The University of Georgia

University Council
Athens, Georgia 30602

August 19, 2016

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Dear Colleagues:

The attached proposal for a new Institute for Resilient Infrastructure Systems will be an agenda item for the August 26, 2016, Full University Curriculum Committee meeting.

Sincerely,

William K Vencill

William K. Vencill, Chair
University Curriculum Committee

cc: Provost Pamela S. Whitten
Dr. Rahul Shrivastav

Proposal for a New Institute

Institute for Resilient Infrastructure Systems

August 15, 2016

Proposed by:

8/15/2016

Brian P. Bledsoe, Director Date
Institute for Resilient Infrastructure Systems

Approved by:

8/15/2016

Donald J. Leo, Dean Date
College of Engineering

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NAME

Institute for Resilient Infrastructure Systems

MISSION

The institute helps communities, businesses, and governments mitigate risks—and seize opportunities—associated with environmental change, extreme weather, and climate-related events by rethinking, transforming, and adapting infrastructure systems to strengthen social, economic, and ecological resilience. We achieve this through collaborative partnerships, integrative research, decision support, education, training, and outreach.

CONTEXT

Communities and cities around the world are struggling to rethink, rebuild, and adapt their aging and failing infrastructure systems in an era of unprecedented environmental and social change:

- Frequency of extreme precipitation is increasing rapidly;
- Droughts are intensifying, particularly in arid regions;
- Frequency, duration, and intensity of heat waves are increasing;
- Intensity of tropical and extra-tropical cyclones is increasing;
- Coastal and low-lying areas are vulnerable to submergence, flooding, and erosion due to relative sea level rise;
- A rapidly growing majority of the world's people live in urban areas; and
- Urbanization is most rapid in coastal and low-lying regions.

Resilience to extreme events and disasters is essential for security and sustainable development. Resilience is defined by the National Academy of Science as the *ability to prepare and plan for, absorb, recover from, or more successfully adapt to actual or potential adverse events*. As the wave of urbanization gains momentum over the next few decades, interactions among climate extremes, land use change, and shifting demographics will amplify the susceptibility of an extended human family of 9 billion to disasters, failing or inadequate infrastructure systems, resource scarcity, and diminished ecosystem services.

The term *infrastructure* has traditionally referred to engineered systems that support basic functions of modern industrialized society: water and sewage, energy, transportation, and public facilities. These interconnected systems are sometimes collectively referred to as "gray" infrastructure. In the U.S., the American Society of Civil Engineers estimates that over three trillion dollars of investments are needed in the next decade just to repair and maintain these existing systems, most of which are not designed for future conditions. Recent extreme weather events have revealed that retrospective and piecemeal approaches to designing interconnected infrastructure systems have made the communities that depend on them vulnerable to natural hazards. Although traditional approaches to infrastructure design have brought enormous

benefits to billions of people, this path also has brought substantial, often unanticipated social, economic, and environmental costs. Over the last decade, “green” and “blue” infrastructure has become recognized as an essential complement to traditional gray infrastructure. Green and blue infrastructure systems are multifunctional ecological features, green spaces, and waterbodies interwoven within and among human settlements that infiltrate, evapotranspire, capture, and reuse storm water to manage hydrologic processes, and more generally, naturally occurring ecosystems that provide essential services such as buffering against coastal storm surges and cleansing of water and air. The emerging paradigm in infrastructure design seeks an integration of engineering innovation and ecological intelligence to create interconnected gray, blue, and green systems that are robust and enhance human well-being across many plausible futures. Resilience theory is rooted in the ecological sciences, yet engineering is the logical discipline to lead implementation of this new paradigm as an extension of past traditional approaches. Ultimately, the approach must integrate the full breadth of disciplines that impact the development of society’s infrastructure.

Despite growing awareness that the adaptive capacity of cities and communities is shaped by complex interactions among the built environment, ecosystems, social systems, and legal and policy frameworks, current understanding of resilience remains siloed. Engineering provides a functional armature for resilient cities and landscapes, but the motivation to adopt solutions lies in the realms of public policy and economics. The implications of proposed solutions emerge from the natural and human ecological processes that they initiate and shape. All of these perspectives are necessary to address the emerging challenges we face, but none is sufficient on its own.

The University of Georgia, via special initiatives in several colleges, has assembled faculty with extensive past experience addressing parts of this interdisciplinary matrix—engineering overlapping into policy, planning into ecology, ecology into public policy. Resilient infrastructure provides a meeting ground of common interest and an intellectual framework for coordinating their various activities; an institute will provide the integrating procedural structure for implementing their shared interests.

INSTITUTE GOALS

Over the next few years, federal agencies, foundations, municipalities, and private enterprises will invest several hundreds of millions of dollars to support research, education/training, and outreach related to resilient infrastructure. Focus areas include prediction of and preparedness for extreme events, climate adaptation, coastal hazards and flood mitigation, food-water-energy systems, and community well-being. UGA has yet to develop significant connections to the funded national network of resiliency research despite a body of activities across campus. As one of the nation’s premier land grant universities, UGA must take a leadership role in ensuring that these investments in research meaningfully advance the quality of life for people in Georgia and around the world.

