant places that are environmentally degraded but seldom documented, can make sustainability a difficult concept to understand and even harder to apply in practice.

C. Both political election cycles and business management timeframes encourage short-term thinking. This means that sustainability policies will require unprecedented attention being given to the future, and a new sense that our present interests are served by longer-term goals and strategies. Certain global issues may be converting an increasing number of people to this needed revised perspective.

D. Using sustainability measures, if rigorously administered over sufficient time, will expand the time horizon of assessment to favor more comprehensive, integrative, and systemic analysis. Such long-term and systemic analysis is key to providing the scope necessary for developing public policies and private practices that reflect more responsible use of our shared environment. Crucial to accomplishing this will be adherence to the principles of sustainability throughout multiple terms of office and across numerous political jurisdictions – no small feat.

5. Practical focus – an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria; a limited number of key issues for analysis; a limited number of indicators or indicator combinations to provide a clearer signal of progress; standardizing measurement wherever possible to permit comparison; and comparing indicator values to targets, reference values, ranges, thresholds, or direction of trends, as appropriate.

A. We have attempted to be extremely practical in recommending measurable standards for coastal Georgia, to the extent that these indicators serve the vision and goals set forth above. It may prove to be most effective to adopt and implement the full set of indicators in phases to simplify and moderate the difficulty of putting the complete program into effect.

B. When existing data sources are available, efforts should be made to use these rather than to incur the cost and effort of a new data-gathering initiative. There should be periodic re-evaluation of data sources to determine if new and reliable information becomes available to enable the use of more effective indicators.

C. Trade-offs intended to improve indicators and data sources must be carefully considered in terms of their effects on the capability to track long-term trends, which may be better served by leaving the indicators and data sources unchanged for many years. If appropriate opportunities arise, it may be more practical to supplement existing indicators with new ones to help verify the implications of trends rather than replacing existing indicators.

Conversely, costs that are avoided because of ecosystems services, like flood protection provided by wetlands or inexpensive food supplies

6. Openness – make the methods and data that are used accessible to all; and make explicit all judgments, assumptions, and uncertainties in data and interpretations.

A. We propose that sustainability criteria be published and widely circulated in coastal Georgia newspapers, newsletters, church bulletins, and other places, both before being adopted and afterwards. Thereafter, at least annually, the results of the application of these indicators in measuring local activities and practices should be equally well publicized. Of course, getting some coverage in broadcast media would be helpful, including coverage by Georgia Public Radio.

B. Preferably, part of the adoption and administrative procedures for using these criteria should include requirements for integrating the results of sustainability evaluation into budgeting and programming decisions of the governmental authorities involved. Within any such governmental process, there is typically ample provision for public involvement, including education and opportunities for making comment in public hearings. But there is undoubtedly some political risk in establishing any standards of performance, as they may reveal weaknesses or declining conditions that could lead to lost elections. For this reason, at least initially to help establish baseline conditions, it may be best for some provisional indicators to be used by an independent entity, presumably a non-profit organization.

C. What is true of many public issues is also true of legitimate, well-intended efforts to measure changes in conditions: the world is often complex and determining how to interpret causes and effects can be very difficult. Such complexity is likely to make it hard to explain to the public and officials what certain indicators mean, why they are needed, and how they are put into use.

7. Effective communication – be designed to address the needs of the audience and set of users; draw from indicators and other tools that are stimulating and serve to engage decision-makers; and aim, from the outset, for simplicity in structure and use of clear and plain language.

A. In the next stage of this project, we will seek assistance of professional messaging experts to get their advice on how to promote the use of indicators. As noted above, the complexity of using these measures to guide and revise governmental programs is compounded by the political risk of revealing problems and subsequent evaluation of efforts used to solve them. For these reasons and others, using the correct language to explain, promote, and apply indicators will be crucial to their acceptance.

