

**Coastal Communities and Economies**  
**Strong Economies, Sustainable Communities, and Healthy Coasts**

*“America’s oceans and coasts are priceless assets. Indispensable to life itself, they also contribute significantly to our prosperity and overall quality of life. Too often, however, we take these gifts for granted, underestimating their value and ignoring our impact on them.”*

U.S. Commission on Ocean Policy

*“To improve coordination between local governments, one of the major programs that NOAA uses at the regional and local levels is the National Sea Grant College Program. Sea Grant leverages state dollars on a 2:1 federal to state ratio. It is a great program where extension agents just like your agricultural extension agents go out and work with local communities on many kinds of community issues.”*

Scott Rayder, Chief of Staff, NOAA

Coastal communities in America represent vital economic, social, and cultural centers that provide jobs, homes, recreation, and an attractive quality of life for the people who live there. Yet, rapid population growth, and urbanization have lead to rapidly declining environmental conditions along the coasts of our nation. The impact of this development on the natural environment is the loss of the important services coastal ecosystems provide. Accommodating growth while preserving the natural environment is one of the most significant, if not, the most challenging issue facing our country in the years ahead. Cumulative impacts of human development on coastal ecosystems have created conditions that are fundamentally unsustainable. Without immediate attention, we face the prospect of losing many of the environmental gains that we have made over the past decades. More importantly, we stand to pass along to future generations – our children – a place and a standard of living that is severely diminished. NOAA Sea Grant is uniquely positioned to enable our coastal communities to take stock of their resources and to prepare for a sustainable future. The challenges faced by coastal communities cry out for the kind of services that NOAA Sea Grant can provide, but we will need a significant enhancement of resources to meet the coming challenges. **This paper provides details of the challenge and outlines our plan of action**

### **The Challenge**

Coastal counties in the Unites States cover less than 17 percent of land area of the country, but they are home to 53 percent of the population. A study of coastal population trends predicts average increases of 3,600 people a day moving to coastal counties, reaching a total population of 165 million by 2015. These figures do not include the 180 million people who visit the coast every year. (U.S. Commission on Ocean Policy). In just 15 years, the population in coastal counties is projected to grow by 27 percent. Fourteen of our largest cities are located along the coast. The nation’s top 20 oceanic and Great Lakes coastal metropolitan areas are on track to add 32 million people by 2025 – and expand their urban footprint by 46 percent! The Pew Commission reports that one-quarter of all land in the U.S. converted from rural to urban area since European settlement has occurred in just the last 15 years (an area the size of Ohio). If the trend continues, 68 million acres of additional land will be developed by 2025.

The dramatic growth of coastal urbanization is clearly having numerous and profound effects on coastal ecosystems and extending throughout the watershed. There is a growing realization among scientists and practitioners that urbanization represents the single most dramatic and dynamic engine of human alteration to coastal ecosystems in our history. These ecosystems represent the most ancient, complex, and productive on Earth, possessing the capacity to supply nearly two-thirds of the world’s sea food.

As coastal populations have grown so also has their vulnerability to coastal hazards – winds, waves, and floods generated by hurricanes and other major storms, as well as physical impacts caused by tsunamis, land subsidence, coastal erosion and long-term shoreline changes. All of these risks are compounded by projected sea level rise. The social and economic consequences of these events are dramatic. The environmental consequences of coastal development are however the most insidious. As a direct result of coastal development:

- More than 20,000 acres of vital, irreplaceable coastal habitat disappear each year,
- 60 percent of our coastal rivers and bays are degraded by nutrient runoff,
- Wastewater effluents exceeding 2.3 trillion gallons enter our coastal waters every day.
- Oil equivalent to the Exxon-Valdez spill enters our coastal waters every eight months.

