



Request for Faculty Proposals
November 2014

CALL FOR PROPOSALS

The Shell Center for Sustainability (SCS) calls for project proposals that build on the Stress Nexus selection of 2012-2014 to bring together a multidisciplinary team of Rice University researchers to focus on sustainable development in 2050. The research produced under this new call for proposals will contribute a knowledgebase to support local, regional, national and global efforts on the topic of Resilience Planning/Climate Action Planning. As with other research currently funded by SCS, we encourage proposals that focus on the Gulf Coast area. Research teams must, however, demonstrate how results can be more widely applicable.

The selected team (or teams) may leverage work currently taking place under “The Stress Nexus of Coastlines”, the “Zero Carbon Development”, and the “Water, Nutrients, and Sustainability” projects. See Appendix for project descriptions. Current teams are eligible to re-apply demonstrating new initiatives that broaden or build on currently funded efforts. SCS will also entertain proposals from individual faculty members who wish to be engaged in existing projects. These proposals require a letter of support from the PI’s of the existing project.

Proposed teams should include multi-disciplinary perspectives in the social sciences, humanities, sciences, policy, and business with regard to the human, environmental, and economic impact.

A. Focus Areas

Proposals will demonstrate how they will effectively consider the following areas:

1. **Infrastructure:** sustainable, renewable, low carbon footprint, design, maintenance, environment, social, policy and economic impact. Capacity to withstand disruptive events. Long-term maintenance and/or operations.

2. **Population growth:** impacts, services, food, water, energy, air quality, resources, urbanization, environment, social, policy and economic impact.
3. **Business model:** doing business in 2050, meeting demands, skill sets and education, environment, social, policy and economic impact.
4. **Global change:** environment and climate impacts, impact on health, energy, infrastructure, population, business, social, policy, and economic impact.
5. **Energy Sources and Supply** (renewable and fossil fuels): viability, efficiency, generation, capture, storage, distribution, demand, environment, social, policy and economic impact. Vulnerability and redundancy.

As indicated in Section D, the process asks the lead Rice faculty member to submit a 5-10 page proposal that specifically addresses the connection to the three Stress Nexus projects already underway, as well as one or more of the **Focus Areas**, demonstrating how the proposed project relates and generates greater synergy with any or all of the three projects in progress. After the initial review, the Proposal Review Committee may request more detailed information.

B. Criteria and Priorities

Partnership and collaboration are critical elements for the attainment of sustainable development solutions. Proposals will preferably include internal participants (within Rice). A Rice professor must be the Principal Investigator (PI) for the project. External partnerships and collaboration may be applicable to strengthen the team and for purposes of leveraging resources.

Projects should offer opportunities for student participation, demonstrate leveraging of SCS funds, create partnerships and collaborations on a multidisciplinary basis (particularly within Rice), demonstrate application of research, and address the following priorities:

1. Expand knowledge about the threats to sustainability in the 5 areas listed above.
2. Demonstrate how new scientific information or new technologies reduce threats to sustainability in one or more of the 5 areas listed above. Key will be the demonstration of change, integrated impact, and benefits.
3. Clearly show how Shell Center funding helps leverage additional research, resources, and opportunities. All funding sources must be listed in the proposal.

4. Provide appropriate opportunities for undergraduate and graduate student research, practice, learning, and funding.

5. Demonstrate communication, data sharing, and coordination among interdisciplinary work teams, partners and collaborators.

C. Funding

The SCS will allocate up to \$300,000 in funding.

The SCS reserves the right to modify the award if proposals do not meet the stated criteria.

D. Project Review

The SCS will use its Technical Review Board and Operating Committee to evaluate research proposals and project progress. Any current SCS members who appear on a proposed research team will be recused from participating in the selection vote.

Proposals should be submitted by the Project PI, who will be the responsible agent for the disposition of project funds, reporting, and for completion of the project. The PI and Co-PI must be a tenured track Rice University faculty member.

More than one project that meets the focus areas, criteria, and priorities of the Shell Center can be submitted. A PI on one project can be a Co-PI on another project but only one project will be selected.

The award amount will be determined based on how the project proposal meets the requirements of the RFP.

Funding is awarded for two year's work. The intention is to foster research that demonstrates in-house interdisciplinary capabilities.

New SCS funding may be available for subsequent research, based on the project's progress and accomplishments demonstrated to continue to synergistically broaden and build on funded efforts.

The submission schedule is as follows:

1. A Pre-proposal meeting will be held December 1, 2014. A pre-proposal meeting will be held at Farnsworth Pavilion, from 12 to 1pm, to address questions about the RFP. Please RSVP to: Lilibeth.andre@rice.edu.

