

National Sea Grant College Program – Sustainable Coastal Development Focus Team Budget Initiative Proposal

The Sea Grant Sustainable Coastal Development focus team has developed a plan of work designed to implement the 2009-2013 Strategic plan goals and objectives for this focus area. The team carefully considered each goal and objective and asked the question “what administrative action is necessary for this goal to be realized?”. The results of our deliberation appear in Attachment 1 of this document. Throughout this document specific strategic plan goals and their corresponding objectives are referenced in “()”. A (3.1) references goal 3 objective 1.

Most goals and objectives can be implemented with some facilitative action by the focus team. However, **Four key funding initiatives are critical to implement all of the Strategic Plan goals.** Two of these initiatives require modest investments (1-5 million annually). Two initiatives require major investments (>10 million annually).

Sustainable Coastal Development focus area is a relatively new focus for Sea Grant. Our coastal communities are facing unprecedented challenges as they face record development rates, record unemployment, and anticipate rising coastlines and changing storm water flows due to climate change. The sustainability of our nation’s coastal communities will depend on their ability to access the best science and make informed decisions that plan land use change and economic development that only impacts or uses coastal resources, water, energy, air, biodiversity, within sustainable limits. To ensure that communities have the scientific information and technical understanding necessary to make these decisions, the Sea Grant strategic plan calls for a building of internal technical capacity with expertise in new discipline areas (natural resource based planning, economic development, and climate change), conducting new research that integrates natural and social science focused on economic and ecological sustainability issues, and developing the programs and demonstrations necessary to implement concepts of coastal sustainability in our cities and communities.

The specific research, outreach, capacity building, and training activities we propose, fill unique niches necessary to assist coastal communities in achieving sustainability. Sea Grant will partner and coordinate with agencies working on related topics (e.g. National Estuarine Research Reserve System's Coastal Training Program, State Coastal Management Programs, NOAA CSC training programs, Coastal Community Planning and Development training, EPA's Climate Ready Estuaries Program, Cooperative Institute for Coastal and Estuarine Environmental Technology's (CICEET), USDA CSREES, etc.) to leverage the effectiveness of our research and outreach for coastal communities.

The 4 initiatives that follow detail the specific actions and budgets required to fully implement the 2009-2013 Sustainable Coastal development strategic plan.

1. Building capacity within the national Sea Grant network to conduct outreach for sustainable coastal development (1.4, 2.1, 3.2a, 3.2b, 3.3): ***\$3.8 million annually for 5 years***
2. NSI Research Competition: ***\$1-3 million annually***
 - Identify land use indicators and tipping points that threaten coastal, ocean, and great lakes ecosystems and footprints needed to sustain these ecosystems. (2.2): ***\$2 million***
 - Creation of new economic and market research-based decision tools (1.1): ***\$2 million***
 - Identify risks and benefits of renewable energy technologies (2.3): ***\$2 million***
 - Develop decision tools for planning future coastal communities (3.2b): ***\$1 million***
3. NOAA Sea Grant Research and Extension Center of Excellence for Sustainable Coastal Development (2.2): ***\$12.3 million annually***
4. Climate change and sustainable coastal development (2.4): ***\$15 million annually***

INITIATIVE 1: BUILDING CAPACITY WITHIN THE NATIONAL SEA GRANT NETWORK TO CONDUCT OUTREACH FOR SUSTAINABLE COASTAL DEVELOPMENT

Budget Request: \$3.8 million annually for 5 years

The science of assessing and evaluating the impacts of land use practices on sensitive coastal ecosystems has come into its own only in the last ten years. The science of climate change has followed much the same trajectory. As the science has evolved, Sea Grant College programs and their partnering universities have attempted to build the capacity to facilitate coastal communities' efforts to address these issues. While sprawling development patterns overtook coastal landscapes during the last decade, the need for research, education, and outreach on sustainable alternatives continues to grow. Because demand from cities and towns for decision support information, processes, and tools far outstrips the capacity of existing Sea Grant Extension personnel, hiring and training university specialists with academic appointments in appropriate departments to help guide and deliver a sustainable community research and outreach agenda is urgently needed. Enhancing partnerships within NOAA and other federal agencies, as well as across-disciplinary university departments will also be needed to fill this need for service.

