

SEUSS

Southeast Urban Sustainability Summit

**Summary
Report**

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Executive Summary

The Southeast Urban Sustainability Summit (SEUSS) was held August 14-15, 2019 at NC A&T State University. The goal of **SEUSS** was to advance research in urban sustainability specific to the state of North Carolina through the development of a **Convergence Research Network** comprised of:

- Academics
- Municipal Leaders
- Industries
- Advocacy Groups

A diverse network of stakeholders were invited to participate from across North Carolina. The output of **SEUSS** was a research and implementation agenda for the state's most pressing urban sustainability and resilience issues associated with the following urban systems:

- Energy
- Water
- Transportation
- Housing
- Health/Safety
- Food/Agriculture

The research agenda that came out of the summit was user-inspired, and it is hoped will lead to solutions that enable our cities and towns to move toward sustainability and resiliency. Our network is made up of academic researchers from fourteen universities, including many centers; sustainability directors and municipal leaders from twelve of our cities and towns; and many industry and non-governmental organizations.

This summary report of the summit provides details of the summit. This includes information about SEUSS Leadership and Steering Committee, a list of system facilitators, the summit agenda, first morning presentations, breakout session findings, top 3 challenges for each system, research brainstorming session details, final research topics, and notes on final research meetings.

Since the summit, the Principal Investigator, Dr. Vicki Foust, has submitted a proposal for the UNC System Inter-Institutional Planning Grant to provide funding for the leadership team to build the SEUSS Network, create a communications infrastructure, and begin identifying appropriate grant solicitations and developing proposals to submit in response to the solicitations. The goal of the Network is to work together to improve the sustainability and resilience of the cities and towns in North Carolina, and the larger southeast region.

SEUSS Leadership Team

Vicki Foust, Principal Investigator

Dr. Vicki Foust is a Research Associate at the Center for Energy Research and Technology (CERT) at N.C. A&T State University, the Principal Investigator for the NSF funded grant to form SEUSS, and Chair of the Greensboro Community Sustainability Council, an advisory board for the Greensboro City Council. Vicki has been involved in sustainability for many years. Her research interests are in leadership and management related to the sustainability of complex organizations. She taught Sustainable Business and Sustainability and the Built Environment courses at Guilford College and NC A&T, performed many higher education sustainability assessments including greenhouse gas inventories and sustainability assessments using the Sustainability Tracking Assessment Reporting Systems (STARS), developing and implementing pilot projects, providing leadership for student sustainability projects, and auditing performance contract. She is currently working with the City of Greensboro on its LEED for Cities assessment. Vicki holds a PhD in Energy and Environmental Systems from N.C. A&T State University, an MBA from Elon University, and a BS in Business Administration from the University of North Carolina at Greensboro.

Jamie Russell, Co-PI

Dr. Jamie Russell serves as Director of the Appalachian Energy Center and is an associate professor of Building Science at Appalachian State University. He holds a Bachelor of Science degree in mechanical engineering from Clemson University and received his doctor of philosophy degree in mechanical engineering from the University of South Carolina in 2004. Dr. Russell carried out his post-doctoral research as a Faraday Research Fellow at Ulster University in Belfast focusing on renewable energy in buildings. Russell joined the faculty at Appalachian State University in 2008. During his tenure as Appalachian, he served for two years (2014-2016) as a visiting professor at the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland. Dr. Russell has managed three Solar Decathlon Competition projects including the Solar Homestead (US Department of Energy (DOE) Solar Decathlon 2011), Solar Decathlon Europe 2014, and US DOE Solar Decathlon 2017. His current research focuses on energy in buildings, energy efficiency and harmonizing building energy consumption and renewable energy sources with the local utility grid.

Selima Sultana, Co-PI

Dr. Selima Sultana is a Professor and Director of Graduate Studies in the Department of Geography, Environment, Sustainability at the University of North Carolina—Greensboro. Dr. Sultana is a geographer with research foci in urban and transportation sustainability. She authored an edited book on transportation modes across the world and published numerous scholarly articles in leading urban and transportation journals. She has received multiple grants to support her work from various agencies and organizations such as DOT, NSF, UNC-GA, Center for Sustainability at Auburn University, and UNC—Greensboro. Dr. Sultana has held multiple leadership positions in professional organization including in the SEDAAG Honors, Program, and Nomination Committees, served as two-term President for the NC Geographical Society, Chair of the Transport Geography Specialty Group of the AAG, and Co-chair for the Housing, Migration, and Commuting cluster of the Network on European Communications and

Transport Activities. Dr. Sultana is currently an Editor for *Southeastern Geographer*, a Guest Editor for the Special Issue of "Accessibility and Transportation Equity" for journal *Sustainability*, and working on several projects including a book, and transportation related sustainability and energy issues.

Greg Monty, Co-PI

Dr. Greg Monty's career focused on R&D in industry and at universities. Greg led many successful start-ups from small-to-large. Dr. Monty brought investors together with technologists to align ever-changing customer needs with technology solutions to produce win-win results. Greg's experience covers electrical engineering, product and business development, project management, standards development, patents, quality, energy, and sustainability. The start-up efforts Greg has been involved in include: LCD displays (founder of OIS, IPO 1985), GaAs semiconductors (founder of Vitesse Semiconductor, IPO 1990), GaAs cell-phone technology, nano-electronic devices and sensors, restricted substances, environmental regulations, sustainability and GHG mitigation, smart grid technology, solar energy, fuel cells and drones. Greg is presently the Director of the Center for Energy Research and Technology at N.C. A&T State University, and he was a Professor at both the University of Michigan and Arizona State University. Greg has over 18 patents in semiconductor technology, nanotechnology, displays, and sensors. Greg has published dozens of technical reports and papers. Greg earned a PhD & Master's degree in Electrical Engineering from the Massachusetts Institute of Technology (M.I.T.) and a Bachelor's degree from Purdue.

SEUSS Steering Committee

Zach Ambrose

Zach Ambrose is a principal at Ambrose Strategy. Prior to founding Ambrose Strategy, he had a career in government and politics that began in the 1990s. His public sector career culminated with 5 years working for Bev Perdue, serving as her chief of staff in the Lt. Governor's office, leading her transition team and serving as her chief of staff in the Governor's office. Zach enjoys working with private & public sector clients to bring innovation to the public sector. He has worked on sustainability, energy and clean tech projects with government, university, non-profit and corporate clients. Zach helps lead the NC Cities Initiative which convenes North Carolina local governments with the goal of developing solutions that address statewide barriers to greenhouse gas reduction. He holds Bachelor of Science degrees from MIT in electrical engineering and Russian.

Lori Collins

Lori Collins is an Environmental Programs Consultant with the North Carolina Department of Environmental Quality and is focused on local government and business sector stakeholder engagement. Lori's recent sustainability work has included North Carolina's clean energy plan development; Duke University Nicholas Institute's Energy Efficiency Roadmap; the Southeast Energy Innovation Collaborative; and the CleanTech Commercialization Corridor initiative funded by an i6 Challenge Grant from the U.S. Department of Commerce to the Joules Accelerator and the Research Triangle CleanTech Cluster. Prior to forming her consultancy, Collins served as executive director of Joules Accelerator, a non-profit funded primarily by Duke Energy to support clean energy startups; president of Abundant Power, an energy financing venture; SVP of Client Management and Operations at LendingTree, head of marketing for Bank of America's mutual fund business, VP of Marketing at Fidelity Investments, and Director of Marketing at American Express. She holds a Master of Science in Carbon Management from the University of Edinburgh, an MBA from Kellogg at Northwestern University, a BS in Business Administration from UNC-Chapel Hill and she is LEED AP.

Marcia Hale

Dr. Marcia Rosalie Hale is an Assistant Professor of Peace and Conflict Studies at the University of North Carolina Greensboro. She is a member of the steering committee for SEUSS and a lead of the Water Group. Her research explores urban environmental justice, human security and sustainability. She has published research on the urban water systems of Los Angeles, California; Athens, Greece; and Istanbul, Turkey. Current projects explore environmental justice issues in North Carolina; social movements and urban policy related to food and water in Cape Town, South Africa; urban policy connected with water and migration in Barcelona, Spain; as well as historic and contemporary policy associated with migration to the U.S. from Central America. Dr. Hale is interested in human dynamics and understands questions of justice and sustainability to be at the intersection of social and environmental conflict. Her course Conflict Transformation at the Food-Water Nexus explores these issues. She also teaches conflict resolution theory and skills at UNCG, as well as in the Global Environmental Policy Programme with the University of Geneva and the United Nations Environment Programme.

Meg Jamison

Meg loves bringing change makers together to make our world a better place. Meg currently focuses her work on social impact networks and building capacity to advance among local governments across the Southeast to address climate change. She is the Executive Director of the Southeast Sustainability Directors Network. Meg's background is in city planning, and she uses that training to provide expertise in community engagement, sustainable development, smart growth planning practices. She has consulted with the internationally recognized urban economics firm, Urban3, but also has experience in rural economic development and local food system economy work. Her food systems work includes coordinating the City of Austin's first Urban Agriculture Program, consulting with SCALE, Inc. to complete food hub feasibility studies. Meg's experience in local economic development spans from coordinating small town revitalization programs with HandMade in America to heading up the northern Arizona office of Local First Arizona, the largest local business coalition in the country. Meg has an undergraduate degree in Urban and Environmental Planning from University of Virginia and a master's degree in Geography from Appalachian State University.

Steve Kalland

Steve is the Director of the NC Clean Energy Technology Center at NC State University where he directs the strategic vision of the center and its programs, including activities in renewable energy, clean power and energy efficiency technologies, green buildings, and clean transportation. Programs range from technical assistance, economic development, public policy (including DSIRE), STEM education and workforce development. Steve has a demonstrated history of working in the non-profit and higher education fields, and has strengths in Environmental Awareness, Policy Analysis, Renewable Energy, Energy Policy, and Business Development. Steve holds a Master of Science (M.S.) focused in Public Policy Analysis from University of Rochester.

Grace Marasco-Plummer

Grace serves as the Program and Research Development Manager for the Research Institute for Environment, Energy and Economics (RIEEE), an umbrella organization housing the Appalachian Energy Center and two additional interdisciplinary centers. She is responsible for a variety of program and research development activities including funding opportunity identification, research team building, concept and program development and related workshops and events. She also supports the directors of the Appalachian Energy Center and the RIEEE to develop and cultivate partnerships and external collaborations. She serves as Vice Chair of the Board of Directors of Blue Ridge Women in Agriculture and on the University Sustainability Council at Appalachian State. She holds an undergraduate degree in International Business and Asian Studies from the College of Charleston and a Master of Arts in Human Geography from Appalachian State University.

Marilynn Marsh-Robinson

Marilynn Marsh-Robinson is the Partnerships and Alliances Manager in the SE Regional Office with Environmental Defense Fund. She joined in 1999. Marilynn works with partners to develop holistic, practical energy solutions that incorporate socioeconomic factors. She collaborates with electric cooperatives, rural communities, faith based partners and transit agencies. Marilynn also supports inclusive financing for energy improvements. Her experience includes helping to

especially minority-serving colleges and universities. She serves on the North Carolina Department of Environmental Quality (NCDEQ) Environmental Justice and Equity Advisory Board, North Carolina Conservation Network Advisory Board and the Planning Committee of the North Carolina Environmental Justice Network. Marilyn is a Climate Reality Leader and a graduate of the North Carolina Rural Economic Development Institute. Education: BA, Political Studies, Meredith College.

Sarah Praskievicz

Dr. Sarah Praskievicz is an assistant professor in the Department of Geography, Environment, and Sustainability at the University of North Carolina at Greensboro, a member of the SEUSS steering committee, and co-organizer of the SEUSS water focus area. Her research interests focus on physical processes in river systems and sustainability of water resources. She teaches sustainability-related courses such as Introduction to Earth Science and The Water Planet. As a Sustainability Faculty Fellow at UNCG, she is currently leading a student research project with her class focused on the water quality of North Buffalo Creek, an urban stream in Greensboro. Sarah holds a PhD in Geography from the University of Oregon, an MS in Geography from Portland State University, and a BS in Environmental Studies from Southern Oregon University.

Stephen Sills

Dr. Stephen Sills is a community-engaged scholar and Professor of Sociology. In 2015, Sills founded the Center for Housing and Community Studies at UNCG, a transdisciplinary research organization under the Office of Research and Engagement. His recent projects include: a multi-year formative/summative evaluation of a USDA Local Food Promotion Program developing food entrepreneurship in low-income communities; technical assistance to SAMSHA Partnerships for Success (PFS) grantees in rural communities to address behavioral health disparities in opioid overdose prevention focusing on underserved Latino and African-American youth; development of neighborhood-level health indicators to guide and evaluate impact of philanthropic projects for the Foundation for a Healthy High Point; the design and implementation of an evaluation of a multi-year neighbor-based collective impact initiative to address diabetes and asthma (BUILD 2.0); an oral history project on Latino/a immigrants living in peri-urban and rural mobile home communities; and a recent study of pediatric asthma in low income neighborhoods using GIS analysis of hospital visits and housing assessments, which has led to over \$4.5 million in neighborhood revitalization efforts (RWJF/Reinvestment Fund Invest Health Grant).

Agenda

Wednesday, August 14

7:30 – 9:00 am

Academic Classroom Building Atrium
Registration and Continental Breakfast

9:00 – 9:35 am

Academic Classroom Building Room 101

Welcome

Dr. Vicki Foust, Principal Investigator, SEUSS
Center for Energy Research and Technology
N C A&T State University

Blessing of the Summit

Vivette Jeffries-Logan
Occaneechi Band of the Saponi Nation

Welcome to Greensboro

Honorable Nancy B. Vaughn
Mayor of the City of Greensboro

Welcome to N C A&T

Dr. Robin Coger
Dean, College of Engineering, NC A &T

9:35 – 10:00 am

Sustainable Urban Systems

Dr. Selima Sultana
Co-Principal Investigator, SEUSS
Professor in Geography, Environment & Sustainability
UNC-Greensboro

Convergence Research Network

Dr. Jamie Russell
Co-Principal Investigator, SEUSS
Director, Appalachian Energy Center, Appalachian State University

SEUSS as a Convergence Research Network

Dr. Greg Monty
Co-Principal Investigator, SEUSS
Director, Center for Energy Research and Technology, NC A&T

10:00 – 10:30 am

Sustainability – Economics in North Carolina

Dr. Michael Walden
William Neal Reynolds Distinguished Professor NC State University

10:30 am – 11:00

Sustainability – Environment in North Carolina

Sushma Masemore
State Energy Director for North Carolina

Deputy Assistant Secretary
NC Department of Environmental Quality

11:00 – 11:30 am **Sustainability – Social Equity in North Carolina**
Amanda Martin
Deputy Chief Resilience Officer
NC Office of Recovery and Resiliency

11:30 - 11:45 am Q&A

Noon – 1:00 pm *Student Union Ballroom A*
Lunch
Environmental Defense Fund Cities Initiative Presentation
Megan Anderson
Sustainability Manager
City of Raleigh

Panel Discussion:
Megan Anderson
Sustainability Manager
City of Raleigh

Emily Barrett
Sustainability Manager
Town of Cary

Tobin Fried
Sustainability Manager
Durham County

Amber Weaver
Sustainability Manager
City of Ashville

Christy Daniel
Managing Director Renewable Solutions
Duke Energy

SEUSS Afternoon Breakout Sessions
Dr. Vicki Foust, Principal Investigator, SEUSS
and
Julie Brenman, SEUSS Lead Facilitator, Fountainworks, Inc

- 1:15 – 2:45 pm *Academic Classroom Building*
Breakout Session Round 1: Identify SUS “Grand Challenges” and barriers” in each urban system (that must be addressed at the city/urban-community scale; Identify overlap/integration with other urban systems)
- Leaders and Rooms for Rounds 1, 2, and 3**
 Energy (107) Dr. Jamie Russell and Dr. Greg Monty
 Transportation (108) Dr. Selima Sultana and Steve Kalland
 Water (109) Dr. Marcia Hale
 Housing (211) Dr. Stephen Sills
 Health and Safety (308) Grace Marasco-Plummer and Dr. Maggie Sugg
 Food/Agriculture (309) Nicole Peterson
- 2:45 – 3:00 pm *Academic Classroom Building Atrium*
Refreshments Break
- 3:00 – 4:00 pm *Academic Classroom Building*
Breakout Session Rounds 2 and 3: Challenges/Barriers continued (Peer review from other urban systems)
- 4:00 – 5:00 pm **Breakout Session Final Round:** Prioritize grand challenges and map barriers to NSF Research Elements
- 5:00 – 6:30 pm **Hotel Check-In**
- 6:30 – 8:30 pm **Reception at Center City Park**
- Thursday, August 15**
- 8:00 – 9:00 am *Student Union Ballroom A*
Breakfast
- 9:15 – 10:00 am **Sustainable Urban Systems Debrief, Group Leader Reports**
 What we have learned? Where do we go from here?
- 10:00– Noon **Sustainable Urban Systems Facilitated Session**
 (Identify Research opportunities; cross-cutting thrusts; and gaps)
 Sustainable Urban Systems—identifying Convergent Research Network “ideas/opportunities”
- Noon – 1:00 pm *Student Union Ballroom A*
Lunch
 Opportunity to get to know your future research network