B. It will be helpful to develop several communication packages, each targeting a different segment of the public. For instance, it is reasonable that a set of materials about the indicators should be prepared for use in the public schools, churches, civic associations, and among elected officials. To be most effective, the materials for school children should be

8. Broad participation – – obtain broad representation of key grass-roots, professional, technical and social groups, including youth, women, and indigenous people – to ensure recognition of diverse and changing values; and ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action.

After receiving peer review by other environmental professionals, we intend to establish one or more advisory groups to assist in refining indicators and overseeing their application. This will not only provide the benefit of diverse viewpoints, but it will help broaden the base of support for using indicators.

9. Ongoing assessment – develop a capacity for repeated measurement to determine trends; be iterative, adaptive, and responsive to change and uncertainty because systems are complex and change frequently; adjust goals, frameworks, and indicators as new insights are gained; and promote development of collective learning and feedback to decision-making.

A. Obviously, to be useful, indicators must be used over a long-enough period for (1) the conditions being measured to be representative, (2) changes in conditions (favorable or not) to be distinguished from temporary variations, and (3) reasonably reliable evaluation of corrective actions to be possible so that the public and key decision-makers can see what effect has been achieved, if any.

B. We propose that when individual communities or regional entities decide to use indicators they include in that decision a corresponding set of conditions, such as:

(1) Committing themselves to a period of at least three years of time, during which they experiment in good faith with the same set of indicators, unless some obvious problem with an indicator needs to be corrected sooner.

(2) Data sources and methods of data collection shoould remain as constant as possible to reduce the possibility of altering results due to changing data, intentionally or not.

(3) The authority adopting the indicators should have a pre-existing contingency plan for adjusting the program if budgeting constraints require a reduction in effort. This should be based on the relative importance and practicality of retaining a given indicator in comparison with others, as determined by the officials and the public they serve.

10. Institutional capacity – clearly assigning responsibility and providing ongoing support in the decision-making process; providing institutional capacity for data collection, maintenance, and documentation; and supporting development of local assessment capacity.

A It is unlikely that the smaller and more rural counties and cities in coastal Georgia would have the ability to administer an indicators program, even if political support was expressed. Because many social, economic, and environmental characteristics are regional in nature, not conforming to political boundaries, it is most logical to approach this program at a regional level. Although it may seem that the Coastal Georgia Regional Development Center may be a good candidate for taking on this task, there are valid reasons to question that choice. First, the RDC has most often assumed a role of facilitating development, rather than seeking to protect the public interest by carefully guiding development patterns and methods with environmental criteria for site selection, site design, and building practices. Second, the RDC's performance in producing useful results at a reasonable cost and with effective follow-through has been erratic.

B. The City of Savannah and Mayor Otis Johnson have been supportive of the concept of sustainability. At a meeting in February 2007, the mayor said that he sees sustainability as a means for improving both the fairness of government programs and their effectives as measured by financial benefits (economic efficiency) and environmental improvement, including aspects of public health. (*Panel discussion at City Hall on February 7, 2007*.) On that same occasion, he also underscored the need to go beyond the city limits to develop a regional approach, since so many issues are of such a geographic scale that treating them locally would not be sufficient.

Additional sources and perspectives

In 1999, the Center for a Sustainable Coast published a series of three articles entitled: *Is a Sustainable Coast Possible?* The analysis in these articles was an attempt to evaluate current trends and foreseeable alternatives in public policy and various practices, as well as regional conditions and their cumulative implications. Although emphasis was placed on environmental quality and functions, there was effort made to evaluate the economic activities that are most dependent on the environment in contrast with those that impose the highest environmental burden. The analysis concluded that until values are modified to include cumulative, indirect, and long-term consequences of current activities as they affect society and the natural environment, it will be unlikely that significant advancement toward sustainability can be realized.