Sustainable Coastal Development Extension Enhancement (\$2.5 million annually)

We propose a competition among state Sea Grant programs to support twenty SCD specialists for five years (\$125,000 for each position and corresponding projects). The competition would be modeled after the successful Fisheries Extension Enhancement (FEE) program. Successful applicants would build partnerships with national, state, regional, and local organizations to insure that the work will continue after the initial five-year period. The specialists will focus on:

- Development and implementation of decision-support tools [3.2b]
- Locally responsive research and outreach [3.3]

Sharing Decision-Support Information, Processes, and Tools [3.2b]

Sea Grant programs will build local capacity to evaluate alternative future scenarios for coastal communities. This requires collaborative processes that bring all stakeholders to the table as decisions are being made, and research-based decision tools that can be used to inform decisions about sustainable coastal resources, tradeoffs, and options. Sea Grant staff will provide facilitation and leadership that empowers community leaders to eliminate barriers to participatory decision making and provide training in decision support tools and data to make informed sustainable decisions. Partnerships with the National Estuarine Research Reserve's Coastal Training Program and NOAA Coastal Services Center will be drawn on to expand capacity.

Locally Responsive Research and Outreach [3.3]

Sea Grant programs will conduct locally responsive research and outreach efforts that will lead to innovative development techniques, improved site designs, and best management practices. We envision projects similar to those funded by the EPA/NOAA Coastal Smart Growth Implementation Assistance partnership. Sea Grant programs partnered with coastal communities to facilitate policy analysis (e.g., code reviews, infrastructure siting policies, etc.) and public participatory processes (e.g., visioning, build-out analysis, etc.).

Regional Economic Development Specialists [1.4] (\$1.2 million annually)

Sea Grant will fund six regional specialists (Northeast, Mid Atlantic, South Atlantic, Gulf Coast, Great Lakes, West Coast) affiliated with institutions of higher education that will help build partnerships and foster regional cooperation among local government officials, community stakeholders, and regional planning organizations that help promote sustainable growth plans that balance economic development and protection of coastal resources. Regional specialists will have ties to an academic department and a Sea Grant extension program and will have seed funds to implement projects in conjunction with Sea Grant programs in the region. Partnerships would be encouraged with economic development specialists at the Cooperative Extension Services of the Land Grant Universities and with EDA-funded University Centers in their region.

(6 regional specialists @ \$200,000 each = \$1.2 million total)

Internal Workforce Development and Training [3.2b, 3.2a] (\$100,000 annually)

Currently Sea Grant has a recognized Sustainable Coastal Community Development network populated by agents funded under the Coastal Communities and Economies initiative. These agents have worked at the community level largely focusing on implementing the Nonpoint Education for Municipal Officials (NEMO) program and smart growth principals. To achieve the sustainability principals outlined in the 2009-2013 strategic plan, outreach to communities must go beyond existing programming and include participatory decision-making [3.2b], economic development, [1.4], and training and sharing of decision tools and resources related to Natural Resource Based Planning [3.2a] that help communities achieve economic and ecological sustainability. While enlarging Sea Grant's extension capacity through new hires is critical, there is notable economy and exceptional impact that results from investing in the professional development of the current extension workforce. Existing SCCD personnel are seasoned in the Sea Grant mission, experienced in the range of extension methods, and well connected and respected in their regions. But given the relative newness of the SCD focus area to Sea Grant, some of these veterans lack the advanced content and technical education and training that coastal communities require to inform sustainable development decision-making. To that end, we propose a formal 1-2 day continuing education program conducted at the annual SCCD meeting (held in conjunction with a professional conference) annually with extra web-based or site-based training as required.