In response to this challenge, the goals of the institute are to:

- increase the quality and quantity of interdisciplinary research at the interface of societal resilience and infrastructure, and to procure external support for that research;
- synergize UGA's existing and unique strengths in responding comprehensively as an institution to significant research and development opportunities;
- proactively develop interdisciplinary publications and modular research proposals focused on infrastructure and societal resilience prior to announcements of significant funding opportunities;
- enhance the visibility of the University by establishing a national presence in resiliency research and practice;
- increase financial support and cross-cutting curricula for students;
- attract high-quality students and faculty and provide them with effective mentoring in resiliency research; and
- strengthen societal resilience through decision support, training, and outreach.

ADDED VALUE OF THE NEW INSTITUTE

There is a pressing need for UGA to respond with interdisciplinary systems thinking and action on societal resilience. This institute will bring together faculty who are already individually successful in their own areas to serve as the solid foundation for larger groups needed to tackle problems in infrastructure resiliency. It will also connect UGA researchers across campus and build collaborations with complementary efforts at other institutions to serve as a campus nexus for interdisciplinary research leadership and funding success in this area important to Georgia and the nation.

By synergizing UGA's diverse strengths in environmental design and engineering, ecology, earth and atmospheric sciences, public health, law and policy, and the social sciences, the Institute for Resilient Infrastructure Systems will be positioned to make a lasting impact at multiple scales by attracting significant external research support. The institute will be nationally unique in its focus on uniting engineering with ecology, environmental science, design, and other disciplines to realize effective integration of green and gray infrastructure for resilience to weather and climate-related extremes. The institute will also be attractive to a new generation of ecological engineers, urban designers, applied ecologists, and problem-solvers who are seeking to develop the skills needed to address the complex water, energy, food, environmental quality, and resource allocation issues facing humanity. Further, underrepresentation in STEM disciplines can be countered with curricula in this arena as they are inherently rich in interdisciplinary content and subjects of social concern.

Several units across the UGA campus (as well as off-campus partners) will benefit from the integrative and strategic activities of the institute. The following units have been involved in planning the institute and will contribute the core faculty that will launch it:

Carl Vinson Institute of Government
College of Agricultural and Environmental Sciences
College of Engineering

College of Environment and Design
Franklin College of Arts and Sciences
Marine Extension and Sea Grant
Odum School of Ecology
School of Public Health
Warnell School of Forestry and Natural Resources

A list of participating faculty and letters of support from these units are provided in Appendices 1 and 2, respectively. It is anticipated and desired that additional academic units will become involved as the activities of the institute develop. Several of the faculty members listed in Appendix 1 have collaborated on multi-million dollar grant proposal submissions to NSF and USDA focused on climate extremes and food-water-energy systems within the last six months. At least five more large proposals focused on climate extremes and food-water-energy systems are being developed by these faculty members for submission to NSF, USDA, and private foundations during the fall 2016 semester. The proposed institute will catalyze and enhance these emerging interdisciplinary collaborations and attract partners from other institutions.

RESEARCH FOCI AND AREAS OF EXPERTISE

The transition to robust, flexible, and adaptive infrastructure systems that meet current needs and address future challenges, including flooding, rising sea levels, heat waves, and rapid social change, requires us to transcend disciplinary boundaries. Faculty members initiating the institute represent nine UGA academic units (Appendix 1) and bring a tremendous depth and breadth of expertise. During the development of this proposal, these faculty members have identified several intersecting research themes and topics that synergize existing expertise and align with forthcoming opportunities for significant research support, including:

Resilience and Adaptation to Extreme Weather and Climate Events

- improving prediction, prevention, and mitigation of weather, climate, and water-related hazards and disasters
- methods for assessing the resilience of infrastructure systems and evaluating people's exposure, vulnerability, and resilience to adverse events
- decision support and risk management tools for allocating scarce resources to improve resilience to weather and climate-related pressures and shocks

Blue-Green-Gray Infrastructure Systems

- integrating green and gray infrastructure solutions for urban and coastal resiliency
- designing urban streams and drainage systems that safely absorb rainfall or runoff events within their future range of variability while providing numerous co-benefits
- strategies for managing flood risks as part of wider, integrated planning intended to achieve urban and environmental revitalization
- overcoming uncertainty and barriers to adoption of blue-green infrastructure for managing flooding, urban heat islands, eutrophication, and other risks

- urban ecology and design of hybrid/novel ecosystems that provide essential services

Resilient Transportation Systems

- modeling effects of changing climate and sea level rise on transportation infrastructure
- assessment and design of roads and bridges in urban, riverine, and coastal areas for climate resilience
- re-design of aging transportation infrastructure for future climate conditions as it is rebuilt or upgraded

Coupled Human and Natural Systems Analysis and Modeling

- system dynamics modeling of interactions of infrastructure systems at various temporal and spatial scales
- agent-based and complexity modeling of coupled human-built-natural systems as a complex adaptive system of systems
- application of ecological theory to interconnected infrastructure systems
- network modeling to identify and reduce vulnerabilities in food-water-energy systems
- balancing human materials and energy resource demands with maintenance of ecosystem functions and services

Resilience Planning and Policy

- integrating the use of information about vulnerabilities and resilience into local planning and decision making processes
- visualization for communicating future infrastructure/environmental design alternatives to stakeholders and decision-makers
- developing novel methods and tools to identify "low regret" infrastructure solutions that are robust across many plausible futures
- examining how the law and law-like systems of rules inform the development of resilient infrastructure

