NSF DCL: Concepts for Advancing Sustainable Urban Systems (SUS) Networks: Southeast Urban Systems Summit (SEUSS)

Project Description

Vision and Goals

SEUSS (Southeast Urban Sustainability Summit) is a conference proposed for North Carolina to develop a research collaborative comprised of academics, municipalities, industries, and NGOs with the vision of advancing research in urban sustainability specific to the state. The resulting research agenda will have implications for the entire southeast region due to the many similarities of the NC cities and towns, to those across the greater region. SEUSS will focus on both sustainability and resiliency of the primary systems managed by municipalities: energy, water, waste, transportation, housing, health/safety, and food/agriculture. SEUSS will form a diverse network of stakeholders across the state committed to identifying and addressing the state's most pressing sustainability and resilience issues.

The goals of SEUSS are to (1) plan a Sustainable Urban Systems conference that will include city planners, sustainability directors, academics with research interests in urban sustainability, advocacy and activist groups, and industries engaged in advancing sustainable urban systems; (2) implement the SUS conference using a Convergence Research Network (CRN) approach; and (3) sustain the SUS CRN after the conference.

SEUSS will include: opening plenary/panel discussions on the current state of urban systems; keynote speakers (Mayor/City Manager); and working group breakout sessions by urban system to identify and align research needs to participant research competency/interest. An interdisciplinary and inter-institutional SUS research collaboration will be established.

Broadening Participation Research in Sustainability Science

Sustainability science is an emerging field, and SEUSS leadership represents both a Historically Black College/University (NC A&T) and a Minority Serving Institution (UNCG). SEUSS will increase SUS knowledge of academics and underserved students. A small number of SEUSS invitations will be specifically reserved for students from these institutions.

Statement of Conference Need

Sustainability is defined as meeting the needs of the current population, without infringing on the ability of future generations to meet their needs (Development, 1987). An NSF-funded ACERE report defines an *urban system* as a "geographical area with a high concentration of human activity and interactions, embedded within multi-scale interdependent social, engineered, and natural systems that impact human wellbeing across spatial and temporal scales" (Subcommittee, 2018) A *sustainable urban system* is one that "transforms structures and processes to measurably advance wellbeing of the planet"(Subcommittee, 2018).

"Cities create wealth, generate employment and drive human progress by harnessing the forces of agglomeration and industrialization" (Programme, 2016). Cities are the main drivers of growth (63% of population today, growing ~40% by 2050) and are places of cultural and social interaction (Keivani, 2010 and Ortman, 2009). Cities must service the population, and in many cases the infrastructure is strained or at capacity.

According to the 2016 United Nations World Cities Report the key risks and challenges that will be faced by urban areas in the 21st century are; (1) urbanization growth; (2) governance and finance; (3) slums; (4) urban-services delivery; (5) climate change; (6) inequality; (7) forced migration; (8) rising insecurity; and (9) urban risk. According to (Keivani, 2010), cities contribute to unsustainable development by: (1) propagating intra-urban social inequalities; (2) restructuring urban economies; (3) increasing emissions

and pollution; (4) struggling to provide basic infrastructure and utilities; (5) not controlling urban form and spatial development; and (6) mishandling multi-level governance and institutional development.

North Carolina Conference Focus

North Carolina is an ideal SUS conference location because: (1) NC contains many different types of urban ecosystems (geographically, demographically, and socioeconomically variant); and (2) there is a critical mass in NC working to resolve SUS issues, but not in an integrated way. Participants are discussed later in the Conference Work Plan.

Urban centers in NC are mid-sized or smaller, many have blue-collar economies, and are adjacent to rural agricultural regions. The state is culturally diverse, especially in urban centers. NC geography includes mountains, foothills, plains, and coastal regions. NC also faces many sustainability and resiliency challenges posed by hurricanes/tornadoes/storm surges, as well as extreme heat.

NC SUS challenges include: pig-farm waste (Sorg, 2019); utility solar-farm growth (2nd-highest Solar deployment state in the US) (Henderson, 2019); land-use changes; food-deserts (Greensboro was the worst food desert in the US in 2014) (McLaughlin 2015); coal-ash spills into state waterways (NC Environmental Quality, 2019); new wind-turbine generation facilities (including off-shore wind plans) (Offshore Wind in NC, 2019); and extreme socio-economic inequality (Debruyn, 2019).

Urban Impact on North Carolina (Tippett, 2019) commissioned by the North Carolina Metro Mayors Coalition found 66% of residents live in growing urban areas. NC has transitioned from tobacco/textiles/furniture industries to information-technology/banks-and-finance/food production/biotechnology economies. Another study, *Implementing Community Resilience across North Carolina* (Hutchins, 2019) identified the primary metro-area sustainability issues as flooding, wildfires, landslides, supply-chain disruptions, water shortages, extreme heat, sea-level rise, and storm surge.

Fortunately, many factors are converging to drive sustainability across the state. The NC Governor has contributed critical mass and momentum to address NC sustainability and resiliency issues with the issuance of Executive Order 80 (EO80, focused on energy and emissions reduction, and electrification of the transportation system). SEUSS is perfectly aligned (complementary and supplementary) to address the city and municipality needs of the state (NOT directly covered by EO80).