2. A letter of Interest or pre-proposal must be submitted for comment by **DECEMBER 15, 2014**. (See item 3).

A second pre-proposal meeting may be scheduled to offer interested PI's the opportunity to respond to questions that may exist at that time prior to full proposal submission. Notice of meeting will be sent through All Departments distribution and posted on the Research page at <http://shellcenter.rice.edu>

3. Full Proposals must be submitted to the SCS by 5 pm on Monday, JANUARY 19, 2015. They should be addressed to Lilibeth André, Associate Director, Shell Center for Sustainability, MS 27, or submitted electronically to lilibeth.andre@rice.edu.

4. By Monday, FEBRUARY 16 2015, the Evaluation Committee will select the most promising proposals for the first round, and may request additional material to clarify the ideas in the proposals. Review may include an interview of the top team(s) to address questions by the Evaluation Committee.

5. By Monday, MARCH 16, 2015, selection of the grantees will be announced.

Upon selection and acceptance of funding, PIs will receive the first funding advance of 25% after they have delivered a 1-5 page project summary for public information along with supporting images, pictures, or graphs. Team member photos should be provided; A mid-term progress report is required at 50% completion and can be submitted electronically. The second payment of 25% of the funding is advanced once this report is accepted; The final report will be presented to the SCS's Operating Committee. The second half of the funding will be advanced based on the evaluation of the project. The final payment of \$50,000 will be provided upon the Operating Committee's acceptance of the final report.

All reports will follow the format for submittals outlined below. Reports will include team member photos, project photos, illustrations, graphs, charts or media clips where applicable. There may be additional opportunities to discuss the project and findings as well.

All written materials submitted to SCS must be in a language that can be readily understood by a non-technical audience and by the general public. This material should include graphs, images, photographs, publications, and mention of any patents, awards, or other recognition received by the project.

References to the research should include credit to the SCS for funding received.

E. Submittals

Please follow the format below when preparing the 5-10 page proposal. Proposals should include a brief statement of the anticipated results and reporting methods (e.g., publications, patents, etc.). The proposal must be written so non-technical reviewers can understand it.

1. Objective
2. Approach
3. Team
4. Focus Areas
5. Criteria and Priorities
6. Schedule
7. Budget

F. Contact

For Additional information, please contact Lilibeth André, Associate Director, Shell Center for Sustainability, at (713) 348-2796 or at lilibeth.andre@rice.edu.

APPENDIX

The Stress Nexus of Coastlines

Coastal landscapes are among the most dynamic environments on Earth's surface. These regions also offer extraordinary natural resources and are therefore relied upon for societal welfare; consequently, coastlines are inhabited by 60% of the world's population. However, as a result of global sea-level rise and increasing severe-storm frequency and magnitude associated with climate change, coastlines are ever more vulnerable to significant geomorphological change. Nevertheless, infrastructure development and population of coastal landscapes continues to grow. A recent study by the Wall Street Journal has estimated that coastal neighborhoods in the U.S.A. have drawn new residents at a rate of 1.3 million per year in the past two decades, which has helped increase the coastal population by nearly 50% since 1970. This development has fostered a 40% increase in property values since 2004, to an estimated \$10.2 trillion (Gulf and Atlantic coasts combined). Therefore, there are tremendous social, engineering, and economic incentives to evaluate the future viability of coastal settings.

Coastal sustainability is a complex issue that necessitates combining social, engineering, and geomorphology studies to address trends of increasing population, infrastructure development, and landscape dynamics. The frontier of coastal sustainability science therefore necessitates cross-disciplinary studies, which is the prerogative for this research effort. The project integrates specialists in the fields of coastal geomorphology, inundation modeling, population and society development, and infrastructure engineering. The goal is to produce a comprehensive evaluation of coastal adaptation schemes that account for geomorphology and regional development.

Specifically, this research will evaluate the intersection of social and natural sciences for the upper Texas Gulf Coast. The study site focuses on the greater Freeport region (south of Houston), where intense development intersects a dynamic coastal landscape modified by the Brazos River delta and adjacent barrier islands. The project aims to forecast the private and public development, as well as measure and model regional coastline development. The research will be coupled with studies that assess sustainable engineering of transportation infrastructure, and analyze regions that are at significant risk to storm-surge flooding. The broad aim is to apply these regional-scale assessments to the entire Texas Gulf Coast, especially where ecologically diverse and low-lying landscape is heavily developed and relied upon for recreation, trade, and commerce.

Zero Carbon Development

In the very near future, climate science tells us that cities will have to confront a series of dramatic ecological challenges. Regardless of how these challenges are met, or not met, it is already clear that upcoming generations will have to occupy cities in a very different way than we occupy them today. New, low energy patterns of occupation will cut deeply into our accustomed ways of life and call for a ground up restructuring of urban environments. This restructuring will have to take place across several fronts. Technical, economic, or political solutions to the problem of climate change are ineffective in and of themselves. Taken separately, they only provide partial solutions that have proven to be inadequate. An urban plan is a vehicle for a holistic response that combines technical, political and economic solutions synergistically in order to propose alternative, low impact lifestyles scaled to our new limitations.