Infrastructure for Health and Well-being

- hydro-epidemiological research to understand and reduce waterborne diseases associated with extreme weather events through infrastructure design
- improved accounting of the broader social, economic, and ecological benefits of natural infrastructure, including public health
- understanding the social and environmental justice aspects of building resilience into our communities
- community engagement in developing and emerging countries to provide basic infrastructure for public health while conserving ecosystem services in the face of rapid change

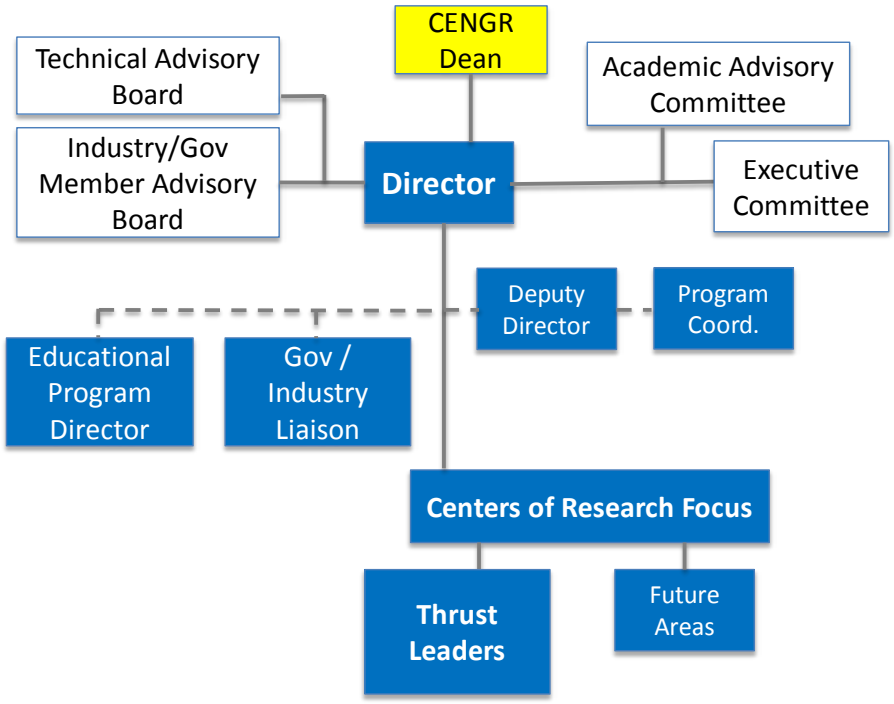
We envision subsets of these topics self-organizing into “centers of focus” within the institute as a result of workshops, writing retreats, and other activities. Two initial centers of focus have

coalesced around transportation infrastructure and green-blue infrastructure for flood resiliency and urban revitalization as described in the following section summarizing the organizational structure of the institute.

ORGANIZATIONAL STRUCTURE

The institute will be located administratively in the CENGR dean's office and will report to the dean of Engineering. A diagram depicting the basic organization of the institute is provided below.

Institute Basic Organization



This chart represents the general framework within which the institute will grow. With input from both internal and external advisory groups, the director and leadership team comprised at full institute maturity of a deputy director, industry/government liaison, and educational program director will work to refine and advance institute goals with its affiliated faculty and centers of research focus that represent particular strengths and may be externally funded via major grants.

The director will be appointed by the dean of Engineering. The appointment of the director will be reviewed annually. Participation of faculty in the institute will be voluntary and by agreement with the institute director. UGA faculty members with relevant research interests can apply for

affiliation with the institute by completing a web-based application form. Faculty applications will be evaluated by the Executive Committee (described below). Participating faculty will maintain their existing appointment in their home academic unit and no commitment of returned indirect costs will be required for affiliation. Responsibilities of participating faculty are to:

- attend institute meetings and proposal development retreats;
- collectively discuss and recommend institute strategic directions;
- actively participate in specific institute research and development activities;
- provide knowledge and guidance on societal priorities and relevant areas in their field of expertise; and
- promote the strengths of the institute in supporting future resilience decisions to their sponsors and collaborators.

The founding director of the institute is Dr. Brian Bledsoe. The director is responsible for providing both scholarly and administrative leadership for the institute such that the value of the institute grows for all its constituencies. The director chairs the internal and external advisory groups and is responsible for establishing the leadership team of the institute (e.g., deputy director, educational program director, industry/government liaison) as the institute matures and grows. The director is also responsible for all internal reporting and reviews required of the institute.

The institute deputy director is a faculty member and shares the leadership and management responsibilities of the institute with the director. If the maturity of the institute does not yet warrant it or there is no faculty member suitable for this role, the director may choose to establish an executive manager instead of the deputy director, who will be a staff member dedicated to working with the director in executing the mission of the institute.

The advisory groups on the top right are internal while those on the top left are external. The Executive Committee will be responsible for recommending and codifying the policies of the institute, providing input on priorities for institute research and education activities, and recommending spending priorities for infrastructure support based on input solicited from all faculty affiliated with the institute. The Executive Committee consists of at least five faculty members broadly representing the diverse academic units participating in the institute. The Executive Committee is convened and chaired by the director. Responsibilities of the Executive Committee include:

- establishing policy for the institute (the director has final say for policy; disputes between the director and the executive committee may be taken to the Academic Advisory Committee);
- evaluating faculty applications for membership in the institute; and
- advising the director.