Urban sprawl increases the extent of the built environment, such as industrial facilities, commercial buildings, residential houses, parking lots, roads, etc., degrading the coastal environment. By 2025, more than 25 percent (by area) of coastal watersheds will be covered by impervious surfaces – 60 percent in the mid-Atlantic region! Evidence indicates that ecosystem health is seriously impaired when the impervious area in a watershed reaches 10 percent. If current coastal growth trends continue, many healthy watersheds will cross the 10 percent threshold over the next 25 years

Finally, the unsustainable use of energy, water, and materials in our coastal cities and communities also has contributed to the unprecedented degradation of coastal habitats, and to pollution of our air and water. Polluted waters impact water-based business and recreational activities, with attendant economic costs. Largely unrecognized is the fact that the actual design of our buildings and communities also greatly affects the health of habitats and ecosystems. Currently, the built environment in coastal areas is remarkable inefficient in its use of energy and water -- two precious natural resources -- and in its handling of waste materials. Addressing these issues as well is part of the challenge we face in bringing about sustainable coastal communities.

### **Sea Grant's Role**

America's coasts face unprecedented challenges. While these problems may appear insurmountable, many of the intellectual resources needed to solve them are found within our university systems. Our universities have the most highly trained scientists in the world, but the connection between what happens in university laboratories and the needs of local communities is at times tenuous. We are urgently in need of strengthening the mechanism that connects university resources with local communities. The mechanism that puts the tools and science of sustainability into the hands of citizens and local officials, and enables local citizens to create resilient communities and economies while preserving local environments is the NOAA Sea Grant Program.

Sea Grant is particularly well suited to provide solutions to the problems caused by the overdevelopment of our coasts because of the interdisciplinary nature of our research and extension effort. While most academicians and agency personnel focus in on a narrow range of problems within their area of expertise, Sea Grant brings together disparate experts from the University and the community to attack problems from a number of angles. We are now addressing many of the critical problems addressed above, but in just a fraction of the places our model could be applied. Successful programs in coastal hazard identification and mitigation, waterfront redevelopment, and ports, harbors, and marinas have been developed by Sea Grant and have addressed building more resilient coastal communities. We could substantially expand the application of the Sea Grant model to significantly address the much broader problems facing our coastal communities but it will take a concomitant increase in resources.

***A substantial expansion and revitalization of Sea Grant is needed***, however, to take full advantage of our university resources. The recent expansion of the Sea Grant coastal community development program, for example, has unleashed a pent-up demand for services that we are not able to provide under current allocations. The demand for university engagement is immediate and pressing.

Sea Grant has always played a powerful role as an information broker in the coastal community. Never has there been a greater need for a neutral, credible broker than in the area of coastal growth and development. The number of institutional and private stakeholders in this arena far exceeds those of our traditional clientele. We cannot even begin to approach with this new clientele the level of services provided in that past to our traditional clientele without a very significant expansion of our capabilities.

The growth and development issues faced by local coastal communities are aggregated upwards into larger problems that must be addressed on a national scale. The unique, vertically integrated research, extension, and education structure of Sea Grant that extends seamlessly from the national to the county level will enable NOAA to comply with its coastal mission of sustaining healthy coasts.

Sea Grant can provide leadership in **five crucial areas**:

1. **Identifying issues at the local level** -- Sea Grant through its network of extension agents has lines of communication into coastal communities. Sea Grant personnel know the issues that affect their communities and actors who will be involved in their resolution. We can also help coastal communities work across political boundaries to **protect shared coastal resources because of the breadth of our network**
2. **Marshalling resources both nationally and locally** -- Sea Grant functions at both the national and local level and is able to take advantage of funding opportunities at both levels. Through the National Sea Grant Program and our partners in NOAA, we can work together with other federal agencies (e.g., EPA) with mandates to address the problems of development to guide federal resources where they will do the most good. Sea Grant also works with state and local partners to identify local funding opportunities and talent that can be used to address problems associated with coastal development
3. **Conducting research that helps coastal communities identify sustainable thresholds and achieve a balance between environmental and economic sustainability** -- National Sea Grant College Program can make essential contributions to achieving research goals. The state Sea Grant programs have the organization and infrastructure necessary to fund research and conduct educational activities that will expand understanding of how the built environment impacts coastal ecosystems, and how that environment can be modified to decrease environmental footprints. Sea Grant's current strategic plan focuses on promoting ecosystem-based management and on involving constituencies from government, universities, the public and the private sector, all of whom are needed to strengthen the U.S. research enterprise. Sea Grant can use the funds it leverages to set the research agenda at its home university. Universities are the very places where the interdisciplinary research that needs to be done can be undertaken. The University is rich in the people resources needed to conduct cutting edge research into the form and function of coastal community development
4. **Building community capacity so that people can determine their own destiny** -- The ultimate goal of this effort is to empower the community to be able to make their own wise, informed choices and to be able to guide development in a way in which the environment is