Fortunately, in the intervening years we have witnessed a number of events and issues that have had the effect of modifying the public's awareness in support of sustainability – to a certain extent, anyway. Conversely, as the short-term profit potential of natural resource use and land development has risen with growing demand for coastal homesites and commercial facilities, political forces have tended to concentrate power among those who are motivated to circumvent or restrain public interest claims in order to serve narrow private purposes. These clashing values remain quite volatile, yet they are often clouded by misrepresented and misunderstood or unclear objectives. For example, protecting property rights has become a common reason for fiercely opposing both the enforcement of existing environmental laws and the improvement of resource management programs through rulemaking, budgeting, and legislative amendment. Yet, private property owners stand to gain major benefits from more effective environmental protection because they are vulnerable to inadequately regulated activities upwind or upstream that can degrade the value and enjoyment of their land.

Consider several fundamental issues and trends that appear to be improving the public's acceptance of sustainability concepts:

- **Green Infrastructure**

  There has been growing awareness of the valuable functions provided by nature, sometimes called "ecosystem services." Functions such as water filtration and storage, fishery productivity, and flood control are now more commonly understood to be valuable services provided by the environment that generate obvious human benefits. More local ordinances now require drainage analysis and a drainage plan, at least for larger projects, although the consistency and effectiveness of these measures have yet to be evaluated. Conservation advocacy and education efforts by various non-profit organizations are currently aiming to improve public understanding about risks related to unsuitable site selection and flawed site design. This will make the public more knowledge-able when considering the purchase of a new home so that regrettable decisions will be avoided and, accordingly, developers will rein-in unwise practices.

Additional sources and perspectives, continued

Among environmental advocates in coastal Georgia, a major reason for this heightened concern about environmental quality has to do with the reduced waste assimilation capacity of our rivers caused by escalating non-point source pollution and increasing flood damage, even after relatively small storm events.

- **Water Resources Management**

With the state's overdue focus on water resources management, the Georgia Environmental Protection Division is now linking water withdrawal capacities for supplying new users to the wastewater discharge limits (or waste assimilative functions) of natural water sources. If wastewater discharge permits cannot be obtained due to assimilative capacity being used up (or exceeded), communities often cannot grow until water quality is improved. This represents a new era in Georgia's resource management, and it is only beginning to be understood by many decisionmakers who have been prone to neglecting the environmental burdens of growth, since they have been preoccupied with economic benefits, short-lived though they often may be. If only conceding to required environmental improvements to the extent necessary to get new wastewater permits, at least this is moving toward sustainability. Equally important, by making the connection between water use and water quality, this issue will assist in the understanding and adoption of other policies and practices that improve protection of natural functions based on systemic analysis of relationships among resource users, activities, and management methods.

- **Global Issues**

Through mass media exposure, the public is increasingly aware of the interconnections between the economy and the environment as well as the nearby implications of formerly distant and seemingly negligible activities conducted on other continents. Throughout the 1990s, news coverage was amply scattered with stories of U.S. manufacturing jobs lost to foreign labor markets, as international trade agreements and radically differentiated labor costs took their inevitable course. As worldwide oil prices have risen in recent years, many are considering alternatives for reducing dependence on foreign fuel sources and methods for conserving energy. And, perhaps most profoundly, the effects of greenhouse gases on global climate have seeped into common consciousness with accelerating acuity. All of these and many other issues have contributed to a broader, and perhaps even intuitive, understanding of the systemic nature of our modern world.

Additional sources and perspectives, continued

Although systemic relationships have always been characteristic of nature, until recently their relevance to the human world was largely understood by only two quite dissimilar groups: (1) academics and researchers whose influence and activities were insulated from daily society; (2) world-class venture capitalists who understood the direction of global change and the potential of emerging markets, and who sometimes manipulated them for private gain at public expense. But no matter how well-intentioned, rudimentary efforts to intervene in attempts to solve systemic problems through various government programs (including The Great Society, Supply-Side Economics, and the Contract with America) have failed to the extent that they have produced counterintuitive, unintended effects by neglecting important interconnections with "external" factors. (In such cases, since these neglected relationships proved to be significant, our grasp of systemic problems has been shown to be inadequate to the task because we have failed to comprehend the boundaries of the system in question.)