The Academic Advisory Committee will be appointed by the dean of Engineering and comprised of university administrators (college/school level) to assist in resolving issues that arise due to academic/university organizational structure that inhibit the institute achieving its potential.

The Technical Advisory Board will be comprised of outside technical experts from other academic institutions who are selected by the institute Leadership Team. The Board will provide advice on the institute's strategic research direction, progress towards goals, and make recommendations regarding any needed course corrections and future directions. The Board must meet as a group at least twice a year.

The Industry/Government Member Advisory Board will be comprised of representatives of municipalities, businesses, and other institute partners. The Board will meet collectively as a group twice each year to advise the leadership team and to review collectively funded projects. The Board will annually prepare and present a written Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis. The Board will have a chair who organizes the board's activities in coordination with the industry/government liaison and the director.

The industry/government liaison is a staff member responsible for developing the institute's innovation ecosystem, marketing the institute to industry and government, garnering their financial support, developing and coordinating industrial/municipal involvement with faculty and students, and managing the institute's translation of research for the public good. This position will be filled by Dr. Crystal Leach, UGA Director of Discovery and Innovation Partnerships.

The educational program director is a faculty member who is responsible for the development and execution of the institute's education program (e.g., short courses, courses, certificates, degree concentrations) and supported by other faculty, students, and staff in the execution of the institute's programs. This part-time position will initially be vacant until programs emerge.

The program coordinator supports the institute's web and social media presence; large proposal preparation; coordinates research, curriculum, outreach and oversight meetings, and writing retreats; and coordinates regional, national, and international scientific meetings and conferences.

Institute faculty members anticipate developing centers of focus under the broader umbrella of the institute. For example, the first center of focus under the institute is a University Transportation Center focused on Multi-hazard Resilient and Sustainable Transportation Infrastructure directed by Dr. Stephan Durham in CENGR and involving collaborators at the University of Central Florida and Savannah State University. The aims of this center are to advance knowledge in the areas of transportation infrastructure evaluation and repair, security, resilience and adaptability of transportation systems in response to environmental and human-influenced hazards, as well as planning, monitoring, maintaining of secure systems, and sustainable practices for transportation infrastructure development. The application of this center's research outcomes will potentially reduce life-cycle costs of constructing, maintaining, and rehabilitating the nation's transportation infrastructure. A second center of focus emphasizing storm water and floodplain management is being developed in collaboration with

institutions including North Carolina State University, Colorado State University, and the University of Wisconsin-Madison. As the formation of these centers of focus advances, each will separately seek approval as formal UGA centers as appropriate under university policies.

The Institute for Resilient Infrastructure Systems has been conceived in coordination with the River Basin Center (RBC) in the Odum School of Ecology to ensure complementarity and synergy between its mission and goals and those of the RBC. The RBC focuses on aquatic sciences, water sustainability, and policy, whereas the proposed institute is primarily focused on coupled built-natural infrastructure systems and societal resilience to adverse weather and climate-related events. The RBC will not be a center of focus under the institute; however, we nevertheless anticipate a strong and mutually beneficial collaborative partnership between the institute and the RBC.

The institute has also been conceived in coordination with the College of Agricultural and Environmental Sciences (CAES) and faculty leading the UGA Sustainable Food Systems Initiative. The institute's focus on engineering for extreme events will complement and support emerging CAES programs in sustainable food and food-water-energy systems.

CURRICULA

The institute will primarily focus on the research foci and goals described above at its outset and will not grant degrees. Participating faculty will develop and offer graduate and professional development certificate programs aimed at integration of perspectives across the engineering, scientific, and policy dimensions of resilient infrastructure as defined above. Initially, we plan to develop and offer two certificate programs with complementary emphases:

- Certificate in Resilience Leadership, Planning, and Policy
- Certificate in Ecological Restoration (currently under development by CED, CENGR, Odum, and Warnell)

Institute faculty will also design and offer an interdisciplinary concentration in Infrastructure Systems under the Ph.D. in Engineering degree.

It is anticipated that the concentration and certificate programs initially offered by the institute could provide the foundation for, and eventually expand into, innovative degree programs related to infrastructure and resiliency. As one example of such programs, Purdue and Oregon State offer interdisciplinary curricula at the interface of engineering, ecology, and design. These programs appear to be more attractive to women than traditional engineering programs as evidenced by male/female ratios near 1:1.

FACILITIES

The work of institute faculty and students will initially draw upon a number of existing facilities, including wet chemistry laboratory facilities in Odum, Warnell, CENGR, and CPH, design studios in CED, and computing facilities in Engineering and the Franklin College. The institute

does not currently control any physical resources and will utilize existing space and facilities. Proposals for space and physical resources will be considered in accordance with the growth and success of the institute over its first three years of activity.