INITIATIVE 2: NSI RESEARCH COMPETITION

Budget Request: \$1-3 million annually

Coastal Communities have demonstrated the interest to implement sustainable strategies that has outpaced the science that is available to them. Answers are needed to critical questions in 4 topic areas to assist coastal communities in achieving sustainability. A regular NSI competition is required to engage university-based peer reviewed competitive research in the following 4 topic areas necessary to generate discoveries required by coastal communities to achieve sustainability. Annual NSI's can focus on one or more of the 4 topics described below depending on resources available. When possible, state Sea Grant programs should focus requests for competitive research in these 4 topic areas.

SCD RESEARCH AGENDA -- IDENTIFY LAND USE INDICATORS AND TIPPING POINTS THAT THREATEN COASTAL, OCEAN, AND GREAT LAKES ECOSYSTEMS AND FOOTPRINTS NEEDED TO SUSTAIN THESE ECOSYSTEMS. (2.2) (\$ 2 million)

In order for coastal communities to achieve ecosystem sustainability, they must first understand what land and habitat components (land area, natural vegetation, water quality and quantity) are necessary to sustain these ecosystems. Questions that must be answered include: How much coastal wetland habitat do we need to sustain fish production and where should it be located? How much green infrastructure is needed to regulate storm runoff into coastal ecosystems and where should it be located? How much green infrastructure is needed to regulate nutrient flows into aquatic and coastal ecosystems and where should it be located? What green infrastructure is needed to maintain travel corridors, migrations, and exchange of genetic material between ecosystems and where should it be located? Only when answers to these questions are obtained, can communities enact policies, ordinances and land use plans necessary to maintain the land footprint needed to sustain coastal ecosystems.

Communities are increasingly understanding the relationships between land use changes and impacts these changes have on coastal and aquatic ecosystems. For example, the National NEMO network (which includes many Sea Grant Programs), have been successful in identifying the % of impervious surface cover as a critical tipping point that impacts aquatic ecosystems. Generally, studies have shown that when a watershed's impervious surface cover exceeds 10%, stream ecosystems are impacted (there is a shift from specialists to generalist species and invasive species increase). When the % of impervious surface cover exceeds 25%, streams are degraded (meaning specialist species disappear, and invasive species dominate). This simple indicator of % impervious surface cover has been extremely effective in assisting communities in identifying tipping points (10% impervious cover and 25% impervious cover) that cannot be exceeded without impacting their streams. Sea Grant programs have been successful in working with communities to measure their existing impervious surface cover, and implement land use change policies, ordinances, comprehensive plans, and smart growth strategies necessary to keep a community's impervious surface cover below levels that impact their streams.

We need to build upon this model to develop additional indicators and tipping points communities nationally can use to guide land use change and development decisions that will not negatively impact coastal, ocean and Great Lakes Resources. Questions include: What are the indicators and tipping points that indicate when oyster beds will be impacted? What are the watershed indicators and tipping points that identify when hypoxia will result or increase? What are the land cover or land use indicators and

tipping points that indicate when coastal ecosystems are impacted or degraded (i.e. loosing specialist species and increasing generalist and invasive species)? What are the tipping points for ground water and surface flows needed to sustain stream and coastal ecosystems given climate change and what water withdrawal and storm water input rates are therefore sustainable? Once these new indicators and tipping points are developed, the SCCD extension network can work with their coastal communities to enact policies, ordinances and strategies to ensure that tipping points are not exceeded thus sustaining coastal ecosystems.

SCD RESEARCH AGENDA -- CREATION OF BETTER ECONOMIC AND MARKET RESEARCH-BASED DECISION TOOLS (1.1) (\$ 2 million)

There is a growing realization that society must quickly find ways of integrating critical ecosystem services into regional development plans and the management of urban regions, but the science-based decision support structures and tools that can help urban regions accomplish this are not fully developed. The loss of open land and functioning ecosystems impacted by development is essentially an irreversible process, and little insight is available to those making land-use change decisions as to what tangible and intangible values are being lost. If society is committed to promoting sustainable communities then it must also be willing to preserve natural capital and conserve the region's natural and water resources. Natural capital is broadly defined as the totality of natural systems that provide current and future flows of service, i.e. resources, flora, fauna, and ecosystems that provide human beings with tangible and intangible goods and services that have real use and non-use economic value. It includes the concept of "green infrastructure."