Additionally, almost every city mayor in North Carolina has signed a climate commitment. Most NC cities have a full-time sustainability director, have developed long-range sustainability strategies, and many are engaged with a third-party certification organization such as STAR Communities (recently acquired by the U.S. Green Building Council, and re-named LEED for Cities).

North Carolina also has a strong history of energy efficiency legislation that includes a renewable energy standard, and commitment to energy reduction in state buildings across the state. NC is number two in installed solar, has a growing commitment to sustainable agriculture, and strong bio-fuel production.

While NC is doing many things to make its cities more sustainable and resilient, there is still much work to be done. SEUSS will create the opportunity to bring together all these forces for positive change.

NC Urban Systems - Background and Challenges

The background and challenges of the NC systems that will be discussed at SEUSS are detailed below.

Energy: Energy is an overarching infrastructure system in NC and the SE region. Energy dynamically interacts with food and agricultural (land use); watersheds and freshwater/oceanwater bodies; transportation; waste; housing; and safety/health systems (NSF 2015). Additionally, tradeoffs and decisions related to energy systems will impact alternative energy generation choices (wind, solar, coal, natural gas, nuclear, hydro/pumped-hydro, petroleum, biomass, and others).

NC population and industry growth is greater than the national average, with projections of 1.1% growth per year for the next 15 years (Henderson 2016). NC, therefore, must understand how to sustainably satisfy the growing demand for electricity generation while simultaneously meeting the needs for: food production and delivery; freshwater for agriculture, cities/municipalities, and energy generation cooling; transportation of people and products; waste treatment; housing and building solutions for all residents; and safe/healthy air/water (pollution and emissions) and urban areas.

NC has known issues with coal ash ponds (a byproduct of coal energy) that overflow into freshwater streams, droughts that reduce the freshwater cooling (needed for energy-generation turbines) and agricultural waters, and pig-waste overflows into rivers/lakes/streams. Additionally, energy generation and distribution are significantly impacted by weather events (hurricanes, tornados, high-precipitation-producing storms, and droughts) that have been numerous in recent years across NC (NWS 2019).

Water: North Carolina cities are at significant risk of flooding. During hurricanes, coastal areas experience flooding from storm surge, as Wilmington did during Hurricane Florence in 2018, but riverine and rainfall flooding associated with hurricanes occurs in inland cities as well (NWS, 2019). Besides hurricanes, normal convective thunderstorms can trigger flash floods, with North Carolina second only to Texas in vehicle-related flood deaths (Kellar and Scmidlin, 2012). In addition to floods, North Carolina and the rest of the Southeast region experience periodic droughts. Tree-ring evidence indicates that droughts of similar magnitude occur frequently in the paleoclimatic record. However, recent period on which water-resource management decisions are based on one of the wettest periods in centuries (Seager, 2009; Pederson et al., 2012). Finally, the Southeast region, including North Carolina, leads the United States in freshwater biodiversity (Master et al., 1998). Aquatic ecosystems are, however, threatened by water-quantity and water-quality problems stemming from North Carolina's urban areas (heavily agricultural).

Waste: NC faces many waste related challenges. Among these challenges are unlined landfills producing leachate that ends up in groundwater, methane leaks, coal ash ponds and spillage from coal energy generation, pig-manure lagoon overflows, nuclear waste disposal, and limited recycling (DEQ, 2019).

Transportation: Transportation systems have been acknowledged as the 'maker and breaker of cities' (Clark, 1958) because investments in these systems have had a tremendous impact on society. While transportation investments have had positive impacts on economic and social progress (Hoyle and Smith, 1998), there have been resulting costs such as spatiotemporal disparities in opportunity access (Hansen, 1959; Litman, 2016) and environmental degradation—including energy waste and air pollutions, global warming, noise, and ecosystem loss and fragmentation (Black, 2010; Hickman and Banister, 2014). The intertwinement of transportation with all aspects of urban life—social and economic (e.g., Pratt, 1911; Taylor, 1915), and environmental (e.g., Clark, 1958) is well documented (Sultana et al 2017) over a century. Contemporary transportation practices remain as a major contributor to climate change and impede urban sustainability efforts not only in NC, but in the entire world (UN Habitat, 2013). The transpiration sector accounts for the second largest contributor of greenhouse gases (GHG) with urban transportation systems in the United States contributing approximately 75% of these GHG emissions (EPA, 2016). GHG emissions from transportation is increasing 20% faster than other energy-use sectors due to rapid expansion of urban areas worldwide (UN Habitat, 2016). Most of these transportation-related effects are associated with the heavy reliance on motor vehicles for personal travel and freight movement. Given that transportation modes must be decarbonized sooner rather than later (Schwanen et al., 2012), sustainability remains a central reference point in many studies in the transportation field (Klinger, 2016). Thus, there is a need for research in NC concerning how to achieve the integration of transportation and land use in a way that simultaneously reduces petroleum-based automobile travel while concurrently enhancing the local economy, and improving mobility, social equity, and accessibility (Afforlderbach and Schulz, 2015). However, the current research in sustainable transportation in NC is disciplinary and

fragmented from other areas (i.e., water, land use) and stakeholders. We envision that this conference will identify research network result in the identification of urgent transportation needs in NC, shared best practices and performance metrics, and transformational evidence-based research that will lead to quantifiable improvements in transportation through integrated solutions to reduce GHG emissions and disparities in small and large urban communities of NC.