protected and the economy is thriving. Sea Grant is well suited for this task: we have been in the business of empowering communities for nearly 40 years.

5. **Helping communities plan beyond their political jurisdictions to protect coastal resources they share with their neighbors** -- Coastal resources including water, fisheries, and recreational opportunities cross political boundaries. However, land management and growth decisions that impact these resources are made at a much smaller scale. Often impacts made by a collection of communities place a greater burden on the resources that impact all involved. Sea Grant has research and outreach staff that operate at the state, regional and national scale and can help communities work together to plan for their collective futures that sustainable coasts will support.

### **Our Vision: Strong Economies, Sustainable Communities, and Healthy Coasts**

*Sea Grant envisions America's coasts accommodating healthy communities that co-exist with well-functioning ecosystems and are sustained by vibrant and diverse economies. This pattern of balanced growth is the product of a responsive governance structure that encourages public involvement, embraces best available scientific knowledge in our universities and addresses at many scales the needs of a diverse and growing coastal population.*

**Strong Economies:** Living and non-living marine resources and coastal amenities sustain local and national economies through the fisheries and aquaculture, seafood processing, trade, energy, and tourism and recreation enterprises they support. Urban ports and waterways continue to accommodate expanding international trade, staging areas for off-shore industries, growth in recreational boat use and ownership and changes in fishing fleets. Where industrial change left vacant coastal land and buildings, and obsolete infrastructure, these areas will be recaptured for new marine enterprises, or where marine use is not feasible, for public use and access, and planned mixed-use developments that brings enjoyment to residents and visitors alike (see Attachment A).

**Sustainable Communities:** Coastal communities ranging in scale from metropolis to rural village have minimized their environmental footprint through efficient use of land, energy and water; adoption of compact, easily serviced urban forms; use of best conservation practices in transportation, environmental controls and waste management and, other "Smart Growth" principles. Individual buildings respond to their unique site characteristics. Through the siting of development, construction techniques and public education, communities will achieve resilience to coastal hazards and environmental change (see Attachment A).

**Healthy Coasts:** Within surrounding coastal watersheds impervious surfaces have been minimized, run-off filtered, held and returned to ground and surface waters so as to protect aquifers and coastal water quality. Streams adjacent to agriculture and forestry are buffered by riparian vegetation to retain their biological integrity. Rural landscapes retain corridors and connections for wildlife. Wherever possible damaged landscapes and riparian areas will be restored (see Attachment A).

**Responsive Governance:** Coastal communities function for the benefit of broadly diverse stakeholders because governmental institutions adopted the principle of open, accessible decision-making. Elected officials implement this principle through facilitated meetings, workshops and open public hearings at all stages of community planning. Issues will be addressed through governance bodies operating at scales appropriate for their resolution: regional, watershed, municipal, or local neighborhood.

**Informed Decision-Making:** Decisions requiring specialized technical knowledge and skills have been made by using the best available information from the natural, social and policy sciences and engineering found in our universities. Decision-support tools and geospatial information systems that are transparent to the end user trained to understand them will be routinely applied to reduce the risk of irreversible harm to natural resources and human health and safety.