The research proposals to be funded under this objective should address: What is the stock of natural capital within and at the fringe of our metropolitan coastal cities? How can we best assess the value of this stock (e.g., contingent valuation, hedonic land valuation, etc.)? How much of this value is lost when land use change is accomplished in its current fragmented fashion and when undertaken under a "smart growth" model of regional development? How should the use and non-use value of natural capital best be incorporated into market-based strategies developed to preserve, protect, and enhance environmental and ecological resources -- e.g., if differential tax incentives or the transfer of development rights are used to protect ecosystems or natural resources, how should the assessed value of the properties being protected or the value of the rights being transferred also incorporate the value of their natural capital, in addition to the value of their foregone development potential? Finally, can easily- applied and widely-transferable valuation methods or economic models be developed that would enable urban planners, local officials and others without expertise in econometrics to establish the value of the natural capital within their own communities and regions?

Attention must also be paid to helping communities balance their water dependent uses, recreation, and working waterfronts with other types of competing land uses. A variety of sophisticated economic and spatial models can be used to project future land use patterns (see, e.g., Science Applications International Corp. (2000) *Projecting Land-Use Change: A Summary of Models for Assessing the Effects of Community Growth and Change on Land-Use Patterns*. USEPA Office of Research and Development, Report EPA/600/R-00-098) but these models are often expensive to employ, difficult to interpret, need very specialized expertise to run accurately, and require that substantial information be collected as data input and for calibration. Simpler predictive decision tools must be developed that help communities better weigh the economic consequences of the various land use and economic development choices made

by local officials. Better market-based models can assist local officials in zoning or redeveloping their fragile coastal areas in such a way as to maximize economic benefits to the community while addressing the potential environmental impacts and ecological costs of development. Research is needed to develop simple and effective economic tools and predictive models that can help local officials and planners better assess and compare the economic trade-offs of different development or redevelopment alternatives. The use of such models can help coastal communities fashion more cost-effective development plans and policies and more environmentally sound land use controls for their valuable and vulnerable coastal areas.

SCD RESEARCH AGENDA -- RISKS AND BENEFITS OF RENEWABLE ENERGY

TECHNOLOGIES (2.3) (\$2 million) Because many greenhouse gases (GHG) are emitted from the combustion of both fossil and bio-fuels used in energy production, most policies being developed to address mitigating global climate change (or to slow the rate of such change in order to promote societal and ecological adaptation) also address energy conservation and the promotion of renewable energy resources. Climate change is likely to have a significant impact on coastal communities, making the topic one of special concern to Sea Grant. Renewable energy technologies with reduced GHG impacts include solar, hydropower, tidal, geothermal, and wind technologies. Research is needed to determine the extent that these alternate energy technologies can feasibly and cost-effectively contribute to mitigating climate change by supplementing or substituting for conventional energy generation technologies emitting GHGs. Methods for assessing which of these alternate technologies is most cost-effective in different coastal locations, how they can best be accommodated or retrofitted in developed or developing regions, and which programs and policies are most effective in promoting them are all areas of research interest.