Housing: Lack of strong land-use regulation means that NC cities sprawl. Housing issues include housing cost burdens and substandard housing conditions. Extreme conditions exist in half of the counties. (NC Housing Coaltion, 2019)

Safety/Health: Urban safety is a critical issue in NC, especially as urban areas grow. The health of individuals within urban areas are affected by drugs, pollution, emissions, stress of living conditions, economics, and utility support systems. The conference will pay particular attention to socio-economic research opportunities to address SUS challenges for all residents of the urban areas.

Food/Agriculture: Although agricultural areas are typically rural, there is a growing interest in sustainably supplying food from local farms for people who reside in urban areas. Additionally, urban farming solutions might contribute to sustainable urban practice. NC also has significant food-desert areas, especially in the Greensboro area. SEUSS will consider the food/agricultural systems of the state, and how research might lead to more sustainable practice.

Convergence Research Framework

Convergence research (one of NSF's 10 Big Ideas) will be used as the foundational structure for the conference, since it is "a means of solving vexing research problems, in particular, complex problems focusing on societal needs" (NSF 2019). "Convergence is an approach to problem solving that cuts across disciplinary boundaries. It integrates knowledge, tools, and way of thinking from (different disciplines), and beyond to form a comprehensive synthetic framework for tackling scientific and societal challenges that exist at the interfaces of multiple fields It entails integrating knowledge, methods, and expertise from different disciplines and forming novel frameworks to catalyze scientific discovery and innovation" (NSF 2019). Convergence Research has two primary characteristics: (1) research driven by a specific and compelling problem; (2) deep integration across disciplines. (NSF 2019).

SEUSS will use a convergence-research approach to identify key NC SUS issues and develop research opportunities to address the issues through (1) identification of best practices towards sustainability; or (2) discovery of gaps in research. SEUSS will convene a network of academics, sustainability directors, city planners, government leaders, NGOs, and industries. The map in Figure 1 shows the cities that have committed to participating in the SEUSS conference. It is our intention to have each of these cities represented by their Mayors, sustainability directors, city planners, and other interested local stakeholders. Additionally, NC has 17 UNC system universities that are located in the major urban cities of the state, and these universities will be well represented by professors, students, and academic leadership at the SEUSS conference. In particular, underrepresented students will be encouraged to attend and will receive financial support to do so.
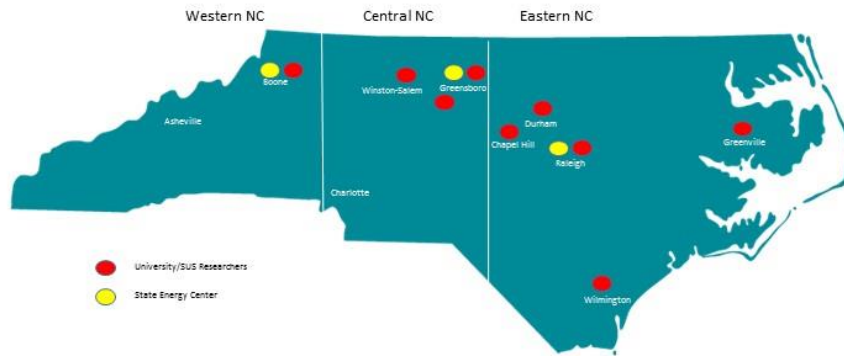
Figure 1. NC map of State Energy Centers, and SUS Researchers in major Cities/Universities.

The large and diverse network expressing support for this conference is an indication of the willingness to collectively tackle these ~~vexing~~ complex and interconnected NC urban sustainability problems. SEUSS Leadership intends to collaborate with the network established at the conference to develop a proposal for a CRN grant to propel the defined research forward. SEUSS will establish a strong collaboration between academic researchers, urban leaders, industry, and nonprofits to enhance the infrastructure for SUS research and education. SEUSS envisions the eventual development of a strong, diverse research network in the Southeast.

The organizing committee will use the characteristics of convergence projects to structure the conference (NSF 2019):

Need for a convergent approach

NC has many siloed groups working on the various SUS issues in the state. The problem is that none of these groups are communicating and seeking to engage to find synergies between the systems, to better understand how the systems interact, and realize tradeoffs.

Readiness to engage in convergence research

There are many groups working on SUS, each with a different perspective on the problem. Through convergence research we can begin to work collectively to address the SUS challenges that affect the long-term sustainability of our state, and possibly even speed the progress through the convergence approach by allowing multiple perspectives to collaborate on envisioning solutions.

Integration of knowledge, tools, and modes of thinking

Municipal leaders have a strong understanding of the current state of urban systems in their cities. NGOs, non-profits, and advocacy groups have a vision for how city systems should function. Industries have the tools and technologies to improve the sustainability of city systems. Academics have theoretical frameworks, prior empirical and applied research, along with discipline specific expertise. A convergence of these various perspectives on NC SUS issues has the potential to provide deeper and broader context to everyone involved in the convergence.