**Adaptive Management:** Key indicators of social, economic and environmental well being, developed through consensus, will be monitored constantly – or at predetermined intervals. This provides feedback to elected officials and the public they serve about how well their decisions are realizing the objectives of sustainable communities and economies. Consequently they will have early warning of divergence from the desired trajectories permitting corrective action to taken, and encouragement where their work has contributed to achieving sustainability.

### **A New Sea Grant**

As described in the 1966 National Sea Grant College Program Act, Congress intended for Sea Grant to have a broad mandate to develop programs that achieve the wise use and development of coastal resources. The program outlined in the previous section fulfills the original Sea Grant promise of wise use and development of coastal resources by building a comprehensive suite of programs designed to achieve that purpose. This community's program provides a new organizing principle for Sea Grant, one that focuses Sea Grant's many assets on emerging problems caused by coastal growth.

The NOAA strategic plan and the US Ocean Commission report clearly state that coastal issues must be addressed in a multi-disciplinary manner and at the ecosystem level. Decisions made by coastal community decision-makers greatly impact coastal ecosystems and an expanded Sea Grant program in coastal communities represents a new organizational paradigm for considering community/ecosystem interactions. Indeed, by implementing a major communities program, Sea Grant will be positioned to lead NOAA and the nation to address the greatest threat to our coastal and marine environment – unplanned and runaway coastal community growth.

A fully developed coastal communities and economies program will add tremendous value to Sea Grant's portfolio and complement Sea Grant's investments in related thematic areas. For example, developing a new knowledge base and training community leaders to protect the marine environment while growing their economy will require the expertise of ecologists, aquaculturists, fisheries scientists, coastal hazards specialists and more. In turn, these more traditional Sea Grant program areas will benefit from communities that consider the relationship and impact of their decisions on the ecosystem and the economy. In addition, by building needed capacity in the social sciences (law, urban planning, economics, sociology, architecture, GIS, etc.) to assist community decision-makers, these same social science assets that are required will be applied to address research and outreach needs in other thematic areas addressed by NOAA Sea Grant.

### **Resources Needed**

Resources are needed to expand Sea Grant's research and outreach capabilities and to extend a newly created knowledge-base to states and communities struggling with growth issues. A three-pronged approach is proposed to expand the community knowledge base, extend that knowledge base to coastal

decision-makers at the local, state and regional levels, and build local capacity utilizing new tools and the application of new knowledge to promote environmentally sustainable coastal community growth.

Specifically, resources are needed to expand Sea Grant's research and outreach capabilities and to extend a newly created knowledge-base to states and communities struggling with growth issues. A three-pronged approach is proposed that expands the community knowledge base, extends that knowledge base to coastal decision-makers at the local, state and regional levels and builds local capacity through the utilization of new tools and application of new knowledge to promote and enable environmentally sustainable coastal community growth.

**Providing the knowledge base** – Building and cultivating healthy coastal communities require integrated knowledge from a variety of scientific, social science and architectural/engineering disciplines. As a science agency, NOAA is greatly undercapitalized in the social sciences and in design and engineering or the type most needed to address Coastal Community Development (CCD) issues. Sea Grant is NOAA's link to universities that have that breadth of knowledge and the coastal communities they serve. What is needed is collaborative research involving comprehensive new approaches in which research in the physical and social sciences are linked with architecture and engineering studies to increase our understanding of the way in which the built environment interacts with and impacts the ocean and earth systems of which they are a part. This research can also be tied to training a new generation of professionals, scientists and engineers who will build both strong communities and sustain healthy coasts.

Resources needed = \$20 M per year awarded on a competitive basis

**Reaching out to communities** – A recent review of Sea Grant's extension program (Byrne, et. al., 2000) concluded that the number of Sea Grant extension agents needed to be substantially increased in order for NOAA to successfully engage the coastal public. What is clear from the early assessments of the National CCD program is that it is greatly oversubscribed in terms of the demand being generated by coastal decision-makers for information -- greatly exceeding Sea Grant's ability to accommodate it. What is needed is a substantial additional investment to extend the existing university-based outreach infrastructure of extension agents and specialists in all coastal states. This investment will be highly leveraged, because of the requirement for a local match and also because Sea Grant has an impressive track record in leveraging funds through partnerships with other agencies, private foundations and NGOs.