With the rise of the global climate change issue we are now witnessing what may well become the threshold of a new era in human awareness based on our interconnectedness, an advancement from which no backsliding will be likely, short of an apocalyptic global calamity. This shift in world-view may prove to be comparable to the Enlightenment or the Industrial Revolution. Yet unlike those prior "paradigm shifts," and to some extent because of them, the current alteration is likely to be more conscious and deliberative because it rests upon the science of survival, amply supplemented and highly enhanced by robust data, sophisticated electronic media, and omnipresent, near-instantaneous global communications.

- **Marketing Nature (or at least perceived "quality of life")**

With the coming of the post-industrial age and the emergence of footloose information-based professions unleashed by the Internet, "quality of life" has become a near-universal mantra that governs the location choices of multitudes that now have this unprecedented mobility. Compounding these new workplace freedoms are the trends in retirement living and a bulge in the demographics of Americans who are approaching their "golden years." These two factors mean that environmental quality has become a vital key to attracting significant portions of those who have ample discretionary income. Although some slow-learning economic development agencies are still laboring to recruit industries of the old order, increasingly, those having locational advantages, including settings that retain extensive natural amenities such as coastal Georgia, are becoming more sensitive to the benefits of unspoiled landscapes. More than fifteen years ago, in *Rural by Design*, environmental planner Randall Arendt revealed that his research found that most people who bought homes in golf-course communities did not play golf. With that observation, he proclaimed the emergence of a new market for natural landscapes, a trend that is still taking hold and producing many consequences, most of them favorable to sustainability objectives.

The emergence of "conservation developments" and "green-certified" projects is an indicator of this trend. However, in places

like Georgia, which are politically resistant to government regulation, whether by a city, county, the state or "the Feds," undoubtedly some controversial "adjustments" will be required to establish resource controls that guide the development sector toward new markets that are based on quality of life. In this interim period we are now witnessing a political drift, evidently driven by reactions against these emerging trends, which are dominated by emotionally charged defense of the status quo mixed with classic greed driven by inaccurate understanding of self interest. Claiming to be concerned with protecting property rights and individual liberties, those who seek short-term gains by using public resources have been successfully infiltrating elected bodies of both state and local government, as well as various appointed boards and committees that make rules and advise policymakers. Until the conflicts between the relatively new trend of cultivating nature and the reactions against its demands are resolved, applying the principles described here will be difficult. However, educational efforts needed to explain and implement the policies of sustainability will prove useful, and perhaps they will help accelerate the great transformation that surely lies ahead.

Selected indicators, why they are important, and data sources

1. Per capita water used and wastewater generated

Data sources:
Estimates of the amount of water withdrawn and the volume of wastewater treated could be based on state permits and operations of community water and sewer systems.)

Water conservation and management are priorities in Georgia, especially on the coast. Water withdrawal and wastewater discharge are critical to both water volume (stream flow) and water quality. Improving water conservation is being given strong emphasis in the Georgia Water Resources Management Plan. Reducing the amount of water used per person is the lowest cost way of ensuring there is water to meet the needs of an expanding population.

2. Toxic release permits and reported emissions

Data sources:
Toxic Release Inventory (EPA) and Air permit enforcement records of Georgia Environmental Protection Division (EPD)

The amount of toxins being released under existing permits is reported by EPA, so this is an existing data source. Public health is commonly believed to be threatened by toxic chemicals in our air, food, and water – and with good reason. Respiratory diseases are rising among children and the elderly, while cancers are also common. Environmental pollution, and the perception of it, can also work against a community's economic interests, especially in areas like the coast, where the environment attracts tourism expenditures.

3. Acres of freshwater wetlands

Data sources:
National Wetlands Inventory (U.S. Fish & Wildlife Service). Acreage estimates could be refined by analyzing landcover using computer mapping generated from satellite and/or aerial imagery.