Involvement of the next generation of convergence researcher

SEUSS will be attended by academics from universities across the state and the southeast who will share knowledge gained with their students] and expose the students to next generation SUS research. Additionally, SEUSS will reserve 20 seats at the conference for students. This will involve them in SUS issues and encourage them to pursue careers in SUS. Student voices will also add yet another perspective to consider in relation to SUS.

Conference Work Plan

SEUSS has three goals:

G1: Plan a Sustainable Urban System conference

G2: Implement the SUS conference using a Convergence Research Approach

G3: Sustain a post-conference SUS CRN

The expected outcomes of SEUSS are to: (1) increase understanding of key SUS issues faced by NC cities and towns, which will influence future thinking about SUS in NC; and (*2*) create a NC SUS convergence research network to intentionally improve NC's urban systems. The goals of SEUSS are detailed below:

G1: Plan a Sustainable Urban Systems conference

An organizing committee has been established to: (1) identify key SUS thought leaders; (2) decide on the location and date for SEUSS; and (3) identify stakeholders to invite to SEUSS.

To convene the SUS Convergence Research Network the SEUSS organizing committee identified key thought leaders for each of the identified urban systems. The thought leaders will craft the SUS plenary/ panel discussions, and provide necessary background information that will drive research in each of urban system areas. Thought leaders will represent cities, planners, NGOs, industries, and academia.

Conference Leadership

SEUSS will be organized by the Conference Leadership, Organizing Committee and Urban System Focus Leaders. The conference leadership and organizing committee will be responsible for planning and implementation of the conference. They will approve the final agenda, and make recommendations regarding speakers, panelists, and facilitators. They will also provide oversight on the compilation of the information for the Conference Report.

Conference Leaders

PI Dr. Vicki Foust, Research Associate, Center for Energy Research and Technology (CERT), NC A&T, will lead SEUSS. Dr. Foust has significant conference leadership experience. Her research focuses on sustainability of complex organizations, and she has developed sustainability strategies for higher education institutions. She serves as the Chair of the Greensboro Community Sustainability Council, which advises the Greensboro City Council on sustainability strategies, and she also serves as the sustainability advisor to the City of Greensboro Comprehensive Planning Committee. Dr. Foust yearly attends conferences across the state, including, in part: the Appalachian State University *State Energy Summit* (annual and mid-winter summits); NCSU *State Energy Conference*; and NC DEQ (Department of Environmental Quality) regular meetings that convene at least 6 times per year. With the rollout of EO80, Dr. Foust and Dr. Monty will be hosting (with NC DEQ) the EO80 central NC planning meeting on the NC A&T campus on May 17th, 2019.

Co-PI Dr. Selima Sultana, Professor, Department of Geography, University of North Carolina at Greensboro, will assist the PI by providing co-leadership for SEUSS. Her research foci are in the area of Urban and Transportation Geography interested in the commuting/travel patterns of individuals,

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households, and among different race/ethnic groups, focusing on how people negotiate the conflicting demands of household responsibilities and the changing urban settings of their lives. Dr. Sultana has authored an edited book and more than 40 scholarly articles and her work has appeared in leading geographical journal such as the *Annals of the Association of American Geographers, The Professional Geographer, Journal of Transport Geography, Transport Policy, Tourism Geographies, Urban Geography, Urban Studies, Growth & Change, Southeastern Geographer, and* in London School of Economics and Political Science's (LSE) blog website.

Co-PI Dr. Jamie Russell, Interim Director Appalachian Energy Center, Associate Professor of Building Science, Appalachian State University will assist the PI by providing co-leadership for SUESS. Dr. Russell's expertise in systems design and reliability will be particularly useful as he works with participants to identify failure modes and failure prevention strategies for critical urban and municipal systems. Jamie's experience in clean energy resource assessment and characterization will be leveraged to examine the potential for sustainable and resilient urban systems.

Co-PI Dr. Gregory Monty, Director, Center for Energy Research and Technology (CERT), NC A&T will assist the PI by providing co-leadership for SUESS. Dr. Monty performs energy research in: NC carbon emissions from energy generation; food/energy/water; complex natural and human systems related to food deserts; and phasor measurement unit big-data algorithms for resiliency. Additional research includes NSF INCLUDES (PI) and NSF HBCU-UP Broadening Participation Research (PI), discussed in the Prior NSF Support section.

Organizing Committee
The organizing committee is comprised of the Conference Leaders and the individuals listed below.

- *Steve Kalland*, Executive Director of North Carolina Clean Tech Center, North Carolina State University

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- *Lori Collins*, Environmental Programs Consultant, North Carolina Department of Environmental Quality

- *Meg Jamison*, Executive Director, Southeast Sustainability Director's Network

- *Marilynn Marsh-Robinson,* US Climate and Energy Partnerships and Alliances Manager, Environmental Defense Fund

- *Zach Ambrose*, Facilitator, Environmental Defense Fund Cities Initiative

Urban System Focus Leaders
System Focus Leaders will be responsible for leading the breakout sessions for the urban system focus areas, and making recommendations for speakers, panelists, and facilitators for the focus areas, as well as documenting outputs and outcomes of breakout sessions, and structuring the information to be included in the Conference Report.