Resources needed = \$ 11.5 M per year

**Building new national capacity** – In recent years, NOAA and EPA have jointly initiated a Federal partnership to apply their collective resources to address coastal community issues through local capacity building. The partnership is being formalized by an inter-agency MOU, which includes staff exchanges, training programs and co-funding of projects. To meet its potential to serve state and local governments the partnership envisions a strong Sea Grant role in delivering products, services, and research results to local community decision makers. To deliver these services a network of National Sea Grant Coastal Community Development Centers is proposed. These Centers would be administered by individual Sea Grant programs and selected on a competitive basis. The Centers would form the focal point for assisting local community development planning and priority setting processes, addressing issues related to the built environment and development, and their potential impact on the coastal environment and assisting communities by helping to organize and bring to bear expertise from both inside and outside of government to directly assist local officials. Experts in the areas of sustainable architectural design and construction, urban and regional planning, development economics, traffic planning, among others would represent the new expertise made available through the Centers.

This new direction will be delivered as education and demonstration to the development communities, educational outreach to the professional community, and provide curriculum changes to the associated colleges and universities thereby bringing new knowledge and skills to today's designers as well as tomorrow's leaders. Example programs would include; 1) teams of experts to be assembled to address specific problems beyond the expertise level of the state or local government. These teams would be assembled and funded under the auspices of the Centers and the request of state or local governments, or 2) state or local governments could develop applications for federal or university resources to be applied to specific state and local coastal community issues.

Resources needed = \$ 8.5 M (National Center = \$ 0.5 M, + 8 regional centers @ \$ 1 M per year)

## Attachment A

### Action Plan: Bringing About Change

Achieving sustainable coastal communities will involve new approaches and new directions for the National Sea Grant program. It will require both a strategic redirection of existing resources, as well as new, additional resources to effect change and achieve the vision of sustainability --- where environment, economy, and community work seamlessly together.

**Strong Economies** -- The U.S. Commission on Ocean Policy's *Preliminary Report* asserts that "... oceans provide tremendous value to our national economy." According to the same report the nation's ports handle over \$700 billion in goods; the recreational saltwater fishing industry contributes over \$20 billion to the nation's economy; the offshore oil and gas industry annually adds \$25-40 billion; and, hundreds of millions of tourists travel to the coasts to enjoy ocean-derived amenities. As a result, between 1970 and 2000, coastal counties grew at a faster rate than the remainder of the country in all measures of economic growth – establishments, employment, wages and gross product– and coastal states now account for approximately 75% of the America's economy.

#### Critical Issues/Situation

Growth has come at a price. In most coastal states accelerated urban development has driven up land values, and often resulted in displacement of many traditional, water dependent enterprises from urban shorelines. Recreational boating access has become restricted by urban growth pressures, while the burgeoning demand for in-water dockage and boat launching facilities cannot be met and often results in congestion and public conflicts.

Other significant water-based enterprises are only beginning to feel pressure from competing uses, and are increasingly concerned about their economic viability. The expansion of major cargo ports, in response to projected growth in international trade, is being constrained by the shortage of available waterfront land on which to expand marine terminals, competition for the waterfront land that is available from non-maritime, waterfront uses, and community opposition stemming from growth-induced urban congestion and pollution.

Yet, while most coastal economies are coping with growth, many non-metropolitan communities in almost all coastal regions of the U.S. are suffering as their resource-dependent economies decline. The underlying causes of decline have been: globalization trends that supplant local industries; resource depletion that restricts the availability of local commodities (fisheries, forestry products, and minerals); and, regulatory restrictions that hamper industrial operations. Many of these communities are ill-equipped to reverse these declines. For instance, coastal communities in the Gulf of Mexico that serve as staging areas for oil and gas production need substantial investments in public infrastructure to support an industry that is moving further offshore and which places tremendous demands on resources, including a literally, eroding coastal land base.