Wetlands are the kidneys of our landscape, filtering out contaminants before they can get in our streams and rivers. Wetlands also help control flooding by retaining stormwater runoff, while they help moderate the effects of drought for the same reason – slowly releasing withheld water when it is needed. There is an increasing tendency in coastal Georgia to fill wetlands as a means to gain more buildable land, but this results in both flooding of private property and the loss of important wildlife habitat. Protecting and restoring wetlands benefits both the economy and the environment.

4. Volume of trash (solid waste) generated; percentage of waste-stream recycled.

Data sources:
Presumably this could be measured by the amount of cost for local landfill operations or for the amount of waste collected if this service is contracted out. Recycling efforts could be estimated using the records of related sorting operations and/or revenues generated by the sale of recycled materials.)

By reducing the amount of solid waste we generate, the less landfill space is needed, the less energy used by consumers, the lower our water needs, and the fewer air emissions generated. Likewise, the more of our waste-stream that's recycled, the less land fill space is needed, while energy used is reduced in fabricating the recovered material into a useful product. Reduced energy consumption (see next indicator) also means proportional reduction in the resources used in producing energy and in the risks to environmental quality caused by it.

5. Energy use per capita and total

Data sources:
Energy consumption estimates may be available from power company records accessible through the Public Service Commission. These can then be used to calculate per capita amounts based on population estimates.

As previously explained, reducing energy use proportionally lowers the demand for water, since water is used for generating steam and cooling the power-plant's generating equipment. Likewise, emissions produced in generating power will be proportionally decreased, improving air and water quality. (Note: What is emitted into the air eventually falls to earth, and if it doesn't settle on water bodies directly, much of it is washed into rivers, lakes, and oceans by stormwater runoff. Mercury, the most common form of fish contaminant, is largely due to this kind of pollution.)

6. Percent energy from renewable sources

Data Sources:
Again, these estimates will have to be based on information provided by the Public Service Commission for power plants, and by other state sources for vehicle fuels.

The more energy generated from renewable sources, the more sustainable our communities will be. As new sources such as solar, wind, and tidal energy are put into use, proportionally less energy will be produced using fossil fuels and radioactive materials – both of which impose undesirable risks to public health. To the extent that biofuels such as fiber-based ethanol and recycled vegetable oils replace conventional fossil fuels, these too will help reduce unwanted emissions while also advancing us on the path toward energy independence.

7. Acres disturbed per capita, acres or impervious surface per capita

Includes roads, parking lots, rooftops, and other hard materials covering land, which can be estimated from aerial photography and satellite imagery.

Data sources:
As with wetlands, the area of impervious surface can be estimated from an analysis of land-cover based on aerial imaging and computer-assisted mapping. Some of this may be available to local government zoning and property tax offices, and some is maintained by state departments, such as Community Affairs (DCA) and Natural Resources (DNR)

Non-point source pollution from stormwater runoff is a major source of water contamination, on Georgia's coast as well as the rest of the state and nation. The best way to reduce the amount of pollution caused by this source is to limit the area of land covered by impervious surfaces. To do this requires standards for both individual project sites as well as overall development patterns. Urban sprawl tends to increase impervious surface in proportion to the population served because more roadways and driveways are needed for access, and larger structures and parking lots are typically built. (Some national studies have estimated that land disturbance to support development is increasing at twice the rate of population growth.) Tracking this area, both total and in proportion to population, will provide valuable information that can be correlated with water quality standards to evaluate and manage growth to attain greater sustainability.

8. Economic diversity – employment and income by sector

Note: Recommended goal of top 3 comprising less than 50% of total employment.)

Data Sources:
The Bureau of Census produces a detailed economic survey that is updated every five years. More frequently collected data is available from Georgia's departments of Economic Development, Labor, and Revenue, which can provide additional information based on employment, investment, and tax records.