The environmental and ecological risks of these renewable technologies, however, remain largely unknown. For example, the U.S. Department of the Interior and the states of California and Oregon have recently reached agreement to remove four dams on the Klamath River, the third most important western river for salmon, even while recent research suggests that the impacts of hydropower dams on migrating young salmon remain uncertain [see, e.g., Gross L (2008) Rethinking Dams: Pacific Salmon Recovery May Rest on Other Factors. *PLoS Biol* 6(10): e279]. Similar ambiguities exist with the environmental impacts of other types of renewable technologies – for instance, although there is concern about the impact of wind generators on migrating birds, there appears to be little impact of wind turbines on the wintering of farmland birds [see, e.g., Devereaux, Denny and Whittingham 2008 *Journal of Applied Ecology*, 45, 1689–1694] while new research suggests that windfarms might also have a deleterious impact on bats [Baerwald et al. (2008) Barotrauma is a significant cause of bat fatalities at wind turbines, *Current Biology*, 18:16, 26 August 2008, Pages R695-R696]. Clearly, further research is required to better understand the ecological impacts of each of these renewable technologies as they become a larger and more common component of the power grid.

SCD RESEARCH AGENDA – DECISION TOOLS FOR FUTURE SCENARIOS FOR COASTAL COMMUNITIES (3.2b) (\$1 million)

A variety of sophisticated software packages and regional development models are widely used in land use, transportation and economic development planning, but are rarely understood by local officials and citizens – they often remain “black boxes” calibrated and used by experts to crank out data at varying spatial resolutions and for varying time horizons with varying margins of error (none of which are usually clearly articulated to the local “users” of the data). In contrast

to employing complex models, municipalities may instead collect data for their periodic comprehensive planning revisions to quantitatively re-assess the impacts of development over time – data that may include traffic counts, census data, water quality monitoring and gauging stations, utility load data, crime data, building permits, etc. – in order to adjust the stringency of development control in response to these trends or, more commonly, simply in reaction to them (generating policies and interventions that are often “too little, too late”). Finally, some communities may choose to rely on focus groups, charettes, surveys, etc. in order to develop more qualitative measures of the impacts of growth on the perceived quality of life of resident and to develop policies and programs to address these impacts (ignoring the perceptions and desires of those citizens who are not engaged in these participatory processes).

Research is needed on the development of more transparent models that can assist local officials in making better and more sustainable decisions about their community’s or region’s growth. Ideally, these projective models should clearly articulate the range of error in projections and their scale and resolutions should vary according to the significance of the resources being (or to be) managed. Moreover, outputs should be graphic and spatial, allowing clear understanding of different development scenarios under different constraints and development policies, so that citizens can comprehend the different ways that their communities or regions can develop in the future based on the policies adopted today. Finally, such models should be adaptive, with the future scenarios and projections able to be modified by changes in data and user preferences.

Research is also needed to develop better ordinances and regulatory standards for development activities which can potentially address the impacts of climate change. These can include more effective on-site storm water management requirements, green roofs and landscaping that can mitigate urban heat island effects, programs and codes that promote energy and resource conservation, and the use of life-cycle costing and construction materials that are carbon neutral in terms of the development or redevelopment of coastal communities. Economic incentives that can be employed to promote these sustainable development objectives can also be developed and evaluated against command-and-control strategies. In many cases, the optimal public policies promoting sustainable growth are likely to be combination of economic and regulatory initiatives and research should be undertaken to better assess what such a mix should include under various spatial, ecological, economic and development conditions.

INITIATIVE 3: NOAA SEA GRANT RESEARCH AND EXTENSION CENTER OF EXCELLENCE FOR SUSTAINABLE COASTAL DEVELOPMENT (2.2)

Budget Request: \$12.3 million annually

By 2050, more than 70 percent of the nation's population and economic growth is expected to take place in 10 mega-regions linked by environmental systems, transportation networks, economies, and culture. 8 of these mega-regions are coastal. Over the next 50 years, the US. Population is expected to grow by ½ of our 2000 population level and much of this growth will occur in coastal areas (www.America2050.org). The sustainability of our coastal, ocean and great lakes resources are inextricably linked to the sustainability of our nation's economy. The revenues and employment generated by coastal resources and coastal dependent industries are a significant component of our Gross Domestic Product (GDP). In Florida alone the ocean and coastal related economy generates 78% of the state's GDP and reaches \$550 billion annually. (http://www.floridaoceanscouncil.org/economies_report.htm).