Some non-metropolitan economies have made a successful transition from a predominantly industrial economy to one based on services. Many areas have captured a share of metropolitan-based recreation and tourism markets and second home development, but often struggle with its seasonal nature. Also, increasingly mobile, technology-based enterprises are relocating to the more amenity-rich smaller coastal communities. Amenity-rich smaller communities have attracted retirees and benefit from the local expenditures fueled by their transfer payments–pensions, social security and life savings.

But many of these non-metropolitan coastal communities lack professional planning staffs and modern decision-support tools for making wise land use and economic development decisions. And, while community leaders may have a general sense for what is at risk from the pressures of coastal development and industrial decline, they lack economic and fiscal information concerning the coastal economy's impact on their communities. In addition, the likely economic consequences of the transition to a service economy have not been quantified, and tools are needed to help decision-makers mitigate, and possibly reverse, its negative impacts. Furthermore, the value of healthy coasts for communities has not been calculated, nor have we quantified the impacts of "unsustainable" coastal development.

Improving infrastructure to support community development requires funding at a time when local communities suffer from over-extended municipal budgets. The private sector and, by extension the community, would benefit from knowledge concerning new public and joint public/private financing mechanisms to help put this required infrastructure on place— knowledge that could be made accessible through our universities.

Another significant issue relates to coastal development and effective planning policies. . Planning policies must consider expanding public access to coastal resources and give consideration to priority water-dependent uses. There is also a need for coastal communities to fully investigate concentrating infrastructure and redeveloping existing areas in lieu of developing sensitive, new areas— "brownfields" or "portfields" strategies being championed by NOAA and its partners in EPA.

### **Actions**

1. Solicit research to develop and adapt decision-support tools needed to help communities make prudent decisions about alternative economic futures. Examples include employment allocation models and economic impact models.
2. Solicit research to analyze the contribution of coastal-dependent industries on local economies and the impacts of alternative development scenarios, including the effects of changes stemming from maintaining or restoring healthy coastal ecosystems.
3. Research case studies of successful economic development strategies that can be transferred to coastal communities.
4. Conduct economic analyses of submerged land lease rates and policies to better understand their impact on siting and retaining coastal-dependent industries in urban shorelines.
5. Help communities develop indicators of economic well-being in order to measure Sea Grant's effectiveness in bringing about positive change to coastal economies.
6. Solicit research to analyze the impacts to local residents from a change from a primary industrial economy to a service economy.
7. Increase the recruiting of extension agents and specialist with background in economic development so that they can interpret the result of economic studies to aid the local community.
8. Outreach and education staffs will engage coastal communities in visioning, resource inventories, and related planning activities, analysis of development policies, and education of community leaders regarding the range of opportunities for economic transition and coastal stewardship.

## Outcomes

- (1) Sea Grant anticipates that the coastal communities where it and its partners play a significant role in addressing growth management issues over the next ten years, will experience a positive change in Quality-of-Life, economic, and environmental health indicators and,
- (2) Communities that employ Sea Grant-led visioning and planning techniques will have more diverse and robust economies –including more profitable coastal dependent industries –than those that do not use these methods.

**Sustainable Communities.** Urban and suburban sprawl directly affects habitat, ecosystems, endangered species, and water quality through land consumption, habitat fragmentation, and replacement of natural cover with impervious surfaces. Development patterns and practices also affect environmental quality indirectly since urban form influences the travel decisions that people make. For example, certain patterns of development encourage increased use of motor vehicles that is associated with increased consumption of gasoline, while other patterns encourage walking– reducing the use of energy as well as fostering better health.

## Critical Issues/Situation

The ecological footprint, or the overall impact of our coastal communities on their surrounding ecosystems, is enlarging faster than the rate of population within those communities. Coastal communities are consuming open space, natural resources, and energy, and discharging waste and toxic substances at unprecedented rates. A leading cause of this unsustainable condition is the diffuse pattern of urban and suburban development that characterizes most of our coastal communities.