Energy Focus Leaders

- *Grace Marasco-Plummer,* Program and Research Development, Appalachian Energy Center, Appalachian State University

- *Dr. Raymond Tesiero*, Assistant Professor, Civil and Architectural Engineering, NC A&T State University

- *Dr. Wenliang Li,* Assistant Professor, Department of Geography, Environment, and Sustainability, University of North Carolina-Greensboro

Transportation Focus Leaders

- *Dr. Maranda McBride*, Director of the NC A&T Transportation Institute, NC A&T

Housing Focus Leaders

- *Dr. Stephen Sills*, Associate Professor of Sociology, Director, Center for Housing and Community Studies, University of North Carolina-Greensboro

Water Focus Leaders

- *Dr. Marica Hale*, Assistant Professor of Peace and Conflict Studies, University of North Carolina Greensboro

- *Dr. Sarah Praskievicz*, Assistant Professor, Department of Geography, Environment, and Sustainability, University of North Carolina Greensboro

- *Dr. Manja Jha*, Assistant Professor, Engineering, NC A&T State University

Waste Focus Leaders

- *Matt James*, Environmental Specialist: Public Recycling Programs, North Carolina Department of Environmental Quality

- *Mary McCleelan,* Executive Director of Carolina Recycling Association

- *Dr. Renzun Zhao*, Associate Professor, Civil, Architectural, and Environmental Engineering, North Carolina A&T State University

Food Focus Leaders

- *Britt Huggins*, Director of the Greensboro Community Food Task Force, City of Greensboro, NC

- *Odile Huchette*, Director of the Guilford County Food Council, NC A&T

SEUSS Location and Date

The SEUSS conference will be held at the NC A&T State University campus on August 7 and 8, 2019 in Greensboro, NC. Greensboro is centrally located in the state, making it conveniently located for conference participants throughout the state. Dates were chosen to maximize attendance by faculty and other participants as the academic year will not be in session, and most people will have completed their summer vacations.

NC A&T has meeting facilities that can be used for very little cost due to the PI's university affiliation. This will allow more of the conference budget to be used to offset participant conference costs such as food, travel and lodging. The conference will take place in the Academic Classroom Building which has accommodations for the plenary sessions, breakout sessions, and meals for over 200 participants. The cost to use this facility is free; with the exception of fees for housekeeping services. This will allow

almost all of the conference budget to go towards participant support. Catering will be provided by a local caterer with a focus on local-food sourcing. Affordable lodging is available in close proximity, and shuttle service to/from the hotels will be provided as needed.

Invitations to SEUSS

The following organizations have agreed to recruit participants to the conference by sending SEUSS invitations to their "membership lists." Support letters are attached from these organizations.

• Southeast Sustainability Director's Network

• EDF Cities

• NC State Energy Conference

• Piedmont Triad Regional Council

Faculty will be invited using a database created of Urban Planning/Environmental Studies/Engineering/Sustainability department faculty from the following NC universities, as well as others throughout the Southeast:

• Appalachian State University

• Wake Forest University

• University of North Carolina at Greensboro (MSI)

• NC A&T State University (HBCU)

• NC State University

• East Carolina University

The following non-governmental and advocacy organizations will be invited to attend:

- North Carolina Housing Coalition: advocates seeking to bring together those interested in best practices and improving public policy-making formed the North Carolina Low Income Housing Coalition.

- NC Sustainable Energy Association: NC Sustainable Energy Association (NCSEA) is the leading 501(c)(3) non-profit organization that drives public policy and market development for clean energy. NCSEA work enables clean energy jobs, economic opportunities and affordable energy options for North Carolinians.

- Environmental Defense Fund (EDF): EDF addresses today's most urgent environmental challenges by targeting issues that affect people around the world. Working in partnership with others, EDF focuses where it is best positioned to help, based on its strengths.

- US Green Building Council: LEED for Cities is the latest sustainability assessment tool offered by USGBC. LEED for Cities allows cities to benchmark performance, and develop strategies to improve performance.

- Sierra Club: The most enduring and influential grassroots organization in the United States. The Sierra Club is utilizing its 3 million members to push its Ready for 100 campaign to city leaders

across the US. The RF100 campaign calls on city leaders to commit to 100% renewable energy by 2050.

- NC Warn: 30-year-old nonprofit organization tackling the accelerating crisis posed by climate change by building people power for a swift North Carolina transition to clean power, and by promoting energy and climate justice.

- Poor People's Campaign: A national organization advocating to end systemic racism, poverty, the war economy, and ecological devastation.