BUDGET

The institute will increase externally funded research in the areas stated, enable expanded world recognized scholarship, and expand engagement in a critically needed area. Anticipated revenue streams include contracts and grants, tuition for short courses and workshops, member fees from government and industry partners, and sponsorships and gifts from various sources. Return of indirect costs to the institute is strictly voluntary. Returned indirect costs may be voluntarily distributed to the institute as approved by the participating deans at the time of proposal submission. Member fees from industry and government partners will provide funding of a portfolio of shared projects that leverage resources and provide value-added benefits. For example, local governments concurrently developing vulnerability assessments and resiliency plans can increase the cost-effectiveness of their efforts by combining resources with other municipalities in support of transferable research conducted by the institute.

Institute faculty bring a broad network of collaborators and external support through existing multi-institutional grants, including an NSF Sustainability Research Network grant focused on innovative urban water management, and USEPA funded research on water quality management and life cycle analysis of storm water infrastructure. Pending funding opportunities targeted by the institute include various foundations and NGOs focused on development, climate change, environmental conservation, and resilience (e.g., Kresge, Mott, Surdna, Walton, and Woodard-Curran), and several NSF programs, including Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP), Prediction and Prevention of Extreme Events (PREEVENTS), Coupled Natural-Human Systems (CNH), Innovations at the Nexus of Food, Energy and Water Systems (INFEWS), Hydrologic Sciences, and Environmental Sustainability. Other targeted funding sources and partners include the U.S. Environmental Protection Agency, Federal Highway Administration, National Cooperative Highway Research Program, state departments of transportation, and the National Institutes of Health. Finally, the institute will seek partnerships with private sector entities, including agricultural producers, power providers, and beverage companies.

The College of Engineering will support the institute in its launch and work with the director as needed to expand that support as programs grow. The institute is expected to become self-sustaining in three years based on estimated costs and projected revenues from voluntarily returned indirect costs, fees for continuing education, cooperative agreements with government and industry partners, and sponsorships and gifts from various sources.

Startup funding provided by the College of Engineering will support proactive publication and proposal writing activities, developing industry, government, and inter-institutional partnerships, travel for program development and outreach, and the assignment of staff to support the institute until it becomes self-sustaining. This includes salary for a part time program coordinator who supports large proposal preparation, the institute's web and social media

presence; coordinates research, curriculum, outreach and oversight meetings; supports writing retreats; and coordinates regional, national, and international scientific meetings and conferences. Funding is not requested for the part-time educational program director and deputy director roles, as support for these positions will be gradually procured via the self-supported activities of the institute.

PROGRAM REVIEW

To ensure that the institute is fulfilling its mission and stated goals, periodic reviews will be performed by internal and external evaluators. The institute will be reviewed internally every three years by the dean of Engineering. As part of this review process, the institute will produce a report describing all research and funding efforts in the institute, including the scholarly productivity of the faculty participating in the institute. Measurable outcomes to be quantified by the institute and evaluated in the triennial review are listed below.

- Number of research projects in the institute and level of involvement by institute faculty
- Number of interdisciplinary grants related to resiliency and built/natural infrastructure
- Research productivity of core faculty based on indicators of scholarly activity, such as numbers of journal articles published, conference presentations, invited presentations, books and book chapters, reports, software, and other artifacts
- Number of grant and contract proposals submitted
- Number of grant and contract proposals awarded
- Amount of external funding received
- Number of M.S. and Ph.D. students supported
- Number of students participating in certificates and concentrations offered by the institute
- Number of partnerships created with municipalities/government and industry
- Number of memberships in the institute received

Review of the institute will also include an assessment of the following broader questions:

- Has the institute become a catalyst for interdisciplinary research and curriculum development?
- Is the institute successfully cultivating and growing a national and international reputation?
- Has the institute met its original milestones or adaptively moved to seize opportunities to establish and achieve new milestones?
- Has the institute become self-sustaining?

In addition, an external review of the institute will be conducted not less than every seven years by members of an external review panel appointed by the dean of Engineering. The external review panel will utilize the same measurable outcomes and evaluation criteria described above.

Each internal and external review will address any changes in strategy, resources, commitments, and/or operating agreements, and ultimately recommend or not recommend continuation of the institute. If continuation is not recommended, the dean of Engineering will decide the process for dissolution.

APPENDIX 1 – PARTICIPATING FACULTY AND THEIR RESEARCH AREAS

College of Engineering

Brian Bledsoe (Director) – hydrology, flood mitigation, water infrastructure, water quality

Mi Geum Chorzepa – structures and hazards

Jason Christian – hydrologic modeling and hazard analysis, water resources

Stephan Durham – structures and materials, transportation

Jenna Jambeck – recycling, marine debris, waste management, microbial fuel cells, life cycle assessment

Sonny Kim – geotechnical and pavement systems

Luke Li – infrastructure, water and energy systems, agent-based and complexity modeling

John Schramski – energy systems, ecological modeling, ecosystem energetics, complex network theory and analysis

College of Agricultural and Environmental Sciences

Elizabeth Kramer – sustainability of food and water systems, geospatial analysis

Craig Landry – natural resource economics, coastal resources management

Carl Vinson Institute of Government

Shana Jones – disaster law, coastal law, flood insurance and mitigation policy, leadership development for state and local elected officials

Scott Pippin – land use law and policy, flood insurance and mitigation policy

Matt Hauer – demography, population trends, migration

College of Environment and Design

Jon Calabria – landscape design, storm water, ecological restoration

Brian Orland – environmental perception, participation, decision support, visualization,