The environmental consequences of vehicle travel and vehicle dependency pose a potential threat to long-term community and environmental health. Highway emissions cause chronic health problems, affect water quality, and impose economic costs stemming from crop damage, building and property damage, and damage to visibility. Transportation is also a generator of noise and a major contributor of greenhouse gas emissions leading to global climate change. Vehicle travel has increased substantially in recent decades and much of the increase is a direct result of changing development patterns. Highway congestion cost the nation \$69.5 billion in wasted fuel and lost time in 2003.

Direct environmental impacts of current development patterns include habitat loss and fragmentation, and degradation of water resources and water quality. Building on undeveloped land destroys and fragments habitat and thus displaces or eliminates wildlife communities. The construction of impervious surfaces such as roads and rooftops leads to the degradation of water quality by increasing runoff volume, altering regular stream flow and watershed hydrology, reducing groundwater recharge, and increasing stream sedimentation and water acidity.

Unsustainable building design and manufacturing methods are another cause of enlarged ecological footprints. . Poorly designed buildings consume inordinate amounts of energy and resources, develop unhealthy indoor air quality and cost the inhabitants more than is necessary. Conversion of land for development produces 40 tons per year (per acre? Total US?) of new sediment during construction. (Need a more understandable metric here. What about an example or description of inefficient manufacturing methods introduced above?)

Well designed, compact coastal communities preserve natural areas, including farm, land natural ecosystems and recreational areas, and maximize quality of life. The land preserved by compact growth provides a host of ecological services, including water quality improvement, hydrologic attenuation, and wildlife habitat preservation among many others. Well designed coastal communities can improve water quality by reducing total impervious surface area and by regulating the flow of storm water. Compact communities substantially decrease needed infrastructure and vehicle miles driven, while increasing pedestrian and bicycle opportunities and fostering human interactions.

### **Actions**

1. Hire and train a cadre of new extension agents for all coastal areas experiencing growth versed in urban planning, transportation and land use issues that will bring local community leadership and planning entities together to plan for sustainable strategies that protects valuable coastal natural areas and sensitive areas, minimizes impervious areas, and protects valuable coastal ecosystems, resources and water quality.
2. Recruit a new generation of university extension specialists with appointments in relevant academic departments. These specialists will help guide and direct a whole new sustainable research agenda including helping coastal cities and communities determine the sustainable carrying capacity for coastal resources and critical water supplies and development of land use decision making, scenario building, or additional modeling tools utilizing GIS, watershed, and runoff models.
3. Develop partnerships with local government officials and community stakeholders to increase community walkability, promote public transit, change building and land-use codes to increase energy efficiency, and establish procurement standards that increase energy efficiency and partner with coastal communities and utilities to develop and implement the use of renewable and regenerative energy resources.
4. Study alternative land use arrangements to help guide local decision makers make wiser –more sustainable–planning choices.
5. Organize and foster regional cooperation and partnerships among local coastal planning jurisdictions to promote sustainable growth strategies that protect coastal natural resources and water availability.
6. Provide training based on research to consumers and service providers that leads to improved energy efficiency of buildings, links consumers with energy service companies to improve the energy efficiency of government, academic/research, commercial, industrial and residential buildings, and that leads to improved energy efficiency through coastal community design.
7. Support research that: develops renewable, regenerative energy technologies (wave, thermal, current, tidal, wind, solar, bio-diesel); explores coast-specific building design that promotes energy efficiency, develops benchmark energy use by buildings and communities; explores coast-specific building design that promotes energy efficiency; and, explores coastal community design that promotes energy efficiency
8. Investigate impacts of global warming on coastal communities and characterize the economic and environmental impacts of greater energy efficiency will have on well designed communities.
9. Research and present case studies of successful community planning that reduces the environmental

footprint

### **Outcomes**

County/Municipal officials change local ordinances to support sustainable communities that protect valuable environmental services. New type of renewal regenerative energy technologies are developed and integrated in the design of sustainable coastal communities. New walkable communities will better utilize land resources while protecting environmental services. A new generation of Sea Grant Extension Agents will be working in each coastal county, assisting local government, developers and the community in developing sustainable communities. Research will produce new tools for the use of GIS, watershed and runoff models, and land-use decision making tools to apply to building sustainable communities.