G2: Implement the SUS Conference

SEUSS Conference Agenda		
	Day 1	Day 2
9:00:00 AM - Noon	Welcome and SEUSS Vision	Welcome and Day 2 Instructions
	Convergence Research Network Overview	Debrief of Day 1: Current State/Best Practices
	Overview of NSF Sustainable Urban Systems	
	Plenary 1: Economics in NC	
	Break	Break
	Plenary 2: Environment in NC	Breakout Session 3: Research Gaps Identified
	Plenary 3: Social Equity in NC	
Noon - 1:00 pm	Lunch	Lunch
1:00:00 - 5:00 pm	Breakout Session 1: Current State	Plenary: ~~Breakout Session 4:~~ SUS Convergent Research Opportunities Identified
	Break	
	Breakout Session 2: Best Practices	Break
	Closing Remarks	Concluding Remarks, Conference Survey, and Next Steps for CRN

Conference Agenda Details

Day 1 of SEUSS will be committed to understanding the issues. Panel discussions concerning state level sustainability issues related to environment, social equity, and economics will begin the conference. The discussion will then move to specific urban systems. This discussion will include – differing perspectives of the issues from sustainability directors, municipal leaders, and NGOs. The goal is to inform the participants of the divergent perspectives to provoke new ways of thinking about the issues, and inspire opportunities for research.

Breakout leaders will work in the evening of Day 1 to summarize the sessions 1 and 2 in preparation for the Day 2 de-brief. These summaries will also be incorporated into the Conference Report.

Day 2 will begin with a short de-brief of the findings from the two afternoon breakouts, so that all participants are informed of the current state and best practices for each of the urban systems. The purpose of this debrief is to allow the participants to hear from all the other breakouts, and to identify opportunities for research convergence between multiple urban systems. This ~~be~~de-brief will be followed by a systems breakout to determine research gaps in each system. This discussion will be facilitated to focus specifically on research gaps that integrate the six key elements that were found in the Sustainable Urban Systems: Articulating a Long-Term Research Agenda. The goal for the session is to select the top-3 research projects that might be needed to investigate/support research gaps. These will be briefly described and added to the 10-min focus-area activity team presentations. Lunch will follow with a NC City Manager as the keynote speaker. Breakout leaders will work in during lunch to summarize the morning sessions in preparation for the Day 2 de-brief. This will be followed by a plenary session that will facilitate opportunities to research interactions between systems. The goal of the final afternoon will be to identify research synergies among the entire network, and to list inputs needed from other groups, and/or information that should be shared with other groups to improve their research agendas.

The conference will close with concluding remarks, a request for all participants to provide feedback about the conference through an online survey created in Qualtrics, and an explanation of next steps the Organizing Leadership and Committee Members intend to take to submit a proposal for an anticipated NSF SUS CRN solicitation. A plan will also be put forth by leadership to sustain the SEUSS network that has formed.

Plenary

There will be a plenary morning on Day 1 that will feature three 30-minute panel discussions focused on the key sustainability drivers: Economic, Environment, and Social Equity. The goal of these discussions is to inform the audience of the key issues faced by North Carolina cities and towns. The panelists will include city managers, mayors, sustainability directors, NGOs, and industry. There will be Q&A opportunities at the end of each session.

Breakout Sessions

There will be three breakout sessions throughout the conference. The final goal of these breakout sessions is to develop research topics and networks to support the research needed to address high-priority SUS issues for cities and municipalities across NC and the Southeast. The breakout sessions will be documented by session leaders, and later disseminated to conference attendees through a Conference Report. The Breakout sessions will be facilitated by a 4-person team, and are described below.

BO1: Current State

These sessions will feature facilitated discussion on the current state of each of the NC systems. Participants will be asked to consider:

- City sizes from small to large;

- Presentations from the morning Plenary sessions;

- How the current state of the system is impacted by the following SUS indicators:

  - intra-urban social inequalities;

  - economic restructuring resulting from globalization;

  - environmental concerns of rising emissions, environmental pollution, and poor resource management;

  - access to utilities and basic infrastructure;

      o   urban form and spatial development; and

      o   multi-level governance and institutional development.

BO2: Best Practices

These sessions will feature a facilitated discussion on best practices in each system focus area. Participants will be asked to consider the same sustainability indicators as used in BO1.

BO3: Identify Research Gaps

Once participants are informed of key SUS issues and best practices, then gaps in research will be identified in the context of the NSF ACERE Report (Subcommittee, 2018), which suggest six research elements that should be integrated into SUS research to most effectively advance SUS science:

1. Developing new data and methods to understand current drivers and interactions among natural, human built, and social systems in urban areas as they impact multiple sustainability outcomes across scales.

2. Developing the science to assess the sustainability outcomes nexus is urban systems

3. Understanding the levers for change in diverse urban systems combining (1) integrative design, technology innovation, and socio-technical transitions; (2) focus on multi-level actors and governance

4. Advancing comparative studies, typology studies, and scalability studies to develop a generalizable science of theories of change across diverse city types.

5. Developing the science to model the future of SUS across the three perspectives: single, multiple, and supra-aggregations of cities and urban areas.

6. Developing the science of knowledge co-production among researchers, communities, industry groups, practitioner groups, and governments at multiple levels, leveraging real world experimentation ongoing in urban areas.

Final Session: Convergent Research and Integration

This session will be held in plenary, and all participants will engage in an activity to determine research synergy or conflict between specific system foci.