The economic health of the region is an indication of its sustainability – the more diverse the sources of employment and income, the less vulnerable it will be to disruptions in markets, changes in technology, and other factors. To the extent that the region's economy depends on healthy natural resources and the ecosystem services they support, which is significant in coastal Georgia, economic diversity will reflect the quality and suitability of our development patterns in relation to the responsible use of coastal resources. Decline in the relative or absolute level of economic activity in sectors like fishing, tourism (travel services, hotels and restaurants), and outdoor recreation (wholesale and retail business in equipment and supplies for fishing, kayaking, camping, hunting, and photography) would suggest a down-turn in the appeal of these activities, which could be caused by an adverse trend in the quality of, or accessibility to, natural resources. Distinctions need to be made between a possible decline in the desirability or scale of any given sector because of adverse trends versus reaching a saturation point or natural limit. Because growth in individual sectors and the overall economy cannot be infinite, we must use this indicator with sensitivity to be sure that the diversity we seek is not being won at the expense of untenable expansion that cannot be supported responsibly by the natural and built environments.

9. Quality job creation (*wages in new jobs versus average*) and 10. Income disparity

Data Sources: The Bureau of Census produces a detailed economic survey which is updated every five years. More frequently collected data is available from the state's departments of Economic Development, Labor, and Revenue, which can provide additional information based on employment, investment, and tax records.

These indicators may be at odds with the previous one, since economic diversity among sectors tends to feature a disparity in wages and their distribution, both geographically and socio-economically. (For example, many service-sector jobs pay far less than those in manufacturing.) Still, with favorable diversification it is possible to concurrently raise average wages and improve the dispersion of those wages among the population. It will be important to include both average income and some analysis of the degree to which new income sources are benefiting the native population, to ensure that new jobs are not primarily being taken by new residents and that disenfranchised groups are being provided opportunities for economic advancement.

***A note on economic indicators*:** the problem with existing data sources for employment and wages is that there is no basis for distinguishing between environmentally benign and sustainable activities versus those that are causing a decline in the condition and/or capacity of natural systems. For example, service employment devoted to environmental education is treated equally with services supporting the operation and use of coal-burning power plants. Thus, the worthy pursuit of economic diversification and more uniform distribution of income may conflict with the objective of attaining higher levels of environmental quality and sustainability. To be most effective, these objective must be reconciled by creating the capability to distinguish between environmentally compatible and incompatible economic activities.

11. Open space acreage by type – active/passive, forested/pasture, wetland/upland, habitat value, etc.

Data sources:
Considerable effort has been made to map and evaluate the relatively valuable natural landscape through the Natural Heritage Inventory Program, and various land trust organizations have assembled data and done limited assessments in their areas of operation. In addition, Georgia is now in its second of two different greenspace programs, under which state funding has been provided to assist in the surveying and acquisition of open space intended to serve certain priorities, including protection of water quality and preserving valuable wildlife habitat. However, there is no comprehensive, detailed source of information on the environmental value of land. Much of this work will have to be done on a site-specific level, although aerial and satellite imagery can be used to help guide the field assessment to the most promising sites.)

A casual observer may presume that most areas not being actively used are roughly equal in their environmental value, but this is definitely not true. Most of the forested areas in the region (the vast majority of non-urban land) are monocultures of loblolly or slash pine planted for producing pulp needed in paper manufacturing. Many of these areas have been extensively ditched to allow planting, growing, and harvesting under all rain conditions. As a result, the native landscape has been radically altered by a de-watering strategy that has reduced the environmental and habitat value of what was once mixed forests of bottomland hardwoods and long-leaf pine. In addition to causing increased extremes in the low and high flow characteristics of rivers in the coastal plain by accelerating stormwater runoff via ditching, intensive commercial forest operations are conducted using various chemicals (herbicides, pesticides, and fertilizers), which can add to the non-point source pollution of adjacent wetlands, rivers and streams. Although agriculture is far less common in the coastal region than in the rest of Georgia, it, too, can cause environmental problems despite the seemingly benign quality of such non-urban land uses. In evaluating open space (greenspace), those interested in promoting local or regional sustainability need to be selective in distinguishing between the value of these areas, their current uses, the degree to which they could be restored, and the relative value of such restoration. Moreover, the appropriateness of prospective uses needs to be evaluated, compared with existing uses. Much more public benefit can be achieved with a given amount of open space if its selection, use, and location relative to surrounding activities are carefully considered.