**Healthy Coasts** -- Land development decisions and resultant growth patterns in coastal America are threatening the sustainability of coastal ecosystems. This is occurring in spite of our awareness that today's development decisions should be made with sustainability in mind - so as to "meet the needs of the present without compromising the ability of future generations to meet their own needs." (*Our Common Future*. Brundtland Commission. Oxford University Press, 1987 move to footnote<sup>2</sup>). Better land use planning and coastal resource management are needed to protect the integrity of coastal ecosystems.

### **Critical Issues/Situation**

Regional or watershed-based planning is needed to protect entire coastal ecosystems. But at present, coastal land use planning and community development programs are almost always confined by local political boundaries. We are challenged to link incremental land use decisions - to work within new analytical frameworks - so that larger ecosystem concerns can be addressed.

Natural systems provide the foundation upon which human communities exist. Rural coastal areas are experiencing "linear sprawl" similar to the suburban "growth rings" around major metropolitan areas. Sprawling coastal development reduces, fragments, or degrades coastal habitats that are essential for fish and wildlife; it alters natural sediment flows and contributes to coastal water pollution. Increased development puts more people and property at risk from coastal hazards such as sea level rise, coastal storms, coastal erosion, tsunami and land subsidence. Impaired coastal ecosystems jeopardize local tourism, undermine local coastal dependent industries, and ultimately hinder all economic development efforts.

### **Actions**

Sea Grant's strategic plan embraces the principles of sustainable development. Its programs aim to achieve healthy, vibrant, revitalized coastal communities. Our research, education and outreach programs have assisted the public, coastal planners and local leaders in determining how they want to grow and in recognizing the importance and value of modifying the way they grow. Sea Grant is placing the science of ecosystem sustainability in the hands of citizens and local officials. Research and outreach projects routinely provide the public with an understanding of the linkage between land use and water quality/quantity. To address the issues of the 21<sup>st</sup> century Sea Grant will:

1. Solicit research that will help coastal cities and communities determine the sustainable carrying capacity for coastal resources and critical water availability through the research and development of land use decision making tools including scenario building, additional modeling tools utilizing GIS, and watershed/runoff models.

2. Apply research and outreach efforts that will lead to innovative land development techniques, improved site designs, and best management practices (e.g. low impact developments, green building design, natural areas planning, contiguous wildlife habitat, bio-retention areas, and vegetative swales).
3. Provide technical, planning and process assistance (e.g. community visioning, development planning, meeting facilitation) to coastal communities and local government officials to inventory and analyze land use development policies and scenarios affecting critical coastal resources.
4. Foster coastal watershed planning and management efforts that link to comprehensive land use planning on a regional scale encompassing multiple planning jurisdictions.
5. Support a significant part of the science-based research to develop renewable, regenerative energy technologies (e.g. wave, thermal, current, tidal, wind, solar, bio-diesel); and to characterize the environmental and economic impacts of energy choices.
6. Promote comprehensive land use planning that protects valuable coastal natural areas and sensitive areas, minimizes impervious areas, and protects valuable coastal ecosystems, resources and water quality.
7. Assist coastal communities with brownfield and greyfield programs as they attempt to concentrate infrastructure and redevelop existing areas to help protect environmentally sensitive fringe areas from development.

## **Outcomes**

Sea Grant, because of its experience with science-based outreach, will play a leading role in coastal environmental planning efforts by expanding research and extension assistance to coastal communities. This will be accomplished by assisting local to engage sound science and produce more informed land use decisions that protect and restore coastal ecosystems, critical wildlife habitats, and water supplies vital to a healthy and vibrant coastal community and economy.