Franklin College of Arts and Sciences

Adam Milewski – hydrogeology, water resources management, geospatial modeling

Marshall Shepherd – urban weather-climate, precipitation, hazards, satellite remote sensing

Marine Extension and Georgia Sea Grant

Mark Risse – water resources, coastal management, outreach

Odum School of Ecology

Krista Capps – aquatic ecology, urban streams, biogeochemistry, coupled natural-human systems

Laurie Fowler – environmental law and policy, land use planning, environmental justice, citizen participation

Amy Rosemond – ecosystem ecology, freshwater sustainability, urbanization, nutrients

Seth Wenger – aquatic ecology, landscape ecology, conservation biology, modeling

College of Public Health

Erin Lipp - water pollution, microbial ecology, climate change and human health

Warnell School of Forestry and Natural Resources

Dalia Abbas (pending) – sustainability science, renewable energy

Puneet Dwivedi – economic modeling, life-cycle assessment, social network analysis

Rhett Jackson – hydrology, urban storm water

Todd Rasmussen – hydrology, water resources management

APPENDIX 2 – LETTERS OF SUPPORT

Deans – CAES, CED, CENGR, Franklin, Odum, Public Health, Warnell

Director of Carl Vinson Institute

Director of Marine Extension and Sea Grant

Vice President for Research

The University of Georgia

College of Environment and Design

August 3, 2016

Dr. Brian Bledsoe
College of Engineering
University of Georgia
Driftmier Engineering Center
597 Brooks Drive
Athens, GA 30602

Dear Dr. Bledsoe:

On behalf of the College of Environment and Design (CED) faculty, staff, and students, I extend my full and unequivocal support for your Institute for Resilient Infrastructure Systems proposal.

Because resiliency has replaced sustainability as the most appropriate and useful term to assist the academy and the public in preparing for unprecedented environmental change, we in the CED welcome the opportunity to partner with you in building this necessary center of excellence at the University of Georgia. The new institute will most certainly lead graduate level course development, spur scholarship and grant proposals, and position the UGA as a national leader in resiliency projects and research.

The new institute will also assist communities across the State of Georgia in dealing with sea-level rise, designing resilient transportation systems, and effectively managing stormwater and gray water. Please let us know how CED can assist you as you develop this important institute.

Best regards,

Daniel J. Nadenicek, Dean and
Draper Chair in Landscape Architecture

Athens, Georgia 30602 • Telephone 706-542-1816 • Fax 706-542-4485

The University of Georgia

College of Engineering

August 15, 2016

Dr. Brian Bledsoe
UGA Athletic Association Professor, Engineering
Driftmier Engineering Center
University of Georgia
CAMPUS

Dear Dr. Bledsoe,

I am pleased to provide this letter of support from the College of Engineering for the proposed Institute for Resilient Infrastructure Systems (IRIS). Your efforts, and those of the diverse faculty who helped conceive and define its mission, have established a framework and roadmap for IRIS that will result in campus-wide impact. For the reasons and in the ways outlined in this letter of support, the College of Engineering enthusiastically commits to its role as administrative home of IRIS and looks forward to helping to shepherd the institute's growth and serve as effective steward in cooperation with other colleges and schools for the crosscutting programs IRIS develops.

The institute's mission of helping communities, businesses, and governments mitigate risks – and seize opportunities – associated with environmental change, extreme weather and climate-related events by rethinking, transforming, and adapting infrastructure systems to strengthen social, economic and ecological resilience is strongly consistent with that of CENGR and other colleges and schools. Engineering has a special responsibility in the design of next generation infrastructure systems that enhance societal resilience to adverse events. Our College views robust, flexible, and adaptive infrastructure systems that meet current needs and address future challenges associated with environmental change as essential for security and sustainable development.

The College of Engineering will strongly support the IRIS in its role as IRIS's home administrative unit. The College will provide the necessary faculty time and staff support for Dr. Bledsoe to undertake the responsibilities of leading the institute. CENGR will provide the initial support and work with other units on campus to maintain and grow this support for institute programs that are central to achieving its mission until it becomes self-sustaining, including proactive publication and proposal writing activities; developing industry, government, and interinstitutional partnerships; travel for program development and outreach; workshops and certificate programs. The College will provide existing space for operation of IRIS and work with IRIS and units with which it is engaged to allocate space for the institute consistent with its success and growth.

I look forward to the establishment of IRIS as a formal UGA Institute. The College is committed to working with you and your team for the benefit of the College and campus as you bring IRIS national recognition.

Sincerely,

Donald J. Leo, Ph.D.
Dean
UGA Foundation Professor in Engineering

The University of Georgia

Franklin College of Arts and Sciences
Office of the Dean

July 27, 2016

Dr. Brian Bledsoe
Athletic Association Professor
College of Engineering
101 Driftmier Engineering Center
Campus Mail

Dear Dr. Bledsoe,

I am writing in support of your proposal for an Institute for Resilient Infrastructure Systems. Your proposed institute has the potential to create interdisciplinary collaborations across the sciences at the University of Georgia (UGA). The proposed institute will likely also stimulate opportunities for new avenues for grant writing and subsequent funding as well as attract students and scholars to our institution. I am particularly interested in the potential for how the institute may expand the diversity of scientists who work at UGA. I was also pleased to learn that two Franklin College faculty members, Dr. J. Marshall Shepherd and Dr. Adam Milewski, are joining you in this important effort.