12. Number of commuters, average distance of commuting, and 13 Vehicle miles per capita, vehicle registrations per capita. .

Data sources:
The Bureau of Census collects and reports this information, and it is also published in the transportation section of the annual *Georgia County Guide*, produced by the University of Georgia.)

Reducing the distance of commuting, the number of commuters, the average amount of driving and vehicle ownership will decrease emission of air pollutants, while also helping to cut back on non-point source pollution, or at least produce a decline in the rate or proportion of such pollution relative to population. There will be a diminished rate or amount of non-point pollution resulting from less driving for two reasons: (a) by decreasing the average distance driven, as population increases there will be proportionately less road surfaces, which will result in a smaller volume or rate of non-point source contamination from stormwater runoff, and (b) less driving will mean a proportionally lower amount of particulate emissions and reduced levels of these contaminants carried by runoff into our wetlands and waterways.

14. Alternative fuel and hybrid vehicles – public and private.

Data sources: Although the total number of hybrid vehicles sold is reported by the manufacturers, and fuel efficiency standards are set by Congress, there is no known existing source of information that reports this information for the vehicles used within a specific geographic region. Likewise, no common source of data yet exists for the number of vehicles using alternative fuels by the residency location of their owners. As the availability of these fuels improves and the market for them grows, it is likely that data will become more readily available.)

To improve environmental quality, it is not only important to curtail the number of miles driven but also to upgrade the efficiency of vehicles in use so that a given amount of driving produces fewer emissions. Reducing emissions favors improved air and water quality for obvious reasons. Likewise, emission of contaminants and greenhouse gases can be reduced by using alternative fuels such as bio-diesel and fiber-based ethanol, which burn cleaner.

A note on transportation indicators: It is questionable whether the rapid rate of population growth in the coastal region of Georgia can be compensated by reduced driving and more efficient vehicles, at least using existing technologies and fuels. However, two additional alternatives also favor desired outcomes: (1) compact patterns of land development, such a mixed-used communities featuring commercial and residential land uses combined into a small-town type of format, will greatly reduce land disturbance in proportion to population, while also radically cutting the amount of impervious surfaces and the need to drive. And (2) mass transit provided by high-speed trains and hybrid buses could become more acceptable to the public as the cost of fuel and insurance increase and the need for personal vehicles diminishes. Combined, these alternatives could significantly reduce the environmental burden imposed by a given amount of population growth, although their feasibility depends on value changes of residents and consumers, which can be encouraged but not controlled.

15. Number of affordable housing units in proportion to need.

Data sources:
Housing information from various local, state and federal sources is reported in the annual *Georgia County Guide*, UGA. Additional new data sources could be established through community development and building permitting procedures locally.)

Regionally, the affordability of housing has become an increasingly important issue, as evidenced by the number and proportion of mobile homes, sometimes called manufactured housing. This is especially troublesome in the rural counties where such housing units are scattered among many lots where there is little if any water and sewer service and remote locations isolate residents and impose high transportation costs. In more urban areas, lower-income housing is often located near existing or previous industrial activities, where exposure to chemical contaminants imposes health risks for families with young children. The sustainability of our communities will be enhanced by making a concerted effort to ensure that more affordable new or rehabilitated housing is provided as growth continues. This will improve the quality of life for those in lower income brackets, reduce crime, and help eliminate sources of disease and health risks linked to crowded and contaminated conditions. Combining this objective with high-efficiency design standards would accomplish even more.

16. Voter participation rate, state and federal elections.

Data sources:
Election boards report results of all elections, which can be compared with Bureau of Census population data by age group to determine the rate of voter participation.)

Strengthening our democratic institutions by improving voter participation will favorably influence all of the issues covered by the previous indicators. People who vote are more motivated and informed to be involved in a wide range of public activities that improve our communities. Increasing voter participation rate will provide a more responsive and dynamic constituency on the full range of public issues.