Document the conference and prepare Conference Report to distribute to network

The conference will be video-recorded. The conference committee will produce a report that will include the work output of the breakout sessions, and will provide links to video-recorded sessions. The conference report will include:

- Purpose of SEUSS

- Recognition of SEUSS Conference Organizing Committee members (Biographies)

- Agenda

- Keynote-speaker biographies, presentations, and summaries

- Focus Sessions

      o   Recognition of session leaders;

      o   Summary of discussion;

      o   Research outputs and outcomes.

      o   Identified research networks

The Conference Report will be distributed to all conference participants and NSF. The exact nature of the distribution has not yet been determined.

G3: Sustain a post-conference SUS CRN

The SEUSS leadership and organizing committee are committed to hosting this conference. Leadership is also committed to sustaining a post-conference SUS CRN for the purpose of pursuing the research opportunities identified, growing the SEUSS network, and hosting follow up SEUSS conferences in order to continue this important work. Leadership will create a post-conference communication vehicle for participants to use to communicate broadly with the group. Leadership will also seek funding opportunities (including any NSF SUS Convergence Network solicitations) to provide for continuation and growth of the network. The long-term goal is a strong, diverse network across the Southeast committed to researching SUS issues with the ultimate goal of solving them.

Timeline

Conference Leadership	2019					
	Pre-Award	June	July	August	September	Post-Award
Pre-Conference Planning and Execution: Dr. Vicki Foust(PI), Dr. Greg Monty(co-PI), Dr. Marcia Hale(co-PI), Steve Kalland(co-PI), Lori Collins(Senior Personnel)	Establish Agenda	Finalize Agenda	Approve/Publish Final Agenda	**Conference Date: Aug 7th and 8th**		
	Form Steering Committee (collect member bios)	Weekly Planning Meetings				
	Secure Plenary Speakers	Confirm Speakers (collect bios, presentations, summaries)				
	Define Breakout Topics	Finalize BO Topics				
	Form BO Leadership Teams	Finalize Breakout Leadership Teams				
	Define Facilitation Process	Finalize Facilitation Methods /Training for BO				
		Secure Location/Support	Finalize Conference Support (food, facility)			
			Print Facilitation Documents			
		Invite Participants	Confirm Participants aligned to Breakout Topics			
Conference Planning and Execution: Breakout Topics-Leaders: Energy-Dr. Greg Monty Transportation-Selima Sultana Water-(???) Waste-Dr. Sarah Praskievicz Food/Agriculture-(???) Housing-Dr. Stephen Sills Health/Safety-(???)		Identify panelists	Confirm panelists		Thank panelists and attendees	Establish "Breakout Topic" Research Networks
		Identify facilitators	Confirm facilitators	**Execute Conference: Follow Facilitation Plan**		
			Facilitation Training for each Breakout Topic		Collect contact info for each breakout topic participant	
Post-Conference Conference Report and Planning for NSF CRN Solicitation Proposal (PI/co-PIs)		Determine method for disseminating conference proccedings			Collect documents/notes from Breakouts	CRN Planning Meeting
					Organize all documents	CRN Proposal Team Formed
					Write/Disseminate Conference Report by Sep 30th	Proposal Writing Strategy Defined

SUS Related Meetings

A number of SUS related meetings that have taken place in NC. These meetings focused on sustainability at higher education institutions, energy, greenhouse gas reduction, and city sustainability. The conference leadership team realized there was a need for a conference devoted specifically to sustainability and resilience of cities and towns.

EDF Cities Roundtable Series (September - December 2018)

The Environmental Defense Fund (EDF) partnered with North Carolina Department of Environmental Quality (DEQ) to host a series of four roundtable discussions held in four cities across the state in the

later part of 2018. The purpose of these roundtables was to bring together municipal sustainability professionals to better understand the obstacles municipalities face in implementing sustainability measures, and propose solutions to overcoming the obstacles. The result of this effort was a solid list of obstacles, along with the proposed solutions, many of which were either regulatory or legislative in nature.

Appalachian Energy Summit (Annually in July)

The AES is a three day summit focused on higher education institution sustainability; specifically the 17 UNC system campuses. The summit is aligned with 2005 NC Legislation which requires all state operated buildings to reduce energy, water, and waste by 25% by 2015. The summits (held for the last 8 years) has provided leadership towards achieving the legislative goals (met by the UNC system in 2015), through twice-yearly working groups. The summit is free. The AES efforts have resulted in $800 million in avoided utility costs to date (Appalachian Energy Summit, 2019).

NC Climate Change Interagency Council (November 2018)

In October 2018, the Governor of North Carolina signed Executive Order 80 (EO 80) committing the state to a: 40% reduction in both carbon emissions (below 2003 baseline levels) and energy-consumption-per-square-foot in state-owned buildings by 40% (below 2003 baseline levels) by 2025; and an increase in the number of zero-emissions vehicles to 80,000. The NC Climate Change Interagency Council was formed to develop the strategies necessary to achieve the goals of the Governor's Executive Order (NC Climate Change Interagency Council, 2019).