Best wishes,

Alan T. Dorsey
Dean

The University of Georgia

Odum School of Ecology

August 9, 2016

Dr. Brian P. Bledsoe
College of Engineering
Driftmier Engineering Center
597 D.W. Brooks Drive
Athens, GA 30602

Dear Brian:

On behalf of the Odum School of Ecology, I am pleased to support the proposed Institute for Resilient Infrastructure Systems. I am optimistic that the Institute will facilitate collaboration among faculty and staff at UGA and partner academic institutions, resulting in invaluable opportunities for our students, increased funding to multiple units, and much-needed assistance to all levels of governments who face risks associated with aging infrastructure and climate change.

The integrated approach the Institute proposes opens the door for wide-scale positive change in addition to solving particular infrastructure challenges. Engaging the community in the identification and evaluation of scenarios, as well as considering the potential for integrating protected landscapes that provide aesthetic, recreational and ecological services into the infrastructure grid are hallmarks of our faculty and we are pleased that these will also be hallmarks of the Institute.

We are particularly excited about the opportunities for our water and disease faculty and their students to interact with the Institute. The River Basin Center routinely partners with engineers on projects that include an evaluation of the built infrastructure--- the potential for dam removal to promote fish passage, the selection of structural control measures to most effectively manage stormwater and eliminate nonpoint source pollution, etc. and to have this expertise easily accessible through the Institute is likely to increase our capacity. Some of the work of

our disease faculty, such as the impact of buildings, roads and other paved surfaces on the transmission of disease in urban areas, would also benefit from collaboration with the Institute.

For all of these reasons, we are excited about prospects for the Institute for Resilient Infrastructure Systems.

Sincerely,

John L. Gittleman
Dean and UGA Foundation Professor in Ecology

The University of Georgia

College of Public Health

Dr. Brian P. Bledsoe
Professor
University of Georgia
College of Engineering
Driftmier Engineering Center
597 D.W. Brooks Drive
Athens, GA 30602

Dear Dr. Bledsoe:

I write with enthusiastic support of your proposed "Institute for Resilient Infrastructure Systems." The mission of your proposed institute "....help communities, businesses, and governments mitigate risks--and seize opportunities--associated with environmental change, extreme weather, and climate-related events by rethinking, transforming, and adapting infrastructure systems to strengthen social, economic, and ecological resilience" is highly aligned with the mission of the University of Georgia's College of Public Health.

Our College of Public Health has four departments and one institute that would have clear and highly significant collaborations with your institute:

Department of Environmental Health Science: This department includes several faculty members with expertise in ground, water, and air safety. Our faculty also have interests in maintaining healthy coastal areas and waterways, an area that is highly related to your institute's mission.

Department of Epidemiology-Biostatistics: Faculty members in this department could assist in monitoring the prevalence and incidence of physical and psychiatric disorders associated with climate change and potential mass migrations in response to environmental threats (e.g., rising sea-levels).

Department of Health Promotion and Behavior: Faculty members in this department could assist in the conceptualization, implementation, and evaluation of interventions that increase safety and enhance adaptation in individuals affected or displaced by environmental threats.

Department of Health Policy and Management: Faculty members in this department could collaborate with institute investigators to develop contemporary policies to respond adaptively to environmental threats (e.g., carbon emissions). Faculty members could also conduct evaluations of environment-related policies to assess their effectiveness in terms of safety and cost savings.

Institute of Disaster Management (IDM): This highly successful institute specializes in individual and community-level responses to man-made and natural disasters. The research mission of IDM is highly related to the mission of your proposed institute.

I am certain that many investigators in the College of Public Health would be eager to facilitate the research, teaching, and service missions of your institute. If I can be of any assistance to your institute, please contact me at your convenience.

Cordially,

Timothy G. Heckman, Ph.D.
Associate Dean for Research, College of Public Health
University of Georgia

The University of Georgia

Daniel B. Warnell School of Forestry and Natural Resources
Forestry, Fisheries and Wildlife, Water and Soil Resources
Natural Resources Recreation and Tourism

Office of the Dean

August 16, 2016

Dr. Brian Bledsoe
College of Engineering
Driftmeier Engineering Center
University of Georgia
CAMPUS

Dear Dr. Bledsoe,

The Warnell School of Forestry & Natural Resources is supportive of the proposed Institute for Resilient Infrastructure Systems. Our school has a long history of hydrology research that has supported the development of forest road systems that are durable and minimize environmental impacts. Our faculty members have also performed important research underpinning the very successful non-regulatory best management practices used across the United States to protect water quality during forest management and harvesting operations. In addition, much of the work behind designed wetlands and land treatment of municipal sewage was performed in our school.

We look forward to working with you and this proposed institute to help create additional programs that will serve our school and the entire campus.

Sincerely,

W. Dale Greene
Dean

Athens, Georgia 30602-2152 • Telephone (706) 542-4741 • Fax (706) 542-2281

The University of Georgia

Carl Vinson Institute of Government

August 1, 2016

Dr. Brian P. Bledsoe
Professor
The University of Georgia
College of Engineering
Driftmier Engineering Center
597 D.W. Brooks Drive
Athens, Georgia 30602

Re: **Letter of Support for Institute for Resilient Infrastructure Systems**

Dear Dr. Bledsoe:

Please accept this letter of support for your proposal for a new institute – the Institute for Resilient Infrastructure Systems (IRIS) – at the University of Georgia. I am happy to support your efforts on behalf of the Carl Vinson Institute of Government (Institute of Government).