The water, food, pharmaceutical products, and energy resources provided by our oceans and Great Lakes are instrumental to sustaining human populations. In addition, the recreational opportunities and aesthetics provided by our coastal resources are a fundamental reason our mega-regions continue to grow in coastal areas.

The only way our nation's communities, cities and mega-regions can sustain their human populations, quality of life, and economies is if they sustain the resources on which they depend. In order to achieve sustainability, communities must be able to identify and protect the footprint required to sustain coastal, ocean and Great lakes ecosystems. (For example, an oyster bed does not just depend on the rocks and water in the bay in which they live. Their survivability depends on the quality of the water entering the bay and this water may be affected by land uses in the surrounding watershed. Therefore there is a *footprint* on the landscape that is imperative to sustaining an oyster bed. There is also a *tipping point* beyond which land use changes will negatively impact the oysters in the bay. In order for an oyster bed to be sustainable, the coastal community must understand where the *footprint* is that sustains the oyster's ecosystem that must be maintained and protected when necessary and the *tipping points* for land use within this *footprint* that cannot be exceeded if the oysters are to survive. Until this is understood, communities cannot implement land use policies, or develop comprehensive growth plans that are sustainable.)

In order to achieve sustainability, our nation's planners, community leaders, and scientists must work together. The ***NOAA Sea Grant Research and Extension Center of Excellence for Sustainable Coastal Development*** would provide the structure necessary to engage our nation's best scientists, and institutions in working with coastal community leaders to make new discoveries and test cutting edge ideas and technologies that ensures a sustainable future. This center will engage the existing Sea grant SCCD professionals as a bridge between the research community and coastal communities and as a conduit through which new technologies are transferred and applied.

Center Structure

The center would be designed in a way to engage our nations' best scientists, our Sea Grant institutions, and our network of extension professionals in the Sea Grant Sustainable Coastal Community

Development network. A Sea Grant institution, selected following a national competition, would house and coordinate the Center of Excellence. 32 scientists seeking critical discoveries needed to achieve sustainability would be funded through 3-year competitive fellowships awarded to their home institutions. Three communities across a range of scales would become test beds to apply NOAA Sea Grant Research. Competitive research and outreach projects designed to help achieve sustainable coastal development in 4 critical discovery areas (see below) will engage Sea Grant programs and institutions across the country in working with their communities, cities and mega-regions.

Center Administration (\$1 million annually)

The successful program awarded center administration will:

- facilitate competitions for the fellows and demonstration programs
- administer all subcontracts for the fellows and demonstration programs
- facilitate RFP development and selection process for any NSI's related to sustainable development (see initiative 1 above).
- coordinate work between fellows, NSI researchers and outreach specialists, and demonstration projects to ensure that discoveries are building on one another and getting applied in communities.
- build partnerships and programs to conduct multidisciplinary research and applications
- transfer all discoveries and decision tools developed to the Sea Grant Sustainable Coastal Community development extension network and provide support necessary to get discoveries applied in local cities and communities.
- Assimilate all impacts, perform all reporting requirements and conduct all public information and outreach product development needed for center projects.

Sea Grant Sustainable Coastal Development Fellows (\$4.8 million annually)

A competitive program will be conducted to select 32 national faculty research fellows (8 in each topic area) that receive 3 years of support for \$150,000 annually to conduct research in 4 discovery areas:

1. Identify land use indicators and tipping points that threaten coastal, ocean, and great lakes ecosystems and footprints needed to sustain these ecosystems.
2. Creation of new and improved economic and market research-based decision tools
3. Identify risks and benefits of renewable energy technologies
4. Develop decision tools for planning future coastal communities

(Emphasis will be given to the regional distribution of fellows when possible.)