In many of the attempts to address climate change, vested interests have been targeted — auto manufacturers, fossil fuel companies, real-estate developers, pocketed politicians — as culpable in the climate crisis. These attempts have fallen short because they avoid indicating the real culpability, which is our own high-energy lifestyle. While we may fully grasp the climate crisis, we are still unable to envision the admittedly drastic changes that need to be made in our way of life. The key to bridging this gap between understanding and action is to show precisely what environmentally sound ways of living may look like. We intend to present alternative, low impact ways of living by simply describing their physical settings in concrete design proposals.

Climate Change and Urban Redevelopment

Solutions that work only for wealthy countries, wealthy cities, wealthy neighborhoods or wealthy individuals, are ineffective inasmuch as any solutions to climate change must go mainstream in order to work. Like nothing else before it, climate change is an interconnected problem that is global in scope. Anything less than broad based solutions end up creating life-rafts for those who can afford them leaving behind an increasingly dysfunctional world. In other words, environmental problems and social problems have to be taken on together. To that end, this project has chosen one of the most disadvantaged communities in the city of Houston — the historic Fifth Ward — to make the best case demonstration for environmental reforms.

The Fifth Ward is a 6.25 square mile area (4,000 acres) directly adjacent to the city's central business district. It has a population of 50,000 people. In 2010, the median income for the Fifth Ward (\$22,237) was approximately half that of Houston (\$43,365). Over the last five years the district has seen 60% more crime per capita than the City of Houston. The population within the Fifth Ward has

gone from majority African American to majority Hispanic ethnicity in the past decade but remains 98% nonwhite. With a median age of 31, 42% of all residents are under the age of 25. There are an estimated 20,370 jobs located in the Fifth Ward, but only 12,767 employed residents live in the area. The majority of the residential population (55%) over age 16 is not in the labor force. Additionally, only 39% of Fifth Ward residents are employed. As a stress nexus between society, economy and environment, the Fifth Ward represents a challenge that is daunting at face value. The goal will be to design a redevelopment plan that is based on a very specific political, economic and cultural situation. While an actual urban constituency drives the plan, it will ultimately address a large range of environmental/ urban problems that face every major city in the nation. The design will not only be relevant to the Fifth Ward, but will create a template of sustainable intervention in low-income areas that can be played out in any large city with a similar stress nexus. The intention is that the project becomes a model of carbon free development, not just for lower-income neighborhoods.

Working with students in the Rice University School of Architecture, the research team will author a redevelopment plan for the year 2020 (first year) and another for the year 2050 (second year). Addressing one of the most challenging areas of the city, planning proposals will be produced which seek to transform the Fifth Ward into a new model of public/private redevelopment and a new model for sustainable urban design. The project will bring together the social and natural sciences with business, engineering and design in a single effort.

Water, Nutrients, and Sustainability

River water quality is a major challenge in virtually all urban watersheds where fertilizer use and wastewater act as unwanted nutrient sources. This in turn can result in increased algal production in surface waters that, if allowed to grow, can cause problems in the coastal ocean like dead zones and harmful algal blooms. This wasteful management of water and fertilizer can have negative environmental and economic consequences for coastal communities. Simultaneously, ineffective retention of fertilizer and water where they are needed on the land surface, such as in crops and urban trees, can lead to wasteful urban use of water and fertilizers, further contaminating watersheds. While technologies exist to manage these problems, implementation hinges on their cost-effectiveness and cultural acceptance. The project proposes a suite of low-cost, high yield social science-natural science collaborative projects focused on one nutrient- and water-management technique, biochar. Biochar is charcoal produced intentionally for environmental uses like carbon sequestration and water purification.

This project will help support a postdoctoral researcher who will determine the economic conditions under which biochar improves nutrient and water management sufficiently to be profitable. Because the specific area of valuing biochar ecosystem services is of interest to researchers at Shell Oil Company, this postdoc will be co-mentored by Dr. Christian Davies at Shell as well as by Ken Medlock and Carrie Masiello at Rice. Besides addressing a significant problem in ecosystem water and nutrient management, the creation of this postdoctoral fellowship would jump-start a new natural science-social science collaboration, expand the currently science-only biochar group into the social sciences, and formalize a nascent relationship between Shell and Rice in the area of sustainable water management.

The project also proposes three other high-impact, low cost projects related specifically to biochar, water, and nutrient management. Undergraduate researchers and staff would be focused on these areas of research:

1. Determining the water management benefits of biochar produced from sewage sludge.
2. Documenting the ability of biochar and mycorrhizae to immobilize metals in contaminated soils.
3. Conducting an ethnographic study of biochar-producing communities to better understand how they perceive the hydrologic cycle benefits of their work.