IRIS meets several pressing needs, both at the university level and throughout the state itself. As you are aware, faculty across the university are deeply engaged with developing new research and outreach tools to assist communities with improving their resilience to environmental hazards. Indeed, from assisting local governments with integrating green infrastructure techniques into downtown planning efforts to educating local leaders about ways to protect lives and property from flooding and severe weather events, several public service faculty at the Institute of Government routinely work with communities in this very area. Our division of Information Technology Outreach Services provides important technology support to the Georgia Emergency Management Agency, the Georgia Department of Transportation, and the Environmental Protection Division. IRIS would play an important and much-needed leadership role in increasing interdisciplinary collaboration, promoting cross-cutting research opportunities, and improving understanding of resilient infrastructure systems among a variety of academic disciplines and public service units.

In addition, IRIS will provide an important foundation for developing timely and practical information that has great potential to support the university's responsibility as a land-grant institution to improve life in Georgia. The Institute of Government's mission falls squarely within this public service tradition. Few areas have more relevance to our state and local government partners than infrastructure. IRIS, with a focus on enhancing the state's ability to improve, rebuild, and rethink infrastructure design, will provide important research support for our current and future professional development, education, and outreach efforts. State and local

government leaders face many challenges as they strive to protect public safety, improve environmental quality, strengthen local economies, and increase overall quality of life. IRIS's focus and approach has great potential to assist state and local governments with not only preparing for these challenges but with finding new opportunities to make Georgia safer, stronger, and better.

Again, I am pleased to support your efforts to establish IRIS. The goals of the proposed institute are innovative yet practical, highly interdisciplinary yet focused, and exciting yet sound. Thank you for including the Institute of Government as part of your proposal. We share your interest in helping Georgia strengthen its social, economic, and ecological resilience.

Most sincerely,

Laura J. Meadows
Director

The University of Georgia
Marine Extension Service

August 2, 2016

Dr. Brian Bledsoe
507 Driftmier Engineering Center
Athens, Georgia 30602

Dear Dr. Bledsoe,

On behalf of Marine Extension Service and the Georgia Sea Grant College Program (MAREX/SG), it is my pleasure to provide this letter of support for the *Institute of Resilient Infrastructure systems*. MAREX/SG promotes the economic, cultural and environmental health of Georgia's coast and prepares citizens to become good stewards of coastal ecosystems and watershed resources. This real-world applied and translational mandate includes a focus on resilience and helping coastal communities adapt to climate extremes and sea level rise. We have a long history of close partnerships and engagement with coastal community partners relating to the identification of coastal hazards and the development of adaption strategies. From national award winning projects with Tybee Island to regional efforts along the South Atlantic seaboard, we have consistently found that critical infrastructure systems are a top priority at the local level and that communities are ready, willing, and able to engage with us on these issues. Unfortunately, we don't always have answers to many problems local communities are facing. We welcome the opportunity to engage more of the University community in research and development of tools and technologies to create more resilient systems.

We have cultivated strong working relationships with multiple stakeholders in coastal Georgia including governmental agencies, NGOs and industry. We expect that these stakeholders would also be willing and able to engage with *Institute* faculty and projects. In addition to assisting the *Institute* with access and information delivery to coastal stakeholders, we have faculty and staff resources as well as facilities in coastal Georgia that will be available to *Institute* projects. Our faculty has expertise in stormwater and green infrastructure, climate hazard communication, FEMA flood programs and the CRS program, fisheries and ecosystem services, and development of educational tools and technologies that we feel could contribute to the Institute's initial success. In addition, Dr. Mark Risse will serve as core faculty for the Institute and provide services and advice to the center as needed.

Again, I applaud you for initiating this effort and Marine Extension and Georgia Sea Grant looks forward to working with the Institute for Resilient Infrastructure Systems

Sincerely,

Mark Risse

Dr. Mark Risse
Director, UGA Marine Extension and Georgia Sea Grant

1030 Chicopee Complex – Athens, Georgia 30602-5416 – Telephone (706) 542-8849 – Fax (706) 542-8838

The University of Georgia

Office of the Vice President for Research

August 12, 2016

To Whom It May Concern:

I write to express my enthusiastic support of the proposed Institute for Resilient Infrastructure Systems, to be directed by Professor Brian Bledsoe of the College of Engineering. The proposed institute will be highly interdisciplinary in nature, harness considerable, existing UGA expertise, and address a grand challenge issue (societal resiliency and infrastructure in the fact of climate change) that has immediate relevance for Georgia and beyond. Dr. Bledsoe has the credentials to serve as an outstanding leader for this institute and I appreciate the fact that he has chosen to "start small and focused, and then expand." I will be pleased to support this effort in every way I can.

Sincerely,

David Lee, Ph.D.
Vice President for Research

150 Paul D. Coverdell Center for Biomedical and Health Sciences
Athens, Georgia 30602 • Telephone 706-542-5969 • Fax 706-542-5978