Demonstrations (\$ 3.5 million annually)

Three communities will be selected through a national competition that will become *Model Sustainable Coastal Communities*. 1 community will be selected at each of 3 scales:

- a mega-region that crosses state boundaries and exceeds 5 million people (\$2million annually)
- a medium (1-5 million people) sized city (\$1 million annually)
- a small (less than 1 million people) community (\$500,000 annually)

Applications must be made in partnership between Sea Grant institutions and appropriate community planning organizations and agencies. Selected communities must apply sustainable cutting edge technologies, strategies, and policies and measure progress toward sustainability metrics.

Competitive Peer-reviewed Research and Outreach through NSI's (\$3.0 million annually)

An NSI competition will be conducted annually through the normal National Sea Grant NSI process.

Research and outreach projects will be solicited in 4 topic areas:

1. Identify land use indicators and tipping points that threaten coastal, ocean, and great lakes ecosystems and footprints needed to sustain these ecosystems.
2. Creation of new and improved economic and market research-based decision tools
3. Identify risks and benefits of renewable energy technologies
4. Develop decision tools for planning future coastal communities

The center administration will work with the National Sea Grant office to identify appropriate experts that can assist with RFP development and project selection.

INITIATIVE 4: SEA GRANT AND COASTAL CLIMATE CHANGE – A CROSS CUTTING INITIATIVE OF SEA GRANT’S FOUR STRATEGIC FOCUS AREAS

Budget Request: \$ 15 million annually

NOAA is currently considering the development of a Climate Service and the National Sea Grant College Program is poised to utilize the strong foundations of its federal-university partnership to serve stakeholder climate needs. Here, we propose an integrated Sea Grant Coastal Climate Program of research, outreach and education to address these needs. Sea Grant will be responsible for administering competitive university-based applied research, leading extension and community engagement programs, and delivering education programs and practices that address climate change issues in coastal communities. Climate change issues are embedded within the national strategic plan for each of the four focus areas of *sustainable coastal development, resilient coastal communities, healthy coastal ecosystems and a safe sustainable seafood supply*, therefore, ***this initiative suggests an integrative approach***. While this effort is proposed by the Sustainable Coastal Development Focus Team, each of the three sub-initiatives below is intended to be inclusive of the other 3 focus areas and serves as a template for how the National Sea Grant College Program can help NOAA and a NOAA Climate Service work with coastal communities to address impacts of climate change.

\$5 M per year for extension capacity-building within National Sea Grant Office and its state programs: Develop a climate extension network comprised of NSGO senior climate specialists, and 15-20 university-based Sea Grant climate extension agents with geographic distribution across NOAA’s coastal and Great Lakes regions. NSGO staff serves as coordinators and liaisons to other NOAA offices, research laboratories and cooperative institutes. Competitively-awarded climate extension projects will hire new climate specialists at state Sea Grant programs, address specific local and regional needs for climate issues, and serve as the point of contact for dissemination of relevant research results. A recent survey by the Sea Grant Extension Network indicated that 86% of the programs are currently involved in addressing climate issues, yet there is no cohesive national effort to provide both consistent “in-reach” training and regional outreach products and services. Among sustainable coastal development issues, climate extension specialists will develop local and regional outreach programs on alternative energy, green infrastructure, carbon trading, carbon neutral designs, carbon sequestration, risks and benefits of alternative energy development, as well as climate effects on onsite storm water management, mitigation of urban heat islands, event frequency, water quality and drinking water quantity issues.

\$5M per year for research to support local and regional coastal issues in the face of changing climate: Work with NOAA’s Climate Program Office to support locally and regionally relevant climate research identified by Sea Grant climate extension-led needs assessments and other outreach efforts. This approach of determining stakeholder driven research needs, coupled with outcome-based planning and implementation applies an approach that has been successful in the Sea Grant network for more than 40 years and will allow NOAA to address key constituent needs for climate change information. Among the sustainable coastal development issues, we expect targeted research aimed at determining how climate change will affect carrying capacity of coastal resources (water, fish, etc) and how to better determine management and planning decisions affected by a changing climate.