Broader Impacts

The broader impact of SEUSS is that it will enhance infrastructure for SUS research and education by convening a network of individuals and organizations that are currently engaged in urban sustainability work/research. This network will include academics, municipal employees, industry and non-governmental organizations/non-profits, with the purpose of solving vexing urban problems. The societal benefits and outcomes from SEUSS include: collaboration of diverse stakeholders in transdisciplinary research to solve urban sustainability problems faced by the region; identification of city typologies within the region; exploration of existing real-world experimentation in the region with the goal of cataloging "best-practices" that can be replicated in similar urban areas; and increased partnerships between academia, industry, municipalities, and non-profits. This conference is expected to be leveraged into a SUS Network.

Intellectual Merit

This conference will advance knowledge in understanding, designing, implementing and assessing an innovative and transformative convergence research model for solving problems related to urban systems in the southeast. The conference outcome will contribute to the understanding of how convergence research can stimulate solutions to problems the southeast faces in regard to its urban systems, and its long-term resilience. The conference will bring together a mixture of academics, municipal leaders, industry experts, and non-profits to identify problems the southeast faces with regard to its urban systems, and to develop research clusters around the identified problems in order to advance the knowledge not yet present in the literature.

Prior NSF Support

NSF BCS – 1824949 (9/2018-2/2022, $749,989/3yrs) "CNH-S: Socio-Economic Factors, Land and Water Quality, and the Dynamics between Rural and Urban Zones of Food Production and Consumption" (**Co-PI: Dr. Monty, NCA&T**).

Intellectual Merit: This project will model linkages between biophysical processes and socio-economic factors and how these impact regional agricultural production and food consumption patterns that contribute to regional food security.

Broader Impact: The project is conducted by investigators at two Historically Black Colleges and Universities. The project will include educational experiences for underrepresented undergraduate as well as graduate students, further building research capacity. The project will also include stakeholder (local and state planning agencies, extension agents, agricultural producers, and food retailers) engagement and contribute to facilitating the design, development and delivery of policy-relevant information, specifically identifying policies that either support or hinder food security.

NSF INCLUDES – 1744477 (1/2018-12/2019, $300k/2yrs) "NSF INCLUDES DDLP: EMERGE in STEM (Education for Minorities to Effectively Raise Graduation and Employment in STEM)" (**PI: Dr. Monty; Senior Personnel: Dr. Foust, NC A&T**).

Intellectual Merit: This Pilot encompasses the potential to advance knowledge in understanding, designing, implementing, and assessing an innovative and transformative collective-impact model for STEM education. The Pilot outcome will contribute to the state of the art in STEM education through understanding how career knowledge and exposure can broaden participation of URMs in the STEM pipeline, thereby leading to a national model tailored toward early career exposure to motivate, prepare, and attract students to STEM.

Broader Impacts: EMERGE in STEM has high potential to broaden participation in STEM because it leverages network partners currently engaged with targeted URMs including women (as many as 10,000+ URMs and women may be engaged). The societal benefits and outcomes from this STEM Pilot include: educating Deaf students; helping grade 4-12 teachers and administrators learn to incorporate additional STEM tools; bringing parents and the community directly into the STEM education process; improving well-being of individuals through job awareness and STEM education; developing a diverse workforce with a focus on URMs; increasing collaboration between public, private, and university organizations; and enhancing infrastructure for research and education.

NSF HBCU-UP – 1818679 (7/2018 – 6/2021, $350k/3yrs) "Broadening Participation Research Project: STEP into STEM, Investigating Successful Transitions and Effective Pathways into STEM." (**PI: Dr. Greg Monty, NC A&T**).

Intellectual Merit: This research encompasses the potential to advance knowledge in understanding, designing, implementing, and assessing successful transitions and effective pathways into STEM education, particularly for URMs/women who have entered postsecondary education either undecided on their major, or in a non-STEM major. The outcomes of the research will contribute to the state of the art in STEM education through understanding how STEM best-practice interventions at both community college and 4-year HEIs can broaden participation of URMs in STEM. Data-science approaches with big datasets will inform researchers-to-follow with state-of-the art methods to find trends, influencing factors/variables, combinations of factors and their impacts, and to define a core set of metrics for STEM transitions and pathways that could be used nationally.

Broader Impacts: STEP into STEM has high potential to broaden participation in STEM. The societal benefits and outcomes from this STEM Pilot include: (1) increased participation of URMs/women in HBCUs/MSIs across the nation *(best practice systems and programs will be identified/disseminated to HBCUs/MSIs)*; (2) improved STEM education and educator development for secondary and postsecondary education *(educators/institutions will be given recommendations of best practices)*; (3) increased public understanding and engagement related to science and technology pathways for all students *(research will help the community/parents understand STEM pathways and deliver synchronous messages and experiences to students about STEM education/careers)*; (4) improved career development and well-being of individuals in society *(selection and continuation of STEM is the goal of this research, and students will directly benefit)*; (5) development of a diverse, globally competitive STEM workforce *(URMs/women will directly benefit from project)*; (6) increased partnerships between academia, industry, and other stakeholders *(will draw together high school feeder programs, CCs, and 4-yr institutions, and particularly the HBCUs/MSIs, to establish systems/programs and measurements/metrics for BP)*; and (7)

enhanced infrastructure for research and education *(new data-science methodologies/algorithms developed will be useful in future research on BP).*