- 1:15 – 2:45 pm *Academic Classroom Building*
(Room Assignments Announced at Lunch)
Breakout Session: Question-driven groups, Networking/Planning;
Research Brainstorming for CRN.
- 2:45 – 3:00 pm *Academic Classroom Building Atrium*
Break
- 3:00 – 3:30 pm *Academic Classroom Building Room 101*
Concluding Remarks and Next Steps for Convergence Research Network

SEUSS Network

The SEUSS network includes representation from the following organizations:

Higher Education

Appalachian State University
Duke University
East Carolina University
East Tennessee State University
Elizabeth City State University
Indiana State University
NC A&T State University
NC State University
University of North Carolina at Asheville
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of North Carolina at Greensboro
Wake Forest University
Winston Salem State University

Municipalities

City of Asheville
City of Charlotte
City of Durham
City of Greensboro
City of Raleigh
City of Wilmington
City of Winston-Salem
Durham County
Guilford County
Mecklenburg County
Town of Cary
Town of Hillsborough
Town of Walkertown

Organizations

AARP/NC AARP
Carolina Farm Stewardship Association
Centre for Homeownership & EDC
Church Women United-Wake County
Community Food Strategies / Carolina Farm Stewardship Association
Down East Coal Ash Environmental and Social Justice Coalition
Energy Environment Innovation Foundation
Guilford Community Care Network
Guilford County Project ONE
LaPlaca and Associates LLC

Montagnard/SE Asian Community Disparities Research Network
NC Community Development Initiative
NC Conservation Network
NC Housing Finance Agency
NC Justice Center
NC League of Municipalities
Piedmont Environmental Alliance
Piedmont Triad Regional Council
Ready for School, Ready for Life
Research Triangle Cleantech Cluster (RTCC)
Rivendell Farms of the Carolinas
Rockingham County Integrated Health Care
Safety Net Health
Sustain Charlotte
Sustainability Resource Center
Triangle J Council of Governments
Transit Alliance of the Piedmont
United Way of Greater Greensboro

Industry

AmeriHealth Caritas NC
Duke Energy
NC Advanced Energy
Volvo Group North America

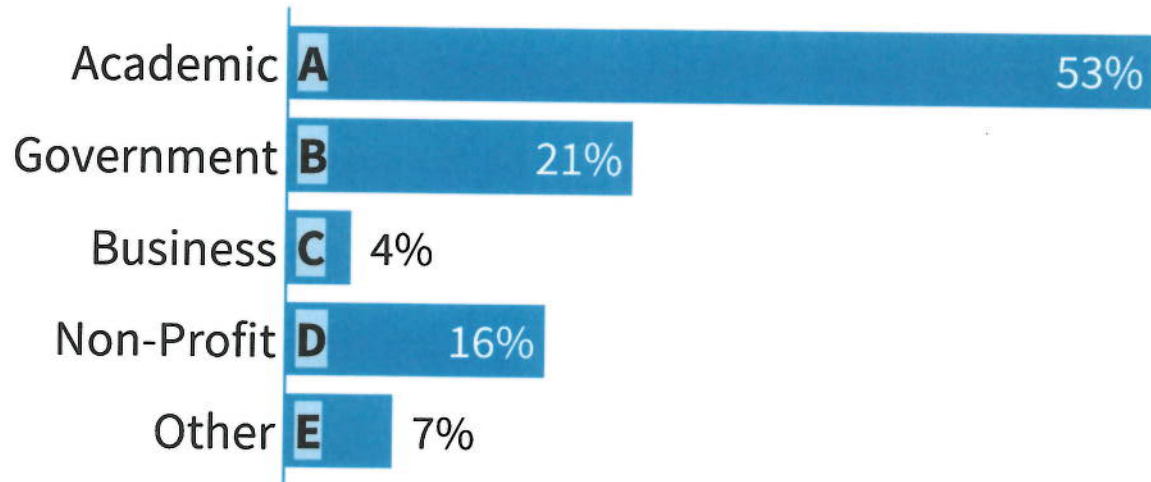
Participant Sector Breakdown

Poll Everywhere was used throughout the summit. The poll below was taken the first morning of the summit to gauge the percentage of participants from each sector.

☞ Respond at PollEv.com/fountainworks

☞ Text **FOUNTAINWORKS** to **22333** once to join, then **A, B, C, D, or E**

What sector do you represent?



SEUSS State-Level Sustainability Presentation

The Summit began with background information on the state of sustainability for North Carolina in relation to Economics, Environment, and Social Equity. These presentations served to inform all participants of the current state. A summary of each of the three presentations are presented next.

SEUSS State-Level Sustainability Presentation: Economics

Economic Background of North Carolina with Implications for Sustainability

Presented by:
Dr. Michael Walden
Reynolds Distinguished Professor
NC State University

Summary of Presentation

The Economics presentation presented an overview of North Carolina economic sustainability. The key topics presented were:

Economic Sustainability Defined: Economic decisions recognizing both benefits and costs to the natural environment and to healthy communities of actions taken.

- Forces Shaping the Economic Future
- Four Sectors to Watch for Future Growth
- Where are the New Jobs?
- Resources
- Generational Squeeze
- North Carolina Issues
- How to Address Sustainability Issues

The full power point presentation can be found in Appendix A.

SEUSS State-Level Sustainability Presentation: Environment

Sustainability and the Environment in North Carolina

Presented by:

Sushma Masemore

Deputy Assistant Secretary for the Environment

NC Department of Environmental Quality

Summary of Presentation

The Economics presentation presented an overview of North Carolina environmental sustainability. The key topics presented were:

- Sustainability Defined:
 - Sustainability according to the Environmental Protection Agency: “Sustainability is based on a simple principal: Everything we need for our survival and well-being depends, either directly or indirectly, on our natural environment.”
 - The National Environmental Policy Act of 1970 committed the United States to sustainability, declaring it a national policy “to create and maintain conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations.”
- The Role of Government in Building the Sustainable Economy Includes:
- North Carolina Executive Order 80: NC’s Commitment to Address Climate Change and Transition to a Clean Energy Economy
- Executive Order 80: NC’s Commitment to Address Climate Change and Transition to a Clean Energy Economy
- Department of Environmental Quality
- North Carolina’s Sustainable Energy Future
- Example Green Practices
- Example Waste Management Practices
- Energy Related Practices

The full power point presentation can be found in Appendix B.

SEUSS State-Level Sustainability Presentation: Equity

Social Equity Aspects of Sustainability in North Carolina

Presented by:

Amanda Martin

Deputy Chief Resilience Officer

NC Department of Public Safety

Summary of Presentation

The Economics presentation presented an overview of North Carolina equity sustainability. The key topics presented were:

- Social Equity in Sustainability
- Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development
- Measure What You Care About
- Strengths: Civil Rights Activism
- Strengths: Others
 - Strong social networks and faith communities
 - Strong economic growth in some areas
 - Excellent public community college and university system
- Challenges: Income Inequality
- Challenges: Economic Mobility
 - Correlates
 - Income and racial segregation, Income inequality, K-12 education, Social capital, Family structure
- Challenges: Persistent Poverty

The full power point presentation can be found in Appendix C.

SEUSS Sustainable Urban Systems Presentation

Presented by:

Sustainable Urban Systems

Dr. Selima Sultana

Professor

Geography, Environment, and Sustainability

UNC Greensboro

Convergence Research Networks: An Overview

Dr. Jamie Russell

Director

Appalachian Energy Center

Appalachian State University

SEUSS CRN Proposal Diagrams

Dr. Greg Monty

Director

Center for Energy Research and Technology

NC A&T State University

Summary of Presentation

The Sustainable Urban Systems presentation presented an overview of Sustainable Urban Systems, Convergence Research Networks, and the development of the SEUSS Network into a Convergence Research Network to address urban systems sustainability for North Carolina. The key topics presented were:

- Sustainable Urban Systems
 - What is Sustainability
 - Sustainable Urban Systems
 - Complexity of Urban Systems
 - What are Sustainable Urban Systems
- Convergence Research Networks
 - Convergence Research and its Purpose
 - Convergence Research Network Formation
 - User Driven Research/Participatory Research
 - Stakeholders in SEUSS Network
 - Challenges to Collaboration

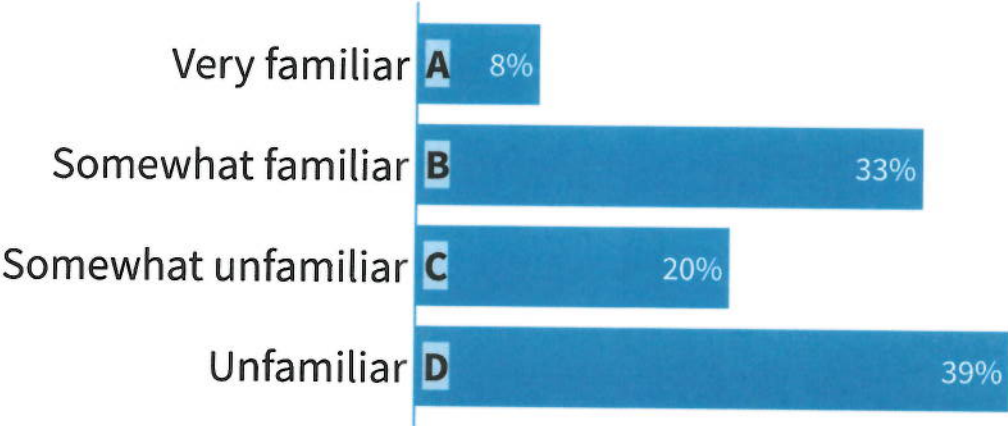
The full presentation can be found in Appendix D

Participant Feedback on Presentations

The following questions were asked to the summit attendees to gauge familiarity with convergence research networks and the area of sustainability that were most applicable to the attendees

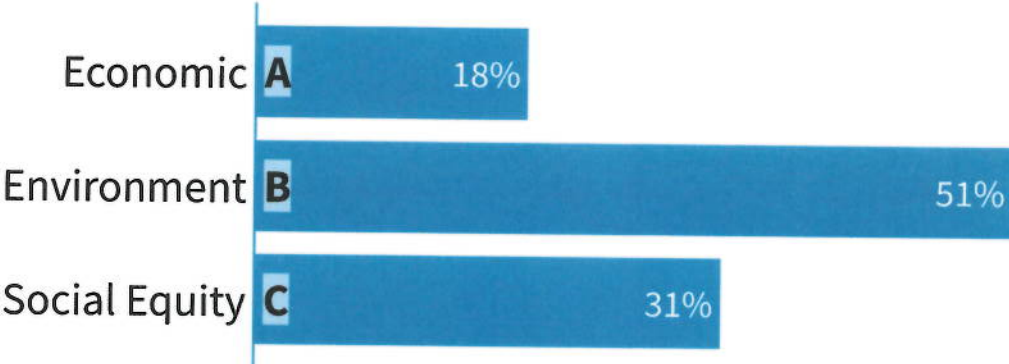
Respond at PollEv.com/fountainworks
Text **FOUNTAINWORKS** to **22333** once to join, then **A, B, C, or D**

How familiar are you with "convergence networks?"



Respond at PollEv.com/fountainworks
Text **FOUNTAINWORKS** to **22333** once to join, then **A, B, or C**

Does Economic, Environment, or Social Equity most impact sustainability in your area of expertise?



EDF Cities Initiative (North Carolina) Presentation

Presented by:
Megan Anderson
Sustainability Manager
City of Raleigh

The EDF Cities presentation presented an overview of the outcomes of the collaborative EDF/DEQ initiated working group comprised of North Carolina Sustainability Managers and Local Government leaders. The key topics presented were:

- Phase 1 goal to identify and prioritize statewide barriers to reducing GHG emissions
- Phase 2 goal to develop implementation goals and strategies for the Phase 1 consensus items

The full presentation can be found in Appendix E.

Urban System Facilitators

Energy

Dr. Jamie Russell
Director of Appalachian Energy Center
Appalachian State University

Dr. Greg Monty
Director, Center for Energy Research and Technology
NC A&T State University

Transportation

Dr. Selima Sultana
Professor, Geography, Environment, and Sustainability
UNC Greensboro

Steve Kalland
Director, NC Clean Technology Center
NC State University

Water

Dr. Marcia Hale
Assistant Professor, Peace and Conflict Studies
UNC Greensboro

Dr. Sarah Praskievicz
Assistant Professor, Geography, Environment, and Sustainability
UNC Greensboro

Food/Agriculture

Dr. Nicole Peterson
Associate Professor, Anthropology
UNC Charlotte

Health/Safety

Dr. Maggie Sugg
Assistant Professor,
Appalachian State University

Dr. Jennifer Runkle
Environmental Epidemiologist
NC State University

Housing

Dr. Stephen Sills
Professor, Sociology
Director UNCG Center for Housing and Community Studies
UNC Greensboro

Outcomes from Breakout 1 (Grand Challenges)

The goal of the first breakout was to facilitate a broad conversation related to Grand Challenges (GC) for each of the urban systems discussed at SEUSS. The groups then identified barriers to solving each of the grand challenges. There were 1-2 facilitators in each breakout room. Each facilitator was trained prior to the summit, and was provided a detailed facilitation plan prior to the facilitation.

A Grand Challenge was defined as: A change needed to improve sustainability in cities/urban areas while considering economics, environment, and social equity. The 6 urban systems addressed during SEUSS, and identified thinking related to Grand Challenges are listed below (from notes gathered during breakout sessions).

Energy

Economic and Workforce Development

- Economic Development based on a clean energy economy
- Educate/train workforce for future energy
- Recruiting into Clean Energy (trade)
- Incentives for new technologies/research
- Coal tax subsidies (use for solar retrain)

Make NC carbon free (all sources)

- Inefficient existing building stock
- Sustainable Supply Chain (Clean Energy)
- Better consumer awareness and education (students)
- Winter peaking (and summer)
- Ensure clean energy is accessible/affordable for all
- Market competition
- Renewable energy seen as unreliable (change perception/increase capacity)
- Lack of transparency
- Not including externalities (Costs and benefits)
- Encapsulated coal ash
- Air storage for solar tower (I/UCRC Center for Energy Storage Technology)
- Animal waste as energy (No incineration)
- Policy
 - Utility Resource Cost Test
 - Updated RPS
 - Low Rates

Resilience

- Modernize Grid
- Technology
- Reliability Balance (behavioral)
- Use Nuclear Navy to backfeed power to ports after coast storms outages

Energy Efficiency (EE)

- Incentives for EE Retrofits
- Update building code to save energy
- On-bill financing of EE Retrofits
- Performance Contracting for EE retrofits at residential level (esp. low income)
- Solar-Ready building incentives

Resilient Low Carbon Grid

- Storage (Policy, Technology, Use of)
- Target clean energy (not renewable energy)
- Power generation on-site
- Community based or local power generation
- Wind power
- Energy costs do not include social costs

- Renewables not cost effective from business standpoint
- Business model structure for energy

Sustainable Energy Policy

- Challenged by dominant energy business model in NC
- Policy to encourage home to orient to have south facing home
- Storage policy is key to systemic use
- Lack of incentives for solar
- Major utility company has too much influence in regulation/legislation
- Get renewable energy accepted from CLT to RAL Develop building code
- Local government can waive permit fees for solar

The Politization of Sustainability

- Sustainability tends to be politicized – especially in the southeast
- How to establish political will?
- How to engage community support?
- Train people for new energy industry/field
- Building code adoption is political when it should be science based
- Greenwashing by Duke Energy while they actively oppose renewable energy and sustainable energy
- Need to experiment with energy demand management

Data Standardization

- GHG Definition and measurement
- Solar PV Power plant – Data collection and analysis
- Need for a centralized research center or demonstration site (ie Pecan Street) – allows industries and startups to test solutions
- GIS model showing optimal location for solar on brownfields, cities, and farms

Equity

- Broadband – lack in rural and low-income communities – obstacle to deploy IOT
- People cannot consider sustainability if they are worried about more basic needs in their lives
- Energy poverty – households that are poor are not targeted by weatherization programs because they consume less
- CAFO – Concentrated Animal Feeding Operation – as emissions
- Clean energy/technology is typically prohibitively expensive, especially for working poor
- Smart metering to reduce household energy consumption

Emissions for Built Environment

- Full building heating/cooling electrification by 2050
- Adequate and competitive BAS
- Cities cannot control building code
- How to build capacity?
- Building energy reduction implementation as it relates to:
 - Low income homes

- State owned buildings (including k-12, CC, Universities)
- Small Business
- Rapid growth in NC and the issue of shadowing existing solar
- Incentives for solar on the built environment
- Alternative sources (hempcrete) Regulatory barriers
- Architectural design of the building

Regulatory Model

- Private grid
- Utilities planning and cost recovery (regulatory framework) obstacle to deploying innovation no incentive for utility
- NC has regulated utility
- Lack of ability by cities to purchase power from suppliers of their choice
- How to be Net Zero
- Renewable energy is typically more expensive + municipalities cannot always afford it
- State-to-state policy analysis

Transportation

Accessibility and Mobility to Public/Multimodal Transportation Systems

- Human Behavior – We are an automobile dominant society, and it is difficult to change this way of thinking. Americans enjoy using cars, and other transport forms are less commonly used.
- Funding Challenges – We need to rethink the way that public transportation and multimodal systems are funded at local, state and national scales. Who will pay for new public transit?
- Perceptions about public transit – We need to change the way that society looks at public transit first, before it can be expanded. Many people view it as an unsafe and unreliable system.
- Future Planning – New transportation systems like autonomous vehicles need to be considered, and their impact on mobility need to be studied. Equity in these systems and other emerging systems need to be better understood.
- Distance as Sprawl – The proximity of public and multimodal transportation to users needs to be considered. Some people have long travel distances to reach public transit, including people who live on the margins of cities. Vulnerable population on the urban periphery might not have access to public transit.

Transportation + Land Use Configuration, Parking and Growth Management

- Land Use Patterns – Existing land use patterns do not always lend themselves to good transportation growth management.
- Political/Joint Development – Many communities do not plan jointly for transportation, there is a need for communities to work together. There is also a need to look into changing state and local policies about transportation growth.
- Parking Education – Developers and local communities need to be educated about new and innovative parking paradigms including electric vehicle charging, bicycle parking, and parking that better takes demand into account.
- Autonomous Vehicles – As new technology is developed like autonomous vehicles, these could cause issues with our existing transportation configurations.

Equity and Justice (including Spatial Justice)

- Geographic Equity – The spatial dimensions of inequality need to be considered when planning new transportation. This is related to the idea of “spatial justice” that transport needs to serve all people regardless of where they are located.
- New Investments/Technology – How will new transportation investments and technologies impact underserved communities? How will the costs of funding these innovations impact the most vulnerable populations?
- Shared Mobility – Do ridesharing and other shared mobility transit systems serve all

Water

Food/Energy/Waste/Water Nexus

- Community Gardens
- Urban Farms
- Energy Demands of BMPs
- Transportation Urban Fringe Water Demand
- Urban-Rural Connections
- Flood events impacting energy production
- Energy costs for wage treatment
- Failure to address decarbonization/Duke monopoly
- Policy change
- Communication
- Trust
- Data on agricultural water use

Building adaptable infrastructure

- Microhydro production
- Green infrastructure
- Siloed investment in infrastructure
- Conservation vs revenue - What are we building for?
- More adaptable systems
- Costs, revenues, failing infrastructure growth

Spatial mismatch between physical and regulatory boundaries

- regulatory/watershed boundaries
- interbasin transfers
- lack of systematic stormwater planning
- graywater regulation (permission)
- Groundwater land subsidy???
- Marine-freshwater connections
- lack of regulatory control - state eliminated BMP requirements
- Resilience to extreme events and future change
- Extreme events (floods and drought)
- Uncertainty in access to water/future impacts
- Urgency (Quantity of quality water)
- Health
- Gray water recycling
- Disposal of household water (circular economy)
- Urine bricks
- Composting toilets not allowed

Culture and Equity

- Water quality and tourism
- Water markets and pricing
- tribal nations exposed to hurricane risk-NC recognizing tribal status
- Tribal connection to specific places - cultural meaning

- relationship with water (cultural, ethics)
- population loss in tribal counties
- Water access to clean water as a right
- Tourism
- Income, home ownership, race, ethnicity
- Redistribution of wealth

Literacy, governance, and participation

- Data integration across time and space
- Recreation vs water quality (communication/transparency)
- Communication about what's in the water
- water literacy (citizen science)
- generalizing best practices
- Redlining marginalized communities (EJ)
- ensure communication and understanding of material
- See who's not in the room. Ensure communities are represented
- Representation in process decisions
- Common glossary of terms

Barriers

- Externalities- does it work?
- Population loss
- Trust
- Politics
- Disenfranchisement
- making it personal - education
- Invisibility of urban rivers
- Synergetic effects
- Lack of understanding between systems/of other systems
- Qualitative Models of systems
- Chemical regulations
- fear of penalties
- lack of watershed planning-resilience
- taking it for granted
- Bottled water as a commodity

Emerging Contaminants

- Existing contaminants (cyambacteria)
- Emerging contaminants
- lack of funding
- Uncertainty-processes and data
- \$ Big Industry

Food/Agriculture

Healthy Planet (Dwindling natural resources- compromised)

- System
 - (Agribusiness, monoculture, Contract Farmer)
 - Subsidies
 - Cheap food
- Economic
 - Regulations opposed on pesticides that harm pollinators
 - No value for natural resources
- Losses
 - H2O salinization/water quality
 - Loss of pollinators and habitat
 - soil erosion
 - Trade-off of making non-arable land viable for ag purposes and causing more destruction of natural environment (Amazon)
 - Waste is a raw material. Circular economy

Climate change

- Production
- Resilience

Pesticide Use

- Dependence on petrochemicals
- Pollinator crisis

Social Justice/Structural Racism

- Nutrition/Obesity issues
- Environmental degradation, exposure to contaminants, water, air quality, runoff, ecosystem loss
- Land Access and Incentives to farm
 - women owned farmers, native farmers, property of heirs
 - incentivize grocery stores to purchase local produce
 - USDA funding (more diversity)

Access to food

- Grocery store models
 - Integrating consumer/producer
 - Cultural shift to seasonal produce
- Price sensitivity (Walmart vs Co-op)
 - Good food costs money
 - Cost of living has not risen with cost of goods, so buying power of most citizens is lower
 - Dollar stores in low-income neighborhoods
 - Food is prescription for life
 - Processed foods are cheaper
- Access to transportation to access food

- Community classes for:
 - Cooking
 - Shopping w/government assistance
 - Sustainable farming
 - Gardening

Farming decisions

- Land
 - No long-term planning
 - Arable land being used for other things
 - Prioritize land for food as a set aside or conservation district
 - Denser areas have higher requirement
 - Developing land is more profitable than farming
 - Tax system penalizes legacy farming
 - Cities/Countries make land available for community and commercial agriculture
 - Lack of benefits of wilding land
 - Growing crops against the Earth's natural biological process
 - Competition for water with development sprawl in legacy farmland
- Losing Farmers
 - Not valuing farmers
 - Consumers don't know their farmers
 - Banks prioritizing investing in healthy goof companies/new sustainable farms
 - Aging
 - Ag Insurance Challenges
 - Health Insurance Costs
 - Smaller farms absorbed by big ones
- Subsidies
 - Subsidies go to big farmers
 - Federal policies support large factory farming
- Economic viability
 - No money in farming
 - Structural racism
 - Disconnect between consumers/farming misunderstood & farmland undervalued
 - Increase \$\$ /acre for solar farms
 - Solar NOT on prime farmland

Food Access

- Agricultural Access
- Infrastructure
- Economics/production of farming
- Logistics
- Land

Education

- Awareness around agriculture (Pay for Educators)
- Eat more plants/less meat

- My Food Plate Model
- Trade War with China (Farmers Impacted)
- Public Health
- food nutrition
- affordability
- Doers/Makers to consumer trend (Disconnect)
- impacts
- products
- Access to natural resources
- arable land/development
- What is a reasonable goal? (Land needed metrics)

Reducing Waste

- Anaerobic Digestion to fuel
 - Cost to build/own/operate
- Food miles
- Food Security
- Regulations:
 - CAFO/Hoas/Poultry
 - 60% of biodegradable waste goes to landfill
 - CAFO Lagoon Management - Spraying/resilience
 - Lack of Data/analytics
- Excessive packaging for food containment
 - Single-use convenience packaging/consumer preference
 - Lobbying of plastic industry
 - Views on Waste
 - Not viewing waste as potential raw material for another product
 - Food should not be wasted
 - Feed people
 - Clear policies/procedures for food recovery and donations
 - Ugly food
 - Compost
 - Composting infrastructure
 - Create fuel
 - Anaerobic digestion infrastructure where appropriate
- Cultural Norms
 - Excess
 - Lack of awareness of consumer behavior
 - Meat intense diet
 - Over-producing unused foods
- Labor in food system
- treatment of minorities/immigrants
- Farmer's needs
- Farm sustainably
- Affordability of food/Viability of Farming (subsidies)

Many of the challenges included social justice, disaster management resiliency, diversification, and a culture shift/education

Questions:

What are examples of resilient agriculture systems measures?

What land is available and how can that benefit resilience?

Brownfields?

What impact does urban ag have on resilience of communities?

water, hear, air quality, soil, ed, jobs, community, waste

What are policies that can help build more resilient communities?

Predictions - How long we have, how many people can we support, within a ring - modeling are there models for this?

Bumcombe - All W. NC and other counties

What are basic food needs? Calories, local quality, serving size

Would urban dwellers recognize value of farmers an land with greater education (radius). How would this shift their perspectives?

based on diet

How to change your food waste? Pounds? Impact

price sensitivity - plastic bag, etc acceptably of paying

Understanding leads to change?

What policies can address?

Incentives/Deals

NC Healthy Food Retailer Task Force

Racist research systems

How do we feed this who have been ignored? No stores = genocide

Non-whole food (culture determines "healthy" food) impacts on long term opportunities (prison)

longitudinal health outcomes/cost of this

injustice - how study of this if funders benefit from injustice

short and long term injustices built into the food system

Study implementation of policies that perpetuate/alleviate racism

Health/Safety

Equipping health systems to integrate social and environmental determinants of health towards a culture of health and empowerment

- Barriers: Broad participation/capacity to engage, lack of procedural equity, receptivity to engagement
 - Value of social determinants of health
 - Poverty (social determinants of item 1&D)
- Environmental exposures of interest
 - water quality
 - Air quality
 - climate change (heat/cold)
- Participatory - collective acceptance/willingness to work toward sustainability, understand aesthetics, culturally responsible engagement
- Community Empowerment (assertion of political rights): The communities voice is currently lacking in the decision-making process
- Networking to collaboration to address common interests, ideas, goals

Mobilization of sustainable health systems (includes social determinants of health)

- Barriers: For-Profit, procedural equity (participation)
- Co-locate health facilities with other social services (education, etc.)
- Chronic Disease - we work more on the treatment side than taking preventative action
- Disability
- Aging
- Environmental Toxins
- Crossover: Food/Ag and food councils

Connections to Nature (that is healthful, not toxic)

- Walkability
- Obesity
- Nature deficit disorder

Collective evaluation among like organizations using common measures toward program improvement is currently missing.

- Lack benchmark measures that are scalable and systematic to monitor action and progress toward sustainable goals

Early life toxic exposure that result in later life significant, but underrepresented health challenges.

Opioid crisis with corollary issues of poverty, employment, etc.

- Substance abuse

Brainstorming

Health outcomes drive/determine/supersede profit

Health in disaster preparedness and recover (2nd disaster)

Impact of changing climate on presence, distribution, severity, etc of health; pace of change, education, prep. Barrier: policy, politics

Effect of an aging population on health systems (shifting demographics) as a non-environmental stressor, yet equally important to factor in when prioritizing and planning for sustainability measures

Health as a sustainability outcome/indicator

Parking Lot Ideas

Cost/ability to pay for services, specialty services

Balancing economics

Lack/limited access to health care or information availability of health/safety information

Gun violence

Location of healthcare systems "neighborhoods" of POC

Necessary, but insufficient role of education towards health literacy and behavior change.

Housing

Population Change

- Cultural shift in housing problems
- Gentrification exclusion
- Geography of new housing (where located)
- Peri-urban/suburban growth
- Social connections/neighborhood
- Quality of life
- Demographic shift
- Disability
- Diversity of housing (Missing Middle)

Communication/Awareness Education

- Caring
- How to maintain housing
- Disclosure laws
- Social capital
- Realtor training
- Bureaucracy seclusion
- Everyday language
- Start young: expectations bigger not better

Technology

- Low and high tech
- Sustainable
- Computer integrated construction
- Entrepreneurial technologies
- Empower people to make data driven decisions
- Yet, still affordable/accessible
- Durability

Policy

- Regulations that exist need to change or to be added to improve equitable access to safe, fair, healthy, affordable housing
 - Local, State, and Fed levels
- \$\$ to support policy
- Flexibility/Adaptability

Affordability

- Costs of construction
- Cost to consumer/resident
- Cost to maintain
- >30%
- Ability to pay for housing without tradeoff
- Who bears cost of unaffordability?

Day 2 Debrief: Top Three Grand Challenges for each Urban System

The facilitators were asked to identify the top three Grand Challenges for the Urban System Breakout session they facilitated, and present these during the morning session in Day 2.

Energy

- Carbon Free North Carolina – resilient low carbon grid; build resilient communities; multiple benefits & equity
- Sustainable Energy Policy and Regulatory Construct
- More Effective Sustainability Politics

Transportation

- Accessibility and mobility to public transportation/multi-modal transportation infrastructure services
- Transportation and land use configuration and growth management/parking
- Equity and justice in transportation – particularly infrastructure and finance investments

Water

- How do we implement equitable, sustainable and resilient urban infrastructure systems across the water/energy/food/transportation/waste/etc. nexus?
- How do we ensure equity and justice in cultural protections and participation, through communication, literacy and effective governance?
- How do we deal with emerging contaminants?

Health/Safety

- Equipping communities and health systems to integrate social and environmental determinants of health towards a culture of health.
- Achieving a culture of accountability and long-term commitment to healthy communities
- Creating a built environment/infrastructure supports a healthy community
- Engage the local public health departments and hospitals on the impact of changing climate

Food/Agriculture

- Agriculture resilience in the face of climate change
- Social justice and food access

Housing

- **Affordability:** the cost of construction, the cost to the consumer/resident; the cost of maintenance; the ability to pay for housing without trading off with other expenses who bears the cost of affordability (health, education, government, etc.)
- **Policy:** Local state, federal regulations that exist, need change or need to be added; policy needs to be monetarily supported and flexible/adaptable
- **Technology:** both low- and high- tech sustainable solutions that may include computer integrated constructions; data driven decision making, but still affordable

Day 2 Table Discussion

After the readout on the top-3 Grand Challenges identified from Day 1, the participants were formed around 13 tables to discuss what they felt might be excellent research topics to explore to address the GCs. Participants at each table could gravitate to whatever urban system or grand challenge they chose from the readout segment. This provided a broad perspective from the tables that had a mixture of individuals representing numerous urban systems at each table.

Directions for Table Discussion session:

User inspired research: please pay particular attention to the voices of the local government and non-profit representatives.

Select a scribe to record your comments on the green paper

Take about 45 minutes to discuss:

1. Cross-cutting themes or thrusts across the systems or research elements
2. Gaps that have not been identified yet
3. Research opportunities that are most important to address

When the discussion time is completed, each table will report out ONE research opportunity that the table identified as most important to address. Be prepared with 1-2 alternate research opportunities to share in case another table suggests the same research opportunity.

Table 1

Cross-Cutting Themes

- Policy and Politics
- Equity
- Cost of Not Taking Action
- How to predict and plan for the impacts of climate change and take action
- Take a Proactive Stance (oz of prevention is worth a lb of cure)
- The Underserved always get left behind

Gaps

- Workforce development
- Funding
- Carbon tax—what is the right cost of carbon
- What is the cost of not taking action
- Public Private Plus Partnerships (the plus is other stakeholders)
- Custom Pilot Projects that can get around regulations to try things out
- Data and uniform systems for reporting carbon
- Look to Western Europe for models (Norway) and for what not to do (Germany shuts down nukes and now is biggest coal user)
- Co-benefit of research and data--- doing good stuff will help drive change and pull others along (eg the underserved communities)
- How do we get community engagement for low income and underserved communities?
- WE (those here at the summit) have a problem bringing the underserved into the conversation and connecting with them and their needs
- Methods of health measurement—natural disasters damage health—eco-anxiety
- Prevention in sustainability—take a proactive approach and stance to actions we take
- How to build healthy communities
- Mobile sources are now larger emitters than stationary sources of carbon—will take a lot of political will to address this bc it will impact individuals
- Must have an eye on parity and equity or the brunt of the costs will be born by the poor
- Equity for poor farmers (70% of PV is on farmland) what about brownfields for sites—coal ash and landfill.

Research Ideas

- Cost of Carbon needs a consistent way to report carbon sinks and emissions and to price and verify the cost of carbon for NC (supports a Carbon Free NC). Look at project draw down by Paul Hawkins. What is the actual cost of carbon free electricity....
- Disparity Free NC--- Public policy needs to drive the change bc waiting for economics to make the change takes too long for our current situation.

Table 2

Cross-cutting Themes

- Equity, policy reform, Dillon Rule
- Procedural equity: Technological capacity & environment
- Shared economy
- Infrastructure

Gaps

- Funding capacity. Facilitation/the who?
- Passion and commitment. Participatory decision making
- Methods/modes/models of holistic engagement. The opportunities for innovative services (trans. food health)
- Serving an aging population matching people to correct housing. Early childhood

Research Opportunities

- Education, clarity, momentum and capacity building. HR effectiveness
- Measure what needs to be measured (shared measurement systems). Universally agreed upon toolbox
- Business accountability for aging infrastructure
- Measuring the value of a decision
- Identify barriers to participation in governance. Quantify problems of electoral participation
- Leveraging culture. Using social media to leverage culture
- Behavior change rather than cultural change (recycling)

Table 3

Cross-Cutting Themes

- Affordable Housing
 - Affordable housing, transportation, disparity and justice.
 - Housing, when poor. Housing exists it leads to poor health outcomes.
 - Poor housing is often near spills and releases, or unhealthy facilities. Again policy gap.
- “Regenerative sustainability” as a standard, which speaks to healthy people, but also healthy systems on which they depend.
- “Resiliency hub”
- Creating communities built around justice, sustainability, affordability. Can be new, or renovation, infill in existing buildings. Make sure that new communities are not harming or compromising existing neighborhoods or living situations.
- Comprehensive or strategic plans that cities have might be a good average point to leverage a plan.
- Must research what words should be used to optimize chances of success with any community. For example, use of the word “resources” is helpful, but any assistance offered must be coupled with guidance over time.
- Must incorporate the culture of the community involved. Must incorporate adaptability.
- Models to benchmark with work as a first phase
 - SE Raleigh Promise group as a model.
 - Intentional communities
 - Communities like Detroit that have adapted, and been resilient
 - Traditional/indigenous communities
- “Pilot project” as something comfortable for a local government to try out.
- Public/private partnerships might be essential to make something happen in a timely manner.
 - Who are the players: NC justice center, urban sustainability directors network (nationwide as a resource), SE sustainability directors network, NC cohort also.
- Electric car/share as a component, located in marginalized communities.
- Better data needed; use our cities as examples of what is happening (note: new state EJ map)
 - Barrier: silos in government when you get into various parts of government, such as DOT, NCDEQ, etc.
- Evaluation as essential in the beginning. Be realistic about cost – 20% of proposal. Start at the beginning. Be sure to include non-traditional, qualitative measures that lead to culturally responsive measures that are not just about grant accountability, but are about formative, program improvement.
- NC Dillon rule; what can be done

Gaps

- Workforce development, energy, technology particularly
- Policy as cross-cutting and essential for all the areas to better support front-line, struggling communities.
- Standards are needed as benchmarks

Research Ideas

1. Data on “state of the State” on affordable housing focused through a sustainability lens.
2. Benchmarking models of regenerative sustainability towards affordable housing
3. Best practices in policies relevant to NC
4. Collective impact model – ad hoc backbone organization, working groups that involve all relevant stakeholder groups. Components: Common agenda, shared measurement, mutually reinforcing activities, encourages continuous communication, and strong backbone.
5. Cumulative impact, cumulative exposure, or cumulative risk from multiple stressors. State getting more and more comments about this.

Researching barriers to moving this through. Don't assume that it's just funding. Other barriers (and champions) might exist, facilitation, framing, backbone organization.

Table 4

Cross-Cutting Themes

- Cross-cutting themes or thrusts...
 - Social, Environmental, Built Environment (metrics and determinants)
 - Definition of Well-being (contextualized, typology)
 - Data
 - Assessments
- City of Pittsboro has an excellent metric (mobility, infrastructure, metrics, determinants)
- Quality of Life metrics (Mecklenburg)

Gaps

Nothing recorded

Research Opportunities

- Operationalization: What changes (prioritized factors) to current approaches will improve our metrics for well-being? (use of data)
- Data – Metrics – Assessments – Time/space
 - GHG all urban systems
 - Access
 - Natural resources
 - Community adoption
- Use data we have today
- Gather Community-level Participant data
- What is the definition of well-being?
- Analyze data
- Does change in well-being save cost?

Table 5

Cross-Cutting Themes

- Equity, access, and impact
- Racism, marginalized populations
- Monopoly, energy path dependency-interests,
- Resistance to change
- Efficiency and waste
- Influence of policy, rules, and regulations
- Technology- micrograms, control and storage
- Economic development potential from innovation

Gaps

- Technology to minimize impact on user
- Actual costs of things
- Scalability/business case
- Integrating systems- decisions, budgets, livable communities
- Model/ monetize or value other impact's outcomes
- Role/voice of industry (only 5%)
- Aging population, shifting demographics
- Develop model to help decision makers and stakeholders evaluate alternative interdependent, tradeoffs, complex synergies that integrate all systems.

Research Opportunities

- How do we develop a model to manage systems more interdependency
- What is the impact on sustainability outcomes when systems are managed holistically (not in isolation from one another)?
- What is the impact on behavior and then sustainability outcomes if/when real, all costs are reflected in decisions?

Table 6

Cross-cutting Themes

- Equity
- Policy making to create more opportunities for those with barriers to make more sustainable choices.

Gaps

- Profit
- Population: growth in urban and depletion of rural regions. Demographic shift of ages, races, ethnicities and cultures
- Economic systems

Research Opportunities

- Urban systems are complications of common pool resources.
 - Based upon the work of Elinor Ostrum, draw a proposal based on the being of Ostrum's encouragement of complex and adaptive systems by tweaking the types of rules (boundary, position, authority, scope, aggregation, information, pay off).
 - Mismatch of scale between natural and governance systems lead to what Ostrum advocates for, which is polycentric governance systems could be great for experimenting with participatory governance.
-
- Urban systems are compilations of common pool resources (resource that benefits a group of people, but which provides diminished benefits to everyone if each individual pursues his or her own self-interest).
 - Alternative definition of sustainability could be to modify Brundtland definition to include avoiding tragedy of the commons. The tragedy of the commons is evidenced in inequity that is now systemic.
 - Draw on work of Elinor Ostrum (who won the Nobel Prize in economics for solving the Tragedy of the Commons and how to work across scales of governance to live sustainably in what she called polycentric governance). Her work is based heavily in designing systems based on strong theories of human behavior (industry behavior too). Also based on common axiom 'act local, think global' and importance of local knowledge.
 - Ostrum encouraged complex adaptive systems (i.e., treat every policy, rule, etc, as trial and error) by tweaking 7 types of rules (boundary, position, authority, scope, aggregation, information, payoff). Mismatch of scale between natural and governance systems leads to what Ostrim advocates for, which is polycentric governance systems.
 - Participatory governance (Arnstein's ladder of participation).

Table 7

Cross-cutting Themes

- Policy at state level
- Equity/ Affordability
- Technology
- Reducing emissions with negative environmental, social ,and health impacts

Gaps

- Communities of color involved in creating research questions and designs.
- Who is making the decisions?
- Campaign finance reform
- Political scientists need to be in the room
- How are we going to ensure the research is applied in the real world
- Circular economies

Research Opportunities

- Transparency of data behind policy and decision making
- Co-benefits and detriments of technology and policy choices
- Pilot projects to get data and proof of concepts to drive policy
- Translate complex issues in a way that is understandable and relatable to audiences
- How do we address the barriers to include the people most affected?
- How can open access to tools and knowledge (e.g. maker space and exports) be used to create solutions and make solar hot water panels; especially for communities of color and low wealth.
- How do we make tech innovation that benefits those that are currently excluded more accessible to improve their own lives and communities?
- How can exposure to DIY technology of kids affect their future success?
- How can maker-space and experts be an effective tool for communities and users to create a sustainable and just society and improve their own lives?

Table 8

Cross-cutting Themes

- Policy as enabling mechanism
- Equity and access
- Built environmental infrastructure
- Resilience
- Health as a unifying theme and an indicator of sustainability

Gaps

- Systems integration across sections
- Cooperation between communities
- Only limited examples (e.g. triangle resilience plan)
- Planning at a regional scale (lack of organizational structure)
- Regional planning gaps between resources, communications, organizational structure especially between large and small communities
- Lack of housing dept. of state level
- Community investment is decision making
- Engagement of stakeholders

Research Opportunities

- Improved mechanisms for regional planning
- Empowering the public informed governance at multiple levels of participation enticing to cooperate government and policy
- Understanding influence in social organizational networks to identify most effective change
- Tools for mapping spheres of political influence
- How to use systems perspective to perform cost/benefit analysis across sectors?
- What are the appropriate metrics to use?
- How do we standardize metrics of sustainability utilize heterogeneous data to effectively inform, “systems” level decision making and education (e.g. social determinants of health questions).
- Study areas projected for growth and how will that impact energy, transportation, housing, etc.
- Scenario planning identify multiple possible futures and figure out different infrastructure investment needs based on that.
- Impact study of local programs (longer term)

Table 9

Cross-cutting Themes

Policy and regulations

- Scalability
- Short term decisions vs long term planning
- Public education and communication
- Human behavior and social perception
- Public perception
- Infrastructure and built environment funding and planning
- No sustainable development and mechanisms to fund needed infrastructure

Gaps

- Administrative policy gaps
- Business sustainability of intersectional programs like growing power
- Use creative thinking to reach future we want
- Follow up data on project impact
- Collection of qualitative data
- Research to practice pipeline

Research Opportunities

- Study areas projected for growth and how will that impact energy, transportation, housing, etc.
- Scenario planning identify multiple possible futures and figure out different infrastructure investment needs based on that.
- Impact study of local programs (longer term)

Table 10

Cross-cutting Themes

- Equity
- Social justice & transitions
- How to create effective policy
- Political structure= current barrier
- Education, need community involvement/engagement

Gaps

- What needs aren't being met
- Policy-grassroots
- Waste
- Social science involvement
- Look for other examples of success
- How to communicate for a simple understanding
- Role of rural areas

Research Opportunities

- How to make our research meaningful and how to make changes
- How to change behavior and make them care
- How to get to the people and learn from them
- How did we get here
- How can we set standards? What standards?
- How to define the baseline and measure progress
- How to allow local context to drive changes?
- What sustainability metrics to focus on and how to move the needle?
- Collect internal data & goals with other cities in a customized convergence network

Table 11

Cross-cutting Themes

- Water bullet
- Short term decisions vs. long term planning

Gaps

- Info storing between research and practitioners
- Administrative policies and implementation gaps
- Public education outreach on role of local and regional govt.

Research Opportunities

- Longitudinal study on energy and health impacts of healthy home retrofit building rehab
- TRB – Research needs Database plus link researcher (academic) and practitioner (industry)

Table 12

Cross-cutting Themes

- Accessible, affordable resources
- Policy
- Resilience (biophysical and socioeconomic, acute and chronic, present and future)
- Land use

Gaps

- Cross-jurisdictional comparison of policies and their effectiveness
- Gender dimensions of equity
- How to incentivize private industry to implement sustainable practices
- Comprehensive land-use planning
- Need to internalize externalities
- Data availability

Research Opportunities

- How can we fully account for the social life-cycle costs of our current policies and use that information to design better policies. How will these costs change in the future
- How can we design an optimal comprehensive land-use plan for the state? What are the impacts of future land-use change on the different sectors and who bears the costs
- What are the social life-cycle costs of land-use practices across sustainability systems
- **Land use is important as it impacts all six sustainable urban systems

Table 13

Cross-cutting Themes

- Policy and politics
- Equity and access
- The built environment
- Institutional infrastructure
- Gaps in rural and urban coordination for resiliency planning (lack of organizational structure for cross-cutting sustainability /health)

Gaps

- Community investment- need to connect health advocates and environmental advocates
- Gap between public awareness/public engagement and metrics open data movement with cities- i.e. link EPA environmental data
- Gaps in systems collaboration
- Gaps in regional planning coordination

Research Opportunities

- Tools to help cities map “influencers” all cost/benefit analysis using cost avoidance across systems
- Develop metrics to measure success/challenges faced by each “grand challenge” topic area”
- NCDHHS- social determinants of health questionnaire
- Look at the relationship between topic area with systems thinking

Research Topics Developed from Table Discussions

The following list contains the 13 broad research topics that evolved from the table discussions. Participants were asked to select the top three research topics you would most like to see pursued using Poll Everywhere. The topics are listed from highest to lowest vote on the poll.

- How do we get community engaged & centered creation of sustainable systems (14%)
- Developing a model that integrates all systems - tradeoffs, synergies - to help evaluate alternatives (12%)
- Develop toolbar of metrics - adaptive for each community, but comparable between communities; equity in decision making (11%)
- Empowering the public - using tools to map political influence, ID change makers - cost/benefit analysis system (11%)
- Research needs database - link researchers, students to practitioners (9 %)
- Cost of carbon - cost of emissions - consistent way to report - accounting of costs/verified (8%)
- Sustainability metrics and needle moving in customized convergence network (7%)
- Process participatory community information gathering. ID 3-5 priority areas, then collect data on areas, money, into solutions (7%)
- Social cost of land use practices - how it impacts all sustainability systems (carbon) (7%)
- How individual and local communities can adapt to stressors across all urban systems, new data for policy (6%)
- Develop best practices for regenerative sustainability toward affordable housing (4%)
- Polycentric governance of common pool resources - adaptively manage/every can benefit (3%)
- How can maker spaces plus experts be an effective tool to those not easily accessible to improve lives, equity, just (3%)

Sustainable Urban Systems: Six Key Elements

Once the research topics were identified and ranked the participants were asked to match the research topics to the six key elements expected to advance sustainable urban systems science.

These key elements were included in a National Science Foundation sponsored report prepared by the Advisory Committee for Environmental Research and Education titled: Sustainable Urban Systems: Articulating a Long-Term Convergence Agenda. According to the report, the integration of the following six key elements (A-F) is expected to significantly advance SUS science.

- A. 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.
- B. Developing the science to assess the sustainability outcomes nexus in urban systems, i.e., the co-benefits and trade-offs among multiple human and planetary well-being outcomes across spatial (local to global) and temporal scales.
- C. Understanding the levers for change in diverse urban systems (“theories of change”), combining:
 - 1. A focus on integrative design, technology innovation, and sociotechnical transitions.
 - 2. A focus on multi-level actors and governance.
- D. Advancing comparative studies, typology studies, and scalability studies to develop a generalizable science of theories of change across diverse city types.
- E. Developing the science to model the future of SUS across the three perspectives.
- F. 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.

The three perspectives (i-iii) noted above are envisioned to enable a holistic study of local to global SUS, while the six key elements (A-F) fill critical research gaps and work to provide a strategic pathway to advance SUS, starting from understanding the system, to designing change from a social-ecological-infrastructure perspective, and finally, to informing action to change the forecast.¹

¹ Ramaswami, Anu and el. Sustainable Urban Systems: Articulating A Long-Term Convergence Research Agenda. January 2018. The National Science Foundation.

Research Outcomes for SEUSS Matched to NSF SUS Report

Community Engagement, Participation

14% G - **How do we get community engaged & centered creation of sustainable systems**

9% K - **research needs database - link researchers, students to practitioners**

3% D - How can maker spaces plus experts be an effective tool to those not easily accessible to improve lives, equity, just

3% C- polycentric governance of common pool resources-adaptively manage/every can benefit

Empowerment and power dynamics

11% E -**Empowering the public - using tools to map political influence; ID change makers - cost/benefit analysis system**

7% M - Process: participatory community info gathering: ID 3-5 priority areas; then collect data on areas; money into solutions

Integrated system modeling

12% B-**Developing a model that integrates all systems – tradeoffs/synergies – to help evaluate alternatives**

7% F- Social cost of land use practices - how it impacts all sustainability systems (carbon)

Metrics and best practices

11% J - **develop tool box of metrics - adaptable for each community, but comparable bw communities; equity in decision making**

7% A- Sustainability metrics and needle moving in customized convergence network

4% I - develop best practices for regenerative sustainability toward affordable housing

Cost of Carbon

8% H - **Cost of carbon - cost of emissions - consistent way to report - accounting of costs/verified**

Adapt to Stressors/Resilience

6% L - how individual and local communities can adapt to stressors across all urban systems; new data for policy

NEXT STEP:

SEUSS participants were asked to attend a breakout session for the research topic that most appealed to them. The goal of the breakout session was to brainstorm potential research questions for each of the six research topics (above). The secondary goal of the breakout session was to identify potential future researchers for each of the topics. The details of these breakout sessions is included over the next six pages.

Research: Community Engagement and Participation

This group explored the vision and challenges associated with community engagement and participation in convergence research. A key position shared by everyone is that convergence research by definition requires centering community experience and needs. This lens of community participation, equity and inclusion should be the lens that all SEUSS work is conducted through. Community here is understood as communities, the social fabric of the state, with emphasis on vulnerable populations affected by cumulative impacts of environmental, sociodemographic and socioeconomic factors.

It was noted that community representation at the Summit was low, and that community participation will be key moving forward. Discussed at length were the merits of SEUSS going to communities versus communities coming to SEUSS. Histories of exploitation were shared, experiences in which various communities were exploited in relationships with municipal and academic institutions. Group participants felt strongly about power sharing going forward, in the distribution of both finances and decision-making.

Three research questions for the network to pursue include:

1. What resources do communities need (and/or already possess) to fully participate in SEUSS as co-equals? Participation includes design and decision-making in research scope, questions and methodology.
2. What resources/training does SEUSS need to be fully present and participating with community? The capacity to be fully present and participating includes awareness and understanding of the socio-political economy that communities are operating within, as well as historic and contemporary exploitation of communities by academic and municipal institutions.
3. What resources/training do designers and implementers need in order to see and value community partnership and to understand “I as We”? Designers and implementers include urban planners, municipal leaders, policy makers, etc.

Research: Empowerment and Power Dynamics

Questions:

1. What makes sustainability projects successful?
2. How do spheres of power influence the implementation and success of these projects?
(Spheres of power = local/grassroots and institutional/political)

How to conduct research:

- Community-based, participatory research
- Mixed methods
- Network Analysis
- Case Studies – Interview + participation
- Secondary Data

Research: Integrated System Modeling

Questions:

1. What are the components of the system? (Community engagement, SDM)
2. How do we measure/model/communicate interconnections across systems?
3. How do feedbacks among systems affect response to stressors?

How to conduct research:

- External validity – can influence decision-makers
- Models that are accessible to average citizen
- Integrative feedback b/w community and model
- SEUSS unifies/interfaces/coordinates among niche models
- Building physical object/neighborhood living lab
- Economic effects of competition/democratizing models
- Summer Institute
- Survival of civilization
- Geospatial land use on the grid/empower farmers
- Industry supported research center
- Toolkit for policymakers- cross-sectoral impacts
- New technologies (machine learning – crowd-sourcing)
- Coastal-marine impacts (military installations)
- Economists

Research: Metrics and Best Practices

Key observations from this research group included: (1) that urban areas (of all sizes) across NC are under-resourced to address SUS; and (2) **a shared, data-driven “SUS-improvement process” is needed for all urban typologies.**

Outcomes from this research breakout group included identification of three research sub-areas: (1) Metrics and best practices: Community-informed, outcome-based metrics to measure well-being across urban area typologies in NC; (2) Community engagement and participation: How to engage community in creation of sustainable systems? Better governance and management of common-pool resources; and (3) Empowerment and power dynamics: Empowering the public; developing tools to map influence factors, identify change agents/actors, and provide cost/benefit analysis system.

A common element in these research topics is the need for metrics and data. The participants in this breakout session clearly stated that financial/personnel resources did not exist in most cities/municipalities to carry out the needed data process (what to measure, gather data, analyze data, drive change through policy, evaluate impact, *repeat*). To tackle many of the research topics from the Summit, a *shared, foundational measurement and policy cycle/process* for NC urban communities that will improve the sustainability/resilience of their urban systems is paramount. More importantly, the evaluation of those urban systems must include the effect on human and planetary well-being.

This research topic focused on the fundamental building blocks for cities across NC to have a smart and shared process. A cost-effective process should be designed that will serve all the communities and will allow a sharing of knowledge through comparative research studies.

Recommendation: Form a team of people that can formulate a Data and Best Practices process that will serve all aspects of research related to SUS.

Notes taken during the breakout session:

1. Who will use the data?
2. Identify outcomes-based metrics with public output to measure well-being across typology of cities (neighborhoods, towns, counties) Common and Variable, traditional and innovative)
3. What is the minimum of a sustainable city?

Notes:

Policy Maker

www.polimap.com Ver 4 (download for windows)

www.dev1.ed-projects.nyu.edu/policymaker Ver 5 (online tool)

Research: Carbon Free NC, Cost of Carbon, Carbon Accounting

It is posited to the group that an accurate cost of carbon for NC is needed to be able to make informed decisions about infrastructure and other investments.

Regarding a cost of carbon that could be implemented as a carbon tax, there was much discussion about the cost side and how this would raise prices for consumers and industry. Carbon credits or offsets could be generated by managed forest land, some potential in agriculture if low till practices are implemented (1-2 tonnes per acre per year), potential for depleted soils to sequester through healthy soil management (eg. old depleted tobacco fields etc.), potential for cities with parks and other green spaces, potential for homeowners yards could be explored.

Regional market for carbon was deemed best rather than state system or smaller due to carbon impact variations??

North Carolina and other coastal, hurricane prone states may have a higher cost to bear from sea level rise and extreme weather than other states in the US—how to account for this in a cost of carbon? How does this fact work out in a larger national/regional carbon market? Will NC residents pay more for carbon than residents in North Dakota?

End user feedback--- Mecklenburg County is stretched to the limit just maintaining its current systems and day to day business--- probably very little potential for carbon offset generation since the area is so urbanized... There is some potential benefit to make a better financial case for parks and other county greenspace.

Look regionally and you will likely find several local governments willing to join in a carbon market as well as some other early adopters like universities....

Piedmont COG has about 3 out of 72 local governments who might be interested in a carbon market--- just not on their radar due to workload and staff capacity.

EDF Cities group is a good group to reach out to regarding a carbon market.

Equity comment--- the poorest will pay a much higher price if not action is taken on climate--- however the poorest also will bear a large burden if fuel and other utility prices increase due to a carbon market.

In general, the concept of setting up a regional carbon market with sellers likely to be rural counties and buyers likely to be early adopters such as universities and some local governments is an interesting concept.

Carbon Accounting

There are already many existing frameworks for carbon accounting--- likely do not need to create one, just need to find one that all are happy with..... the STAR framework for example. Carbon accounting is not on the agenda of the local governments represented in this group.... In fact there is some fear that data may not want to be made public because it would show the real situation of some cities and there is also work that needs to be done to make sure that airports, distribution centers and other carbon intensive systems do not impact the carbon level of a county since it may serve many other areas....

Research: Adapt to Stressors/Resilience

Adapt: Not doing things the same way

Stressors:

- Social
- Technological
- Natural

Across all systems = Impacts Health, Education, Equity

Questions:

1. Focusing on climate change and major events, what are the proactive decisions that can be made within domains to mitigate risk rather than solely focusing (underground parking, co-localizing healthcare in clusters with schools)
2. How will emerging transport modes and technologies impact resilience for urban households/at community scale?
3. Survey of stressors by region/system. Identify ways to adapt vs be resilient to the stressors. Analysis of how those adaptations/resiliency actions impact the stressor and other systems. Fund investments that address pressing stressors across multiple systems. Study results
4. Modeling a collapse of one system and charting what impact it might have on other systems (spatially defined area, different severities)
5. How are sustainable systems, like clean/renewable energy, vulnerable to climate change?
6. How will sustainability techniques and technologies affect the resilience of poor households or all urban households?
7. What are synergies between resilient systems and sustainable systems? What are points of tension?
8. Quantify the effectiveness of natural/green infrastructure for flood loss prevention
9. What are some ways technology can be used to enhance resilience?
10. How can we ensure equitable access/representation of vulnerable communities?

SEUSS Attendee List

First Name	Last Name	Title	Organization
Ridwaana	Allen	Graduate Student/ Research Asst	University of North Carolina at Greensboro
Aaron	Allen	Director	University of North Carolina at Greensboro
Susan	Andreatta	Professor	University of North Carolina at Greensboro
Meghan	Baker	Extension Agent	North Carolina Cooperative Extension
Elise	Barrella	Assistant Professor of Engineering	Wake Forest University
Emily	Barrett	Sustainability Manager	Town of Cary, NC
Sherry	Beeson	Assistant to Executive Director	Affordable Housing Management
Michael	Blair	Community Development Director	Piedmont Triad Regional Council
barbara	bleiweis	Supervisor and Chair	Mecklenburg Soil & Water Conservation District
George	Bonner	Executive Director	North Carolina State University
Erika	Brandt	Sr. Policy Analyst	NC Housing Finance Agency
Paul	Cameron	Sustainability & Energy Analyst	City of Durham
Greg	Carlton	Graduate Assistant	University of North Carolina at Greensboro
Jared	Cates	Community Mobilizer	Carolina Farm Stewardship Association
Charlotte	Clark	Assistant Professor of the Practice	Duke University, Nicholas School of the Environment
Brian	Coble	Senor Vice President	NC Advanced Energy
Joe	Cole	AP Assistant Professor	Department of Peace and Conflict Studies UNCG
Caren	Cooper	Associate Professor	North Carolina State University
Angel	Cruz	Academic/Extension Initiatives Mgr	Center for Environmental Farming Systems (CEFS)
Christy	Daniel	Director Renewable Solutions	Duke Energy
Jesse	Day	Regional Planning Director	Piedmont Triad Regional Council
Mark	Dehaven	Distinguished Professor	University of North Carolina Charlotte
Becky	Dickson	Professor of Sustainability	Wake Forest University
Susan	Doll	Associate Professor	Appalachian State University
Steven	Drew	Director	Greensboro Water Resources Department
Steven	Drew	Director	Greensboro Water Resources Department
Andrea	Eilers	Energy & Environment Program Mgr	Triangle J Council of Governments
Lisa	Ellington	Program Manager	Rockingham County Integrated Health Care
Francheska	Elliott	Community Educator	AmeriHealth Caritas NC
Kristin	Feierabend	Area Agent for Urban Programs	NC Cooperative Extension
Meg	Fencil	Program Director	Sustain Charlotte
Jeremy	Ferrell	Assistant Professor	Appalachian State University
Reza	Foroughi	Assistant professor	Appalachian State University
Andrew	Foster	Clinical Professor	Duke University School of Law
Vicki	Foust	Principal Investigator, SEUSS	North Carolina A&T State University
Tobin	Freid	Sustainability Manager	Durham County
Tim	Gallagher	Executive Director	Safety Net Health


First Name	Last Name	Title	Organization
Tiffany	Gallop	Graduate student	University of North Carolina at Greensboro
Solomon	Ghezehei	Research Scientist	North Carolina State University
Marcia	Hale	Assistant Professor	University of North Carolina at Greensboro
Marcia	Hale	Assistant Professor	University of North Carolina at Greensboro
David	Hampsten	Planning Principal	Transit Alliance of the Piedmont
Leila	Hashemi Beni	Assistant Professor	North Carolina A&T State University
Mary	Herbenick	Executive Director	Ready for School, Ready for Life
Bridget	Herring	Energy Program Coordinator	City of Asheville
George	Hess	Professor	North Carolina State University
Tyran	Hill	Business Development Officer	NC Community Development Initiative
cindy	holmes	assistant sustainability manager	City of Raleigh
Erin	Hostetler	Senior Program Coordinator	Rivendell Farms/Energy Environment Innovation
Mike	Hughes	Vice President-Community Relations	Duke Energy
Misun	Hur	Associate Professor	East Carolina University
David	Ingram	Sustainability Manager	City of Wilmington
Chanelle	James	Entrepreneurship Faculty	UNC- Greensboro
Vivette	Jeffries-Logan	Founder & Principal	Bi'wa Consulting
Manoj	Jha	Associate Professor	North Carolina A&T State University
Corey	Johnson	Professor	University of North Carolina at Greensboro
Timothy	Johnson	Associate Professor of the Practice	Nicholas School of the Environment, Duke University
Jennifer	Johnson	Graduate Student	University of North Carolina at Greensboro
Gray	Johnston	Transportation Planner	City of Greensboro; Department of Transportation
Bobby	Jones	Community Organizer	Down East Coal Ash Env'l & Social Justice Coalition
Stephen	Kalland	Executive Director	NC Clean Energy Technology Center
Stephen	Kalland	Executive Director	NC Clean Energy Technology Center
Firoozeh	Karimi	Graduate Student	University of North Carolina Greensboro
Etsuko	Kinefuchi	Associate Professor	University of North Carolina at Greensboro
Dylan	Kirk	Sustainability Coordinator	Mecklenburg County
Sergey	Kobelev	Energy Management Engineer	City of Greensboro
Eleftheria	Kontou	Postdoctoral Research Associate	University of North Carolina at Chapel Hill
Steve	Kroll-Smith	Professor	University of North Carolina at Greensboro
Robin	Lane	Project ONE lead	Guilford County Project ONE
Nancy	LaPlaca	Principal	LaPlaca and Associates LLC
Sung-Jin	Lee	Associate Professor	North Carolina A&T State University
Anna	Leonard	Environmental Programs Coordinator	Piedmont Triad Regional Council
David	Levy	Executive Director	Affordable Housing Management
Wenliang	Li	Assistant Professor	University of North Carolina at Greensboro
Kathleen	Liang	Kellogg Distinguished Professor	North Carolina A&T State University

First Name	Last Name	Title	Organization
George	List	Professor	North Carolina State University
Jon	Lowder	Executive Director	Piedmont Triad Apartment Association
Ingrid	Luffman	Assistant Professor	East Tennessee State University
Helen	Mack	VFTT volunteer (national trainer)	AARP/NC AARP
Maureen	MacNamara	Assistant Professor	Appalachian State University
Jamie	Maier	Executive Director	Piedmont Environmental Alliance
Praveen	Malali	Director of Research	East Carolina University
Nadine	Malpass	Senior VP Resource Development	United Way of Greater Greensboro
Norma	Marti	Chair--Action/Advocacy	Church Women United-Wake County
John	Martin	Senior Lecturer	Appalachian State University
Amanda	Martin	Deputy Chief Resilience Officer	NC Office of Recovery and Resilience
Karen	McSwain	Assoc Executive Director of Programs	Carolina Farm Stewardship Association
Ahmed	Megri	Associate Professor	North Carolina A&T State University
Mitch	Mitcham	Managing partner	CLP LLC
Ahmed	Mohamed	Assistant Professor	Indiana State University
Greg	Monty	Director	North Carolina A&T State University
Stephen	Moysey	Professor	East Carolina University
Emily	Mueller	Extension agent	North Carolina State University
Shifa	Nordone	Director of Research Development	Duke University
Jaewon	Oh	Assistant Professor	Appalachian State University
Helen	Peplowski	Director of Sustainability	City of Winston-Salem
Nicole	Peterson	Associate Professor	University of North Carolina Charlotte
Grace	Plummer	Program and Research Development	Appalachian State University
Robert	Powell	Associate Professor CAEE	North Carolina A&T State University
Sarah	Praskiewicz	Assistant Professor	University of North Carolina at Greensboro
Sarah	Praskiewicz	Assistant Professor	University of North Carolina at Greensboro
Md Makhlesur	Rahman	Graduate Research Assistant	University of North Carolina at Charlotte
Kuldeep	Rawat	Dean of Aviation, Sciences &Tech	Elizabeth City State University
Jennifer	Richmond-Bryant	Associate Professor of the Practice	North Carolina State University
Louie	Rivers	Assistant Professor	North Carolina State University
Karin	Rogers	Director of Operations	UNC Asheville's NEMAC
Riem	Rostom	Assistant Professor	Indiana State University
William	Rowe	General Counsel/Deputy Director	NC Justice Center
Jennifer	Runkle	Environmental Epidemiologist	North Carolina State University
Jamie	Russell	Director	Appalachian Energy Center
Jamie	Russell	Director	Appalachian Energy Center
Georgina	Sanchez	Postdoctoral Research Associate	North Carolina State University
Susan	Sanford	Executive Director	Research Triangle Cleantech Cluster (RTCC)

First Name	Last Name	Title	Organization
Cathryne	Schmitz	Professor Emerita	University of North Carolina at Greensboro
Malcolm	Schug	Associate Professor	University of North Carolina Greensboro
Will	Scott	Energy Policy Analyst	NC Conservation Network
Elizabeth	Shay	Assistant Professor	Appalachian State University
Evan	Shearer	Grid Planning/Regulatory Specialist	Duke Energy
Rajesh	Sigdel	Graduate Teaching Assistant	University of North Carolina at Greensboro
Stephen	Sills	Director/ Professor	UNCG Center for Housing and Community Studies
Scott	Snow	Manager	Town of Walkertown
Jeff	Sovich	Senior Planner	City of Greensboro
Danielle	Spurlock	Assistant professor	UNC-Chapel Hill
John	Stehlin	Assistant Professor	University of North Carolina, Greensboro
James	Stroud	Executive Director	Centre for Homeownership & EDC
Margaret	Sugg	Assistant Professor	Appalachian State University
Rogelio	Sullivan	Project Manager	PowerAmerica/NC State University
Selima	Sultana	Professor	University of North Carolina at Greensboro
Emila	Sutton	Policy & Research Team Lead	NC Housing Finance Agency
Matt	Talbott	Senior Planner	Guilford County Planning and Development
Raymond	Tesiero	Assistant Professor	North Carolina A&T State University
Jean-Claude	Thill	Distinguished Professor	University of North Carolina Charlotte
Austin	Thompson	Project Director	University of North Carolina at Chapel Hill
Paulett	Wall	Program Specialist	NC Homeless Education Program
Tobin	Walton	Assistant Professor	North Carolina A&T State University
Johnisha	Watlington	Care Manager/ LCSWA	Guilford Community Care Network
Amber	Weaver	Sustainability Officer	City of Asheville
Joe	Weber	Professor	University of Alabama
Jennifer	Weiss	Senior Policy Associate	Nicholas Institute/ Duke University
Alana	Wilson	Post-doctoral Researcher	National Renewable Energy Lab
Yuan	Yao	Assistant Professor	North Carolina State University
Skip	Yeakel	Principal Engineer	Volvo Group North America
Andrew	Young	Member	SE Asian Community Disparities Research Network
Johnny	Yow	Social Worker/Case Manager	Rockingham County Integrated Health Care
Christopher	Zarzar	Assistant Research Professor	Wake Forest University

Appendix A

ECONOMIC BACKGROUND OF NORTH CAROLINA
WITH IMPLICATIONS FOR SUSTAINABILITY



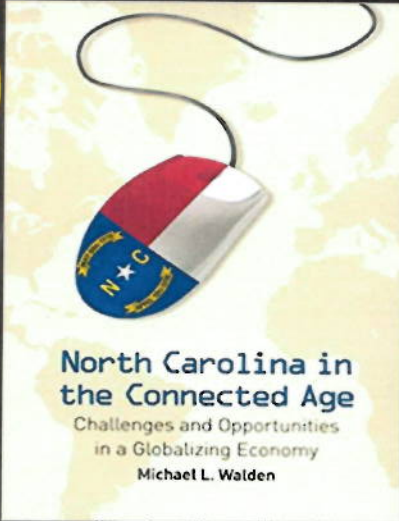
Dr. Mike Walden

**Reynolds
Distinguished
Professor**

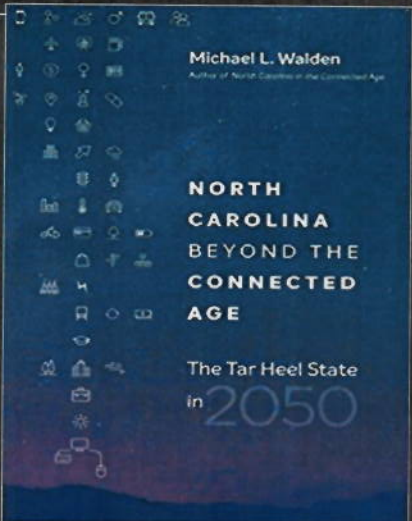
**North Carolina
State
University**

1

**NORTH CAROLINA'S ECONOMY HAS TRANSFORMED IN
THE PAST, AND WILL TRANSFORM IN THE FUTURE**



**North Carolina in
the Connected Age**
Challenges and Opportunities
in a Globalizing Economy
Michael L. Walden

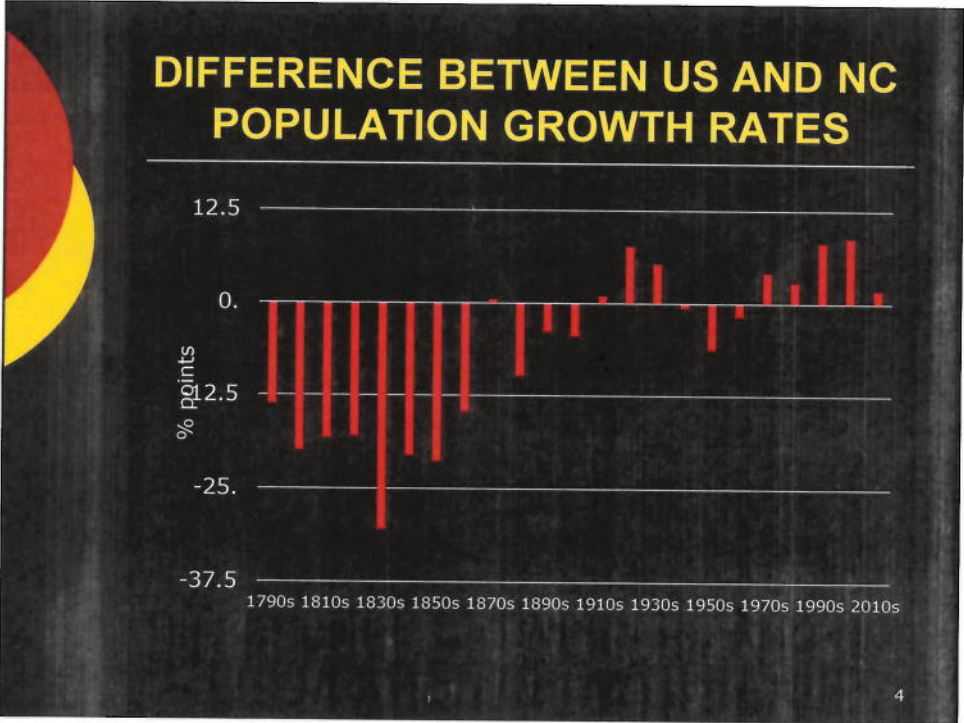


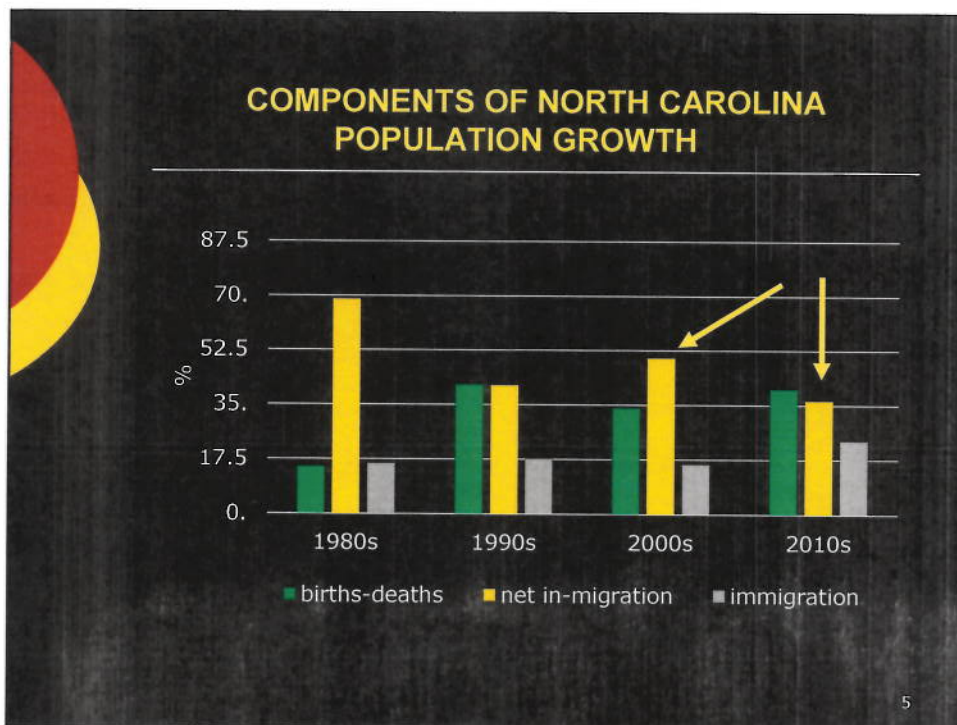
Michael L. Walden
Author of *North Carolina in the Connected Age*

**NORTH
CAROLINA
BEYOND THE
CONNECTED
AGE**

The Tar Heel State
in **2050**

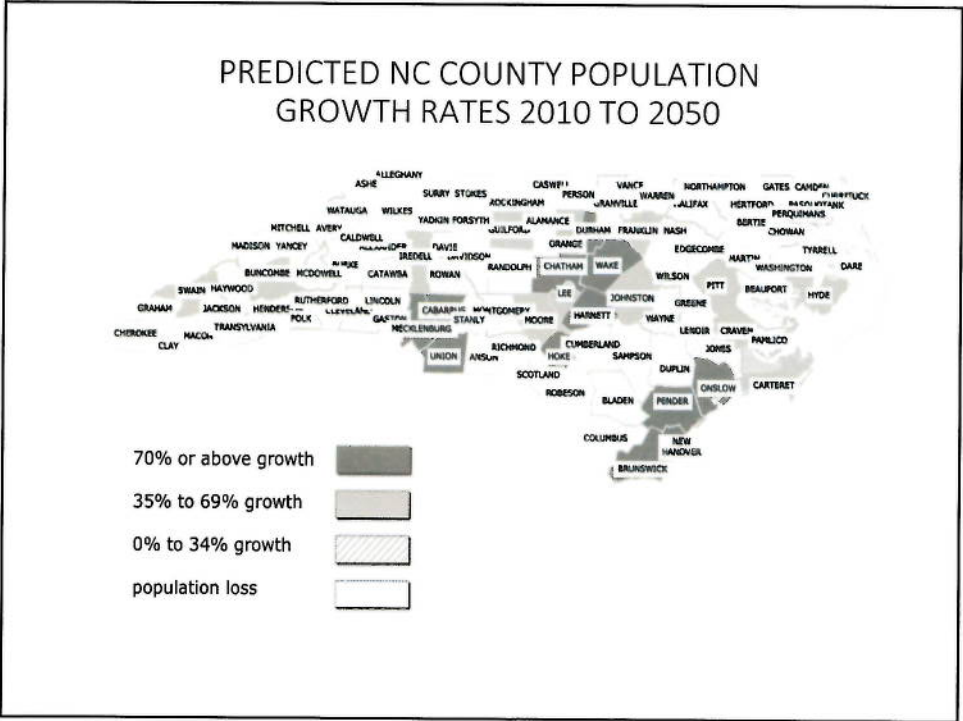
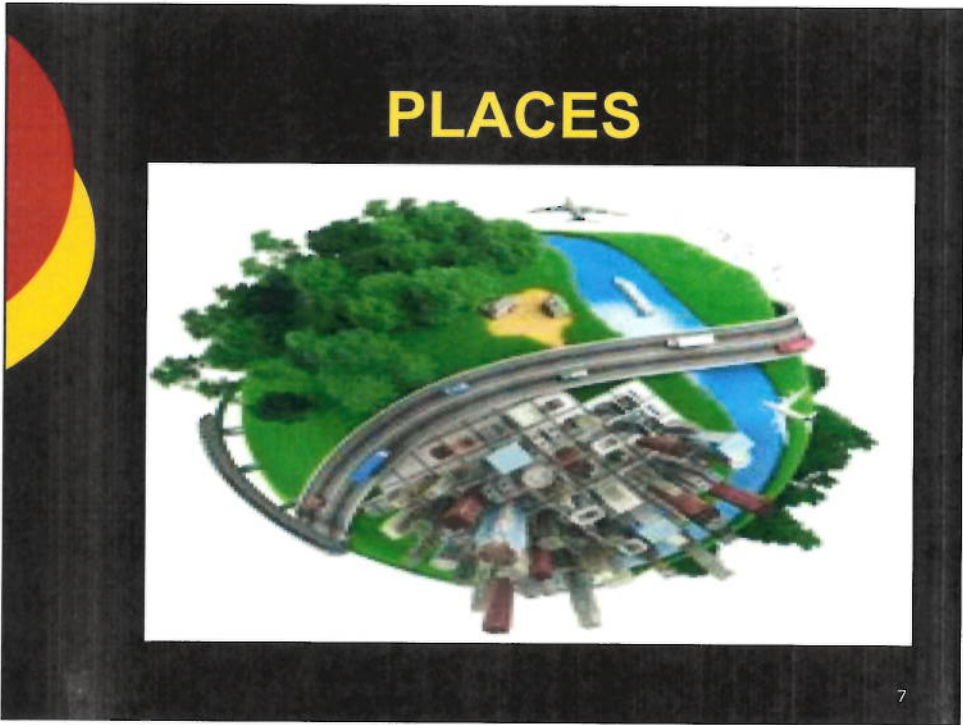
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NORTH CAROLINA POPULATION PROJECTIONS

	2010	2030	2050	2010	2030	2050
Total Population	9.6	11.6	13.4	100.0	100.0	100.0
	Number (millions)			Percentage of Total		
Under 18	2.3	2.4	2.6	23.9	20.5	19.5
18-24	1.0	1.1	1.2	9.9	9.4	9.0
25-44	2.6	3.0	3.2	26.9	26.1	24.1
45-64	2.5	2.8	3.5	26.3	24.1	26.1
65&+	1.2	2.3	2.9	13.0	19.9	21.3



**THE FUTURE FAVORS URBAN AREAS,
OR, COULD A RURAL RENAISSANCE OCCUR?**



VIRTUALIZATION


**E-COMMERCE + DRONE
DELIVERY**

DRIVERLESS TRANSPORT

METRO "TIPPING POINT"

9

ECONOMIC SECTORS



10



FORCES SHAPING THE ECONOMIC FUTURE

AGING POPULATION

TECHNOLOGICAL INNOVATION AND
IMPLEMENTATION

SHIFT OF INFLUENCE TO DEVELOPING
COUNTRIES

SHIFTS IN TASTES AND PREFERENCES

ALTERNATIVE ENERGY

11



FOUR SECTORS TO WATCH FOR FUTURE GROWTH

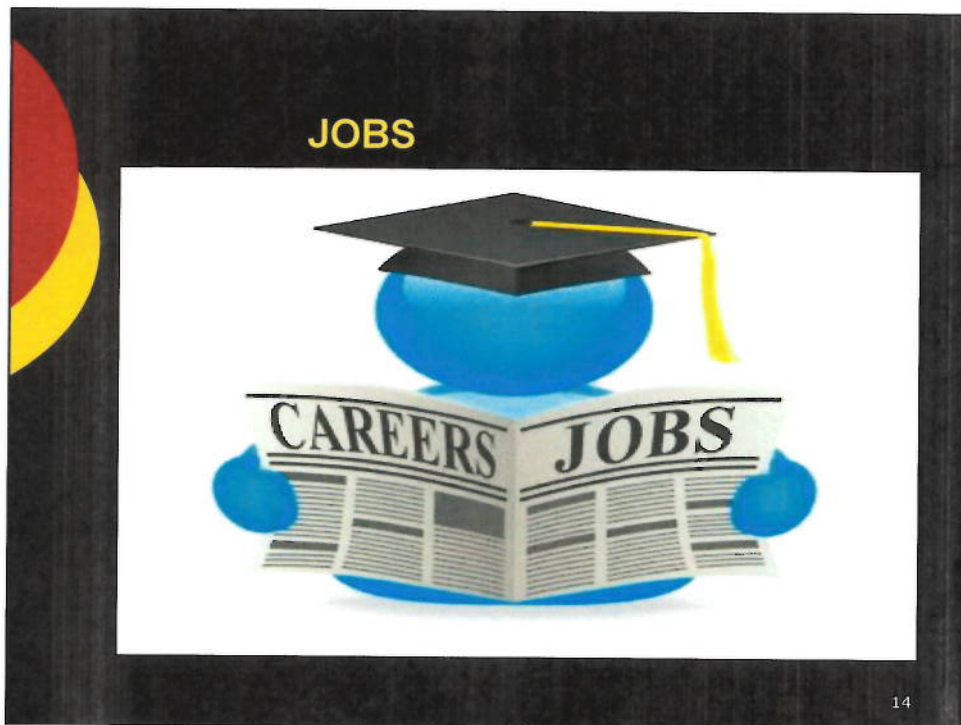
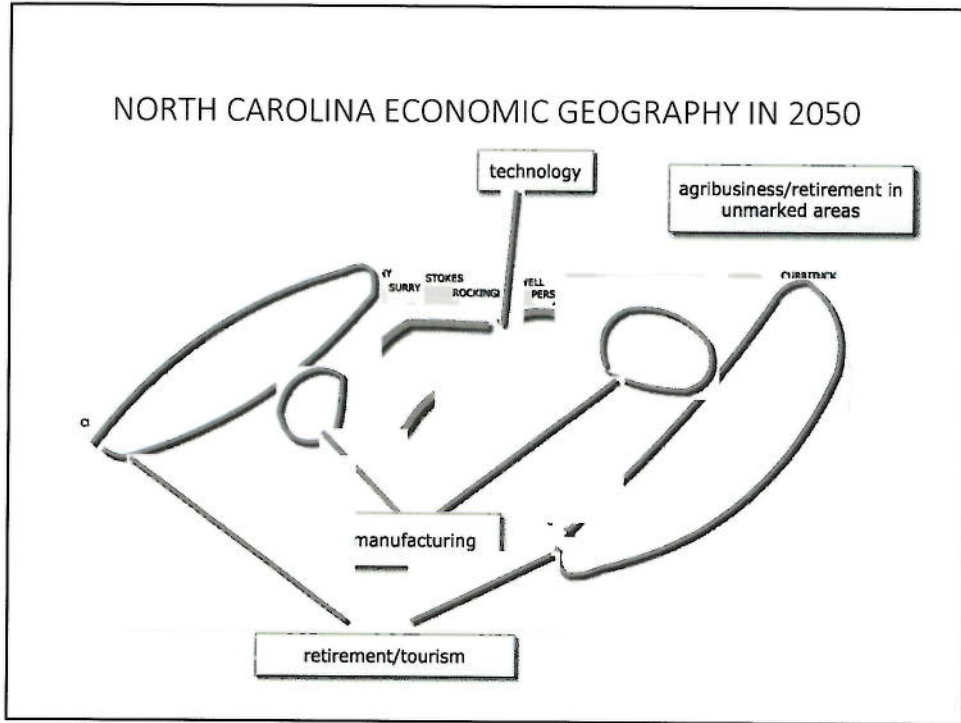
TECHNOLOGY

TOURISM

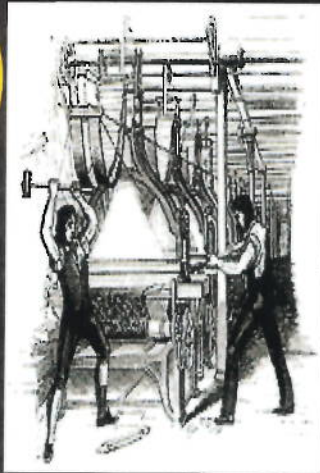
AGRIBUSINESS

RETIREMENT

12



BIG QUESTION: IS THIS TIME DIFFERENT?



FARMING TO MANUFACTURING
MANUFACTURING TO SERVICES
SERVICES TO WHAT?

1,000,000 NEW JOBS IN 2050
OR 460,000 LESS?

15

WHERE ARE THE NEW JOBS?

DEVELOPMENT/MAINTENANCE OF NEW TECHNOLOGY
GLOBAL INTERACTION
LOGISTICS AND DATA MANAGEMENT/ANALYSIS
AGED ASSISTANCE
EDUCATION/RE-TRAINING
SOCIAL INTERACTION
ARTISANSHIP

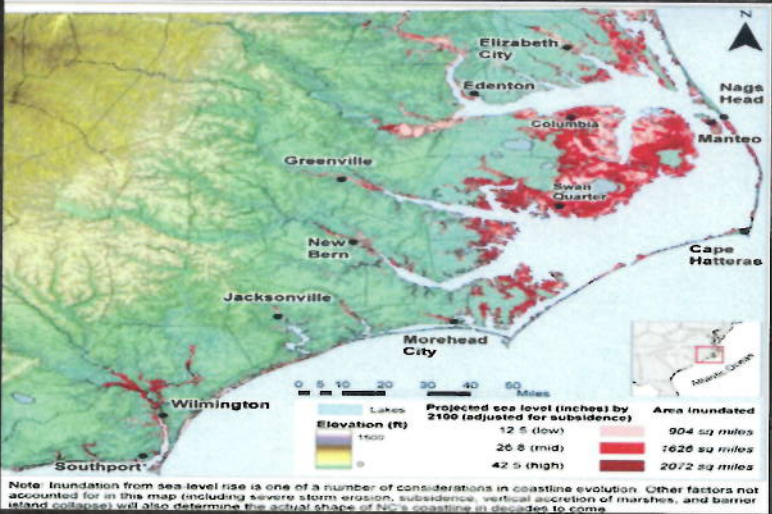
16

RESOURCES

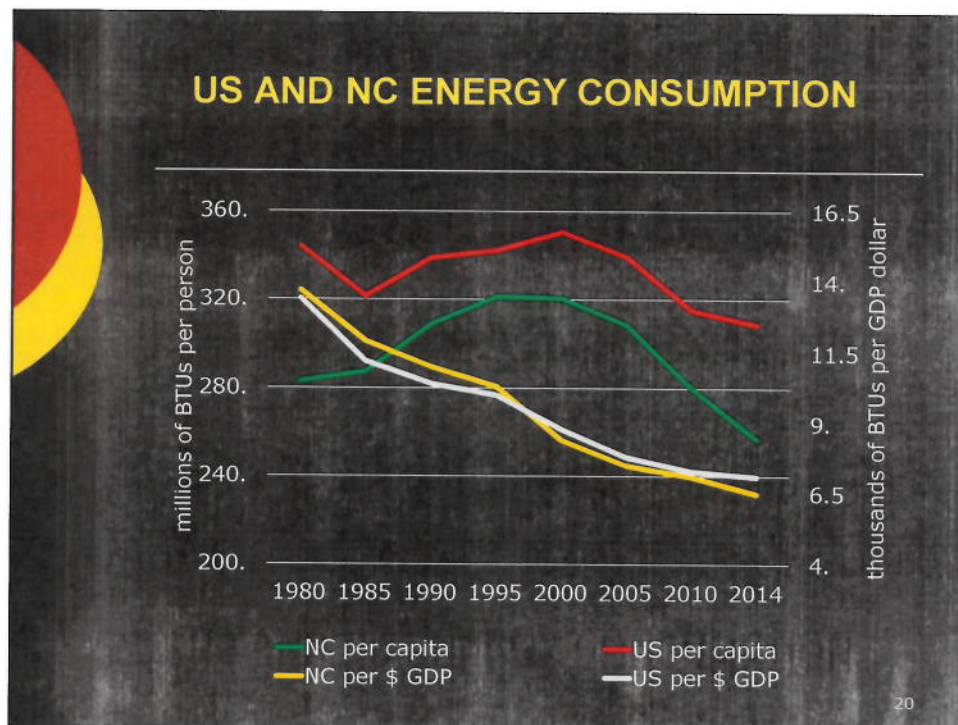
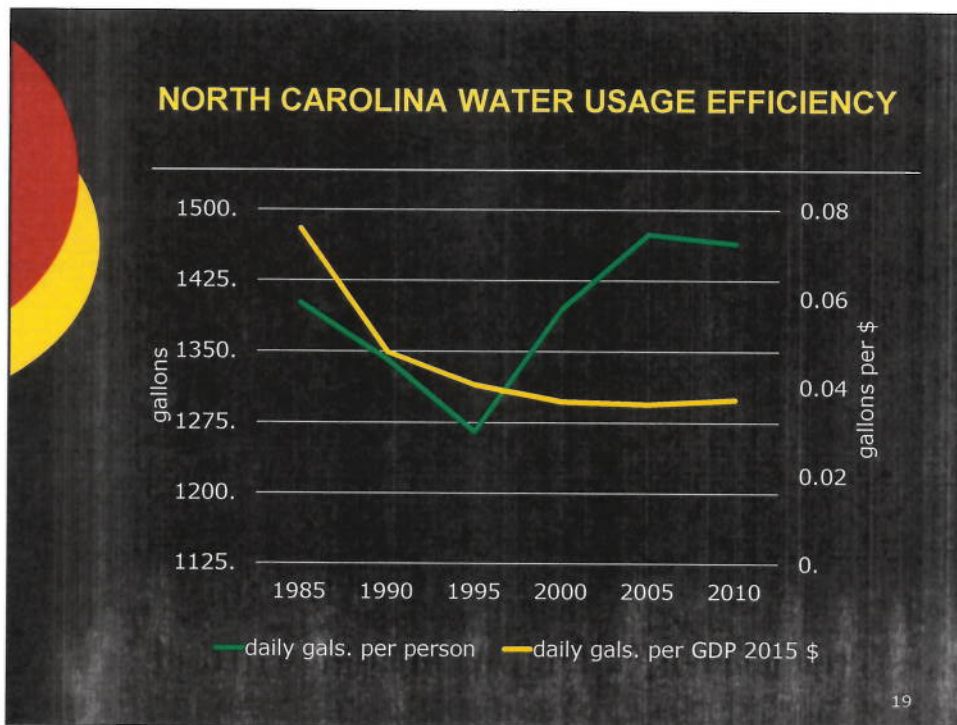


17

SEA INVASION



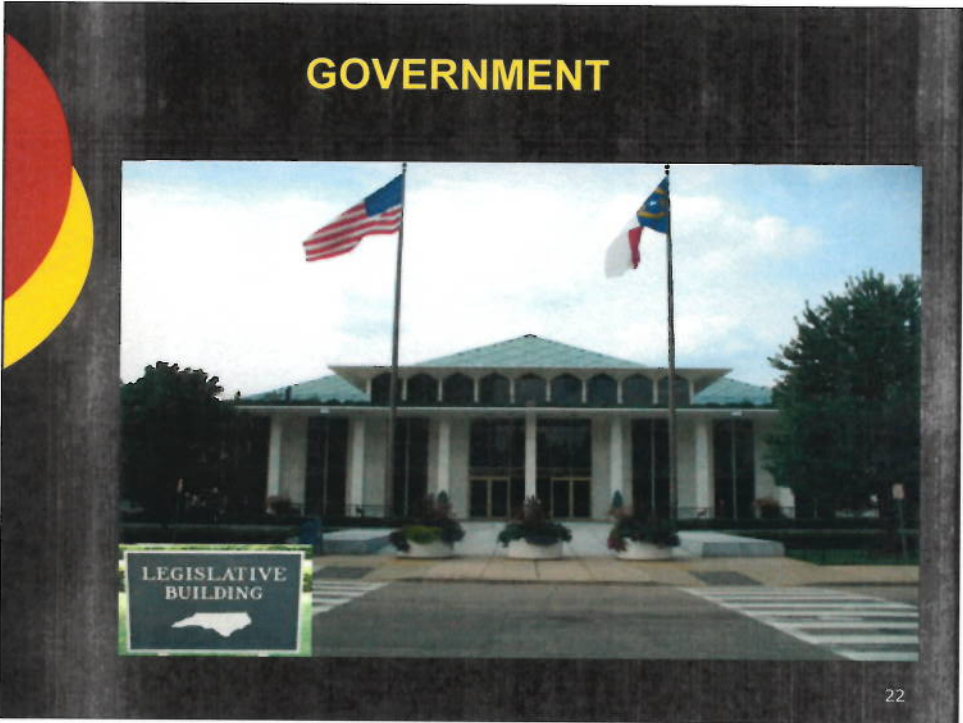
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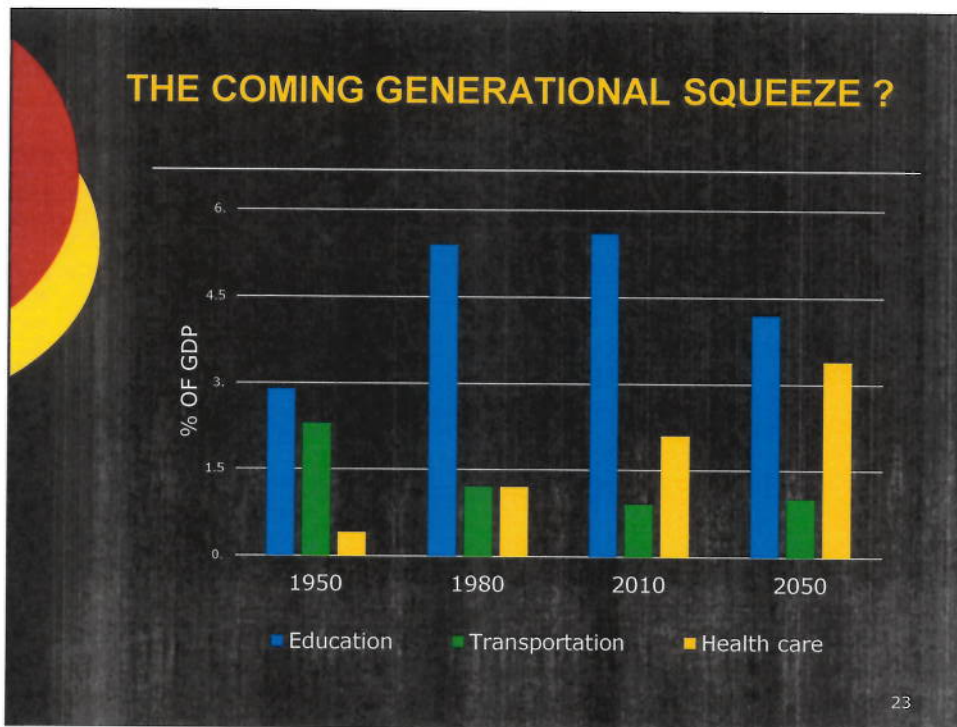


CURRENT AND FUTURE NC POWER SOURCES

Power Source	2014	2050
Coal	19.6%	15.7%
Nuclear	16.8%	12.6%
Oil	31.3%	34.6%
Natural Gas	18.0%	24.3%
Hydro	1.8%	1.5%
Renewable	6.1%	11.3%

21





WHAT IS ECONOMIC SUSTAINABILITY?

ECONOMIC DECISIONS
RECOGNIZING BOTH
BENEFITS AND **COSTS** TO THE
NATURAL ENVIRONMENT AND
TO HEALTHY COMMUNITIES
OF ACTIONS TAKEN

24

**A RELATIVELY RECENT CONCERN
RACHEL CARSON – SILENT SPRING, 1962**



IN OUR EARLY
HISTORY,
RESOURCES WERE
ABUNDANT AND
POPULATION WAS
SPARSE

25

**AS WE'VE ADDED PEOPLE AND
EXPANDED THE ECONOMY**



NATURAL RESOURCES
HAVE BEEN MORE
HEAVILY USED AND
DEPLETED, AND
ADVERSE IMPACTS OF
OUR ACTIVITIES HAVE
BECOME GREATER
("negative externalities")

26

WORRY THAT LIFE IS BECOMING UNSUSTAINABLE



GLOBAL WARMING
RISING SEA LEVELS
VOLATILE WEATHER
EXTINCT SPECIES
HEALTH CONCERNS
FOOD THREATS

27

NORTH CAROLINA IS AT THE CENTER OF THESE ISSUES – BECAUSE:



WE ARE A FAST-GROWING,
URBAN STATE,
WITH EXPANDING SUBURBS,
SHRINKING OPEN SPACES,
CONCENTRATED POLLUTION,
THREATENED WATER,
AND EXPOSED COASTLINES

28

HOW TO ADDRESS OUR SUSTAINABILITY ISSUES?



- CONTROL
- CAJOLE
- TECHNOLOGY

29

“CONTROL” POLICY




DIRECT GOVERNMENT POLICIES TO LIMIT POLLUTION

- * MPG STANDARDS
- * RESIDENTIAL STANDARDS
- * RENEWABLES MANDATES

30


“CAJOLE” POLICY **AKA: CARROT AND STICK**



- SUBSIDIZED RENEWABLE FUELS/VEHICLES
- CARBON FEES
- REFUNDABLE CARBON FEES

31


TECHNOLOGY 1



- RE-USED WATER
- DROUGHT RESISTANT PLANTS
- GRID-FREE RESIDENCES
- SMART CONSTRUCTION

32

TECHNOLOGY 2




COULD:

ON-DEMAND VEHICLES,
VIRTUALIZATION,
DRONE DELIVERY OF GOODS,
AND CYBER DELIVERY OF SERVICES

REDUCE VEHICLE
OWNERSHIP & COMMUTING ?

33

CONCLUSION

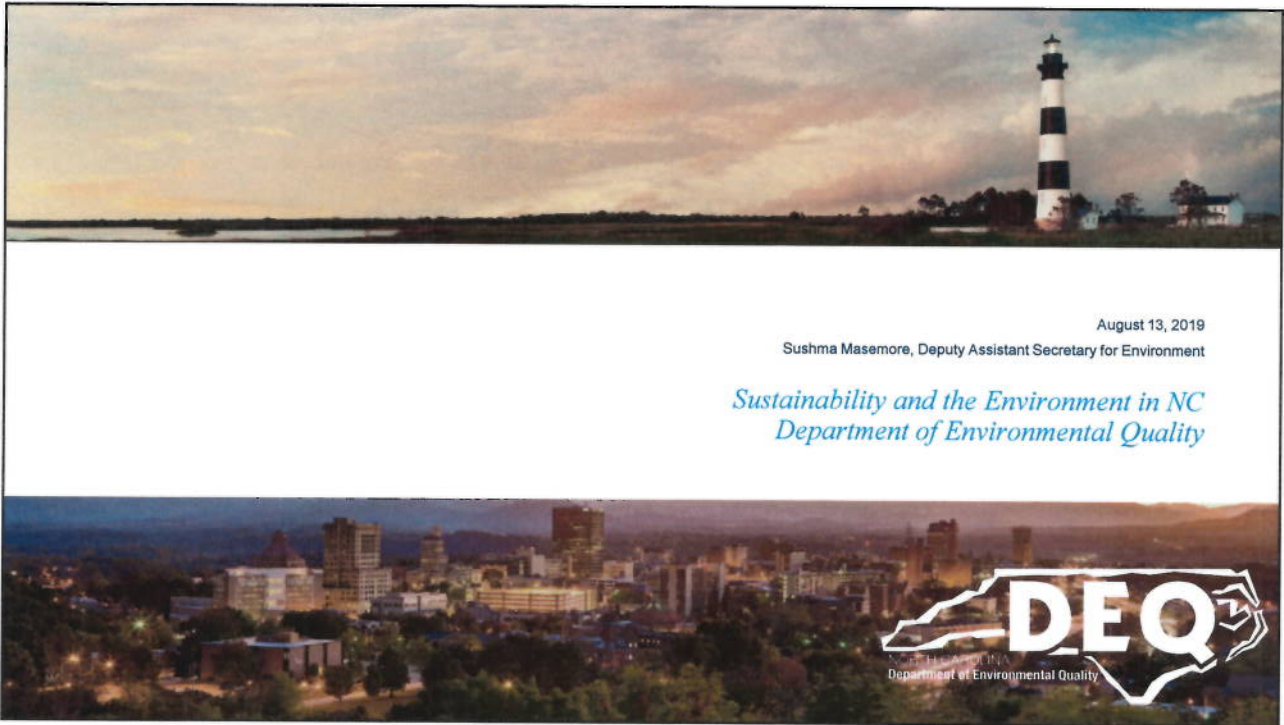


NORTH CAROLINA HAS "HAD
IT ALL" – NATURAL BEAUTY
AND ECONOMIC GROWTH


WILL THAT BE SUSTAINABLE?

34

Appendix B



DEQ Mission:
Providing science-based environmental
stewardship for the health and prosperity
of all North Carolinians



2



North Carolina's natural resources generate billions of dollars for the state's economy through tourism and recreation.

As we consider economic development, and the sustainability and growth of local communities, environmental questions often come first:

- Do people have access to clean and safe drinking water?
- What's the quality of the air?
- Are there issues of pollution?



3

Sustainability

- According to the Environmental Protection Agency:
 - *"Sustainability is based on a simple principle: **Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment.**"*
- The National Environmental Policy Act of 1970 committed the United States to sustainability, declaring it a national policy
 - *"to create and maintain conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations."*



4

The role of government in building the sustainable economy includes:

- Funding the basic **science** needed for renewable energy
- Steering private capital toward **investment** in renewable energy and other sustainable technologies
- Investing in sustainable **infrastructure** such as smart grids, electric vehicle charging stations, mass transit, waste management facilities, water filtration systems and sewage treatment systems
- **Regulating** land use and other private behaviors to minimize destruction of ecosystems
- And setting sustainability **goals** and guiding public and private stakeholders in that direction.

Steven Cohen, a professor at
Columbia University
School of International and Public Affairs



5

History of Sustainability in NC

- **1993** Governor Jim Hunt signed Executive Order No. 8, which directed state agencies to reduce solid waste, recycle and purchase recycled products.
- **April 1999** N.C. Division of Pollution Prevention and Environmental Assistance (now part of the Department of Environmental Quality) worked with the Governor's office to develop a state government environmental sustainability plan.
 - Thirteen state agencies developed their own sustainability plans the same year.
- **July 1999** Gov. Hunt signed an executive order directing state agencies to implement sustainable practices as part of normal operations, including recycling, minimizing environmental impacts in agency activities, and promoting energy conservation.
 - Legislation to purchase low-emission vehicles for state use and for reducing the commuting miles traveled by state employees.
 - Legislation requiring agencies and universities to develop energy management plans and reduce energy their consumption 30 percent by 2015, using fiscal year 2003/2004 as the base year.



6

Executive Order 80: North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy

The State of North Carolina will strive to accomplish the following by 2025:

- a. Reduce statewide greenhouse gas emissions to 40% below 2005 levels.
- b. Increase the number of registered, zero-emission vehicles (ZEVs) to at least 80,000.
- c. Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels.



Executive Order 80: North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy

Department of Environmental Quality

- **N.C. Clean Energy Plan** – encourage the increased utilization of clean energy technologies in the public and private sectors. **Due Oct. 1, 2019**
- **Comprehensive Energy, Water, and Utility Use Conservation Program** – update best practices and guidance to achieve 40% state buildings efficiency goal. **Due Feb. 1, 2019 and Dec. 1, 2019**
- **N.C. Climate Risk Assessment and Resiliency Plan** – provide a scientific assessment of current and projected climate impacts on North Carolina and prioritize effective resiliency strategies. **Due Mar. 1, 2020**
- **Greenhouse Gas Inventory** – prepare estimates of North Carolina's statewide net GHG footprint.

North Carolina's Sustainable Energy Future

- Today North Carolina has the highest concentration of smart grid companies in the world.
- We're second in the nation for installed solar capacity.
- We're the capital for data analytics.
- Overall there are nearly a thousand clean energy companies in North Carolina generating over \$6.4 billion in annual revenue for our state.
- North Carolina is in this position today because of the investments we made in higher education, and in research and development.
- Higher education has a role in the workforce and thought leadership for our energy future ?



9

Example Green Practices

- Sustainable Purchasing
- Electronics Recycling/Stewardship
- Transportation
- Packaging waste
- Waste Diversion
- Pollution Prevention
- Planting trees
- Raising Awareness

Reduce

Reuse

Recycle



10

Example Water Management Practices

- Water Conservation
- Landscaping
- Stormwater Management



11


Energy Related Practices

- Greenhouse gas emission reductions
- Energy efficiency
- Renewable energy
- Green Buildings
 - New construction and renovation
 - Building energy conservation, efficiency, and management
 - Water use efficiency and management, including stormwater management



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Appendix C




NCORR

NORTH CAROLINA OFFICE OF RECOVERY AND RESILIENCY

AMANDA MARTIN | DEPUTY CHIEF RESILIENCE OFFICER

SOCIAL EQUITY ASPECTS OF SUSTAINABILITY IN NORTH CAROLINA




Leading the state's efforts to rebuild smarter and stronger.

8/14/2019

SOCIAL EQUITY IN SUSTAINABILITY

1. Find the people



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2

SOCIAL EQUITY IN SUSTAINABILITY

2. Engage tensions



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SOCIAL EQUITY IN SUSTAINABILITY

Green Cities, Growing Cities, Just Cities?

*Urban Planning and the
Contradictions of Sustainable
Development*

Scott Campbell

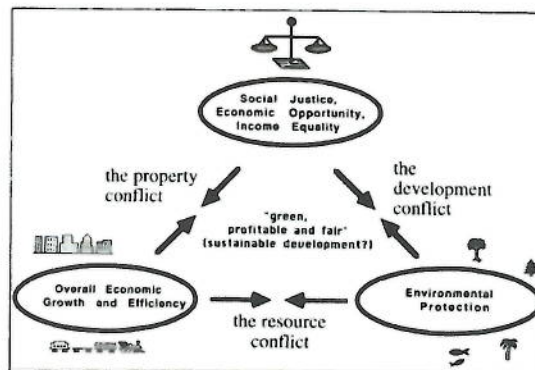


FIGURE 1. The triangle of conflicting goals for planning, and the three associated conflicts. Planners define themselves, implicitly, by where they stand on the triangle. The elusive ideal of sustainable development leads one to the center.



Leading the state's efforts to rebuild smarter and stronger.

SOCIAL EQUITY IN SUSTAINABILITY

Green Cities, Growing Cities, Just Cities?

*Urban Planning and the
Contradictions of Sustainable
Development*

Scott Campbell

“An alternative is to let holistic sustainable development be a long-range goal; it is a worthy one... But planners will confront **deep-seated conflicts among economic, social and environmental interests** that cannot be wished away through admittedly appealing images of a community in harmony with nature.”

[p. 304, emphasis my own]



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SOCIAL EQUITY IN SUSTAINABILITY

3. Create value (Make the pie bigger)



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SOCIAL EQUITY IN SUSTAINABILITY

4. Measure what you care about



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STRENGTHS: GROWING DIVERSITY

Racial/ethnic composition: North Carolina, 1980-2050

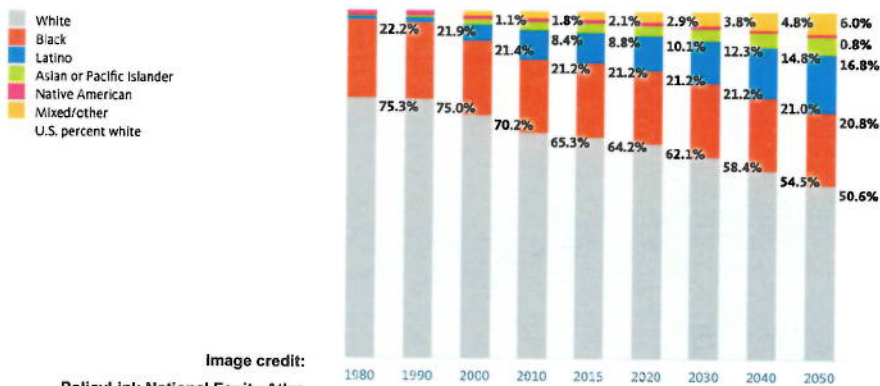


Image credit:
PolicyLink National Equity Atlas



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STRENGTHS: CIVIL RIGHTS ACTIVISM

History of civil rights activism and Black leadership



Image from NC DCR, courtesy of Ricky Stillely Photography



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STRENGTHS

And a few others...

- **Strong social networks and faith communities**
- **Strong economic growth in some areas**
- **Excellent public community college and university system**



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CHALLENGES: INCOME INEQUALITY

Earned income growth for full-time wage and salary workers: North Carolina, 1980-2015

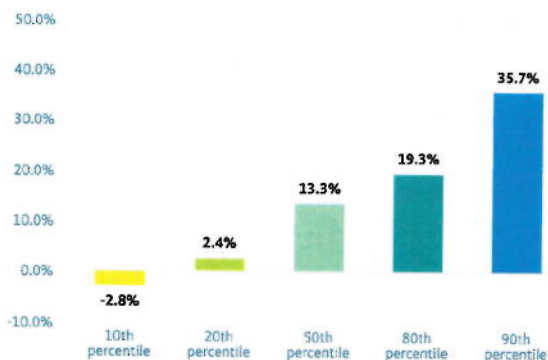


Image credit:
National Equity
Atlas, PolicyLink



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CHALLENGES: ECONOMIC MOBILITY

How likely it is for children whose parents are in the bottom 20 percent of the national income distribution to reach the top 20 percent of the income distribution?

- North Carolina is the third worst in the nation
- Charlotte is the absolute worst of 50 largest cities

Correlates

Income and racial segregation, Income inequality, K-12 education, Social capital, Family structure

Source: Chetty et al, 2014



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CHALLENGES: PERSISTENT POVERTY

North Carolina is the 10th hungriest state in the nation

Households by levels of food insecurity

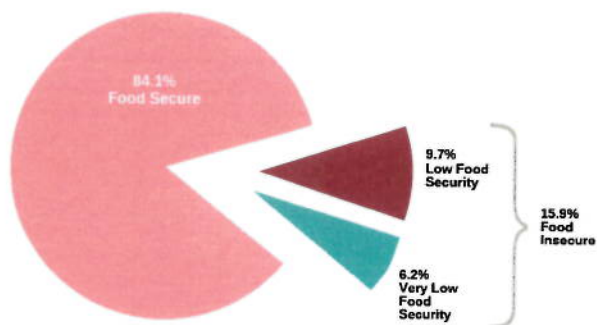


Image credit:
Interfaith Food Shuttle

SOURCE: USDA's 2015 Report on Food Insecurity, 3-year average (2013-2015)



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13

CHALLENGES: AFFORDABLE HOUSING

EXTREMELY LOW INCOME RENTER HOUSEHOLDS

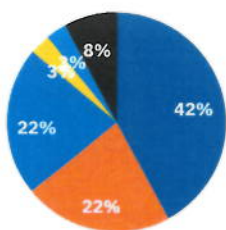
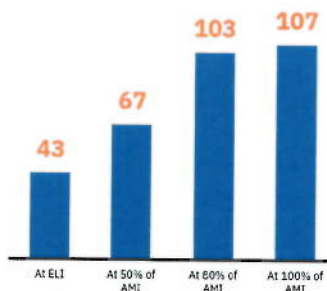


Image credit:
National Low Income Housing Coalition
Data Source:
ACS PUMS

■ In Labor Force ■ Disabled
■ Senior ■ School
■ Single Caregiver ■ Other

AFFORDABLE AND AVAILABLE HOMES PER 100 RENTER HOUSEHOLDS



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CHALLENGES

And a few others...

- **Persistent racism**
- **Health disparities**
- **Separate systems for different people**



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SOCIAL EQUITY IN SUSTAINABILITY

- 1. Find the people**
- 2. Engage tensions**
- 3. Create value**
- 4. Measure what you care about**



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THANK YOU

AMANDA MARTIN | AMANDA.MARTIN@NCDPS.GOV

17



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Appendix D

SEUSS Sustainable Urban Systems Presentation

Presented by:

Sustainable Urban Systems

Dr. Selima Sultana

Professor

Geography, Environment, and Sustainability

UNC Greensboro

Convergence Research Networks: An Overview

Dr. Jamie Russell

Director

Appalachian Energy Center

Appalachian State University

SEUSS CRN Proposal Diagrams

Dr. Greg Monty

Director

Center for Energy Research and Technology

NC A&T State University

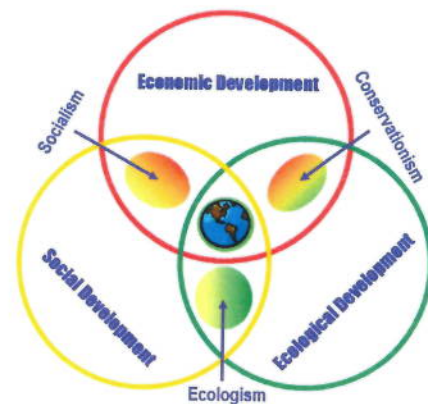
Sustainable Urban Systems: Next Generation Geographic Focus

Selima Sultana
 Professor and Director of Graduate Studies
 Department of Geography, Environment, & Sustainability
 UNC-Greensboro



What is Sustainability?

- “Meeting the needs of the current population, without infringing on the ability of future generations to meet their needs” (Brundtland et al., 1987)
- Sustainability encompasses a range of interconnected environmental, economic, and social issues
- “transforms structures and processes to measurably advance well-being of the planet” (NSF Report, 2018)



WHY URBAN SUSTAINABLE SYSTEMS?

CURRENT RESEARCH ON URBAN SUSTAINABILITY

- Focused on individual cities and communities
- Addressed transitions within single infrastructure sectors (e.g., water or energy or transportation)
- Focused on individual sustainability outcomes (e.g., low-carbon development or resilience)

LIMITATIONS WITH THIS APPROACH

- Worldwide majority people are concentrated in urban areas
- 82% of the U.S. population lives in urban areas and 90% by 2050 (U.S. Census Bureau, 2018)
- Cities are parts of urban areas, and their associated externalities are not always only their issues-- connected with broader urban systems



CITIES VS URBAN AREAS

URBAN AREAS (URA)

- A geographical area that include cities, towns, and suburbs embedded within built-in infrastructures by and for the well-being of people
- Areas outside of an URA consider as **Rural and hinterland**, which are affected by urban consumption and demands
- All these settlements have intertwined link

CITIES

- Dense clusters of people who are not directly connected to an agricultural lifestyle
- Dense cluster of all sorts of human activity and interaction
- Concentrations of capital, information, intellectual ferment and discoveries, and social movements



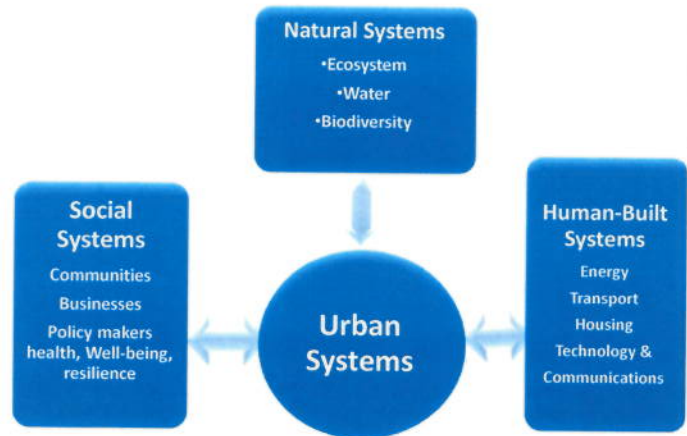
City of Greensboro VS Greensboro URA



All these areas are highly Interconnected

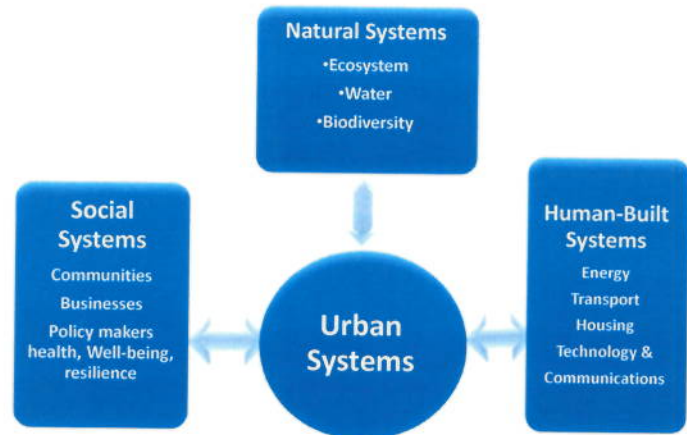
Complexity of Urban Systems

- Urban System is an interdependent set of urban settlements within a specified region
- Embedded within multi-scale interdependent social, engineered, and natural systems that impact human well-being across spatial and temporal scales (NSF Report, 2018)



What are Sustainable Urban Systems?

- An adoption of a geographic scope that incorporates **all these interconnected systems and people within and immediate vicinity of urban areas**
- Understanding their interactions and impacts at **multiscale**--regional and global scales
- Measuring **multiple sustainability outcomes**--environmental (resource consumption with environmental impact), economic (resource use efficiency and economic return), and social (social well-being and health)



Convergence Research Networks an Overview

Jamie Russell
Appalachian Energy Center / Appalachian State University

"a new type of thinking is essential if mankind is to survive"
Albert Einstein



Convergence Research and its Purpose

According to the National Science Foundation (NSF):

"Growing **Convergence Research** at the National Science Foundation (NSF) was identified in 2016 as one of 10 Big Ideas for Future NSF Investments."

<https://www.nsf.gov/od/oia/convergence>



Convergence Research and its Purpose

According to the National Academy of Sciences:

"convergence—