\$5 M per year for education on climate and weather literacy that addresses key regional and local issues: Work with NOAA’s Climate Program Office to support development of a climate education network with geographic distribution across NOAA’s coastal and Great Lakes region. This Climate and Weather Education Network will consist of a NSGO Climate Education Specialist and climate educators within each State Sea Grant Program that will develop national, regional, state and local formal educational programs that result in climate literate teachers and students in the nation’s classrooms. A “Climate Literacy: Essential Principles and Fundamental Concepts” Framework for formal education was developed by NOAA’s Climate Program Office in 2008. The Sea Grant Climate and Weather Education network will work to further establish the climate and weather literacy framework that builds on the research, science and technology education benchmarks developed by the American Association for the Advancement of Sciences Project 2061.

ATTACHMENT 1: PLAN OF WORK FOR THE NATIONAL SEA GRANT SUSTAINABLE COASTAL DEVELOPMENT FOCUS TEAM

Funding and support needed from the NSGO	Funding and support needed from NOAA	Sub committees needed (chaired by members of the SCD focus team)	Actions needed by Miller/Hurley, and Leon	Actions needed from SCCD group	Actions needed by individual programs
<p>Start up funds needed to fund white paper development that delineates the SCD research agenda (yr 1 – 25-40k) [3.2B, 2.3, 1.1]</p>	<p>NOAA creates something like a center of excellence for SCD designed to conduct research (internal and rfp) necessary to identify the sustainable ecosystem footprint [2.2]</p>	<p>Develop a SCD white paper and research agenda (Jaffe)</p>	<p>Seek NOAA support for a SCD center of excellence</p>	<p>Work with EPA and NEMO to coordinate actions on LID and Smart Growth (Jacobs, Faulk) [3.1]</p>	<p>Fund SCD research based on research agenda [1.1, 2.3, 3.2B]</p>
<p>Establish an FEE like competition for 5 yr SCD specialists located in programs [2.1] Specialists would have to focus on the following:</p> <ul style="list-style-type: none"> • Decision tool development [3.2b] • Locally responsive research and outreach [3.3] 	<p>NOAA funds regional or program based climate extension specialists [2.4]</p>	<p>Develop a proposal for a national access needs assessment and legal issues (Showalter)[1.2]</p>	<p>Seek support from NOAA to fund climate extension specialists in programs [2.4] (Hurley & Spranger)</p>	<p>Work out optimum relationship with NEMO for training and sharing of tools and resources related to Natural resource</p>	

<p>Begin in yr 1</p>				<p>Based planning [3.2A] (Jacobs, Whiting-Grant, Faulk)</p>	
<p>Hire regional or national Economic Development Specialists (yr 2)[1.4]</p>	<p>NOAA regional teams take leadership in engaging partners necessary to develop and implement regional sustainable growth plans and strategies necessary to protect coastal resources [3.2c]</p>	<p>Work with the SCCD group and national economic development specialist to develop a proposal to develop a tool that balances economic development with other enterprises and conduct the associated training necessary to prepare the SCD network to use it [1.3] (Murray, Jacobs, Whiting-Grant)</p>	<p>Get NOAA support to put regional growth planning to protect coastal resources (sustainable ecosystem footprint) on the agenda of all NOAA regional coordinators [3.2c]</p>	<p>Conduct training for SCCD network on participatory decisionmaking [3.2B] Jacobs, whiting-Grant, Faulk)</p>	
<p>Sponsor an NSI in year 2or3 based on SCD research agenda.</p>			<p>Seek NOAA funding support to enhance SCD NSI [1.1, 2.3, 3.2B]</p>		

<p>Research will focus on:</p> <ul style="list-style-type: none"> • Economic and market research based decision tools [1.1] • Risks and benefits of renewable energy technologies [2.3] • Decision tools for future scenarios for coastal communities [3.2B] 					
<p>Training funds needed to support workforce development of SCCD team (20K annually)c</p>					

[x.x]=Goal and strategy satisfied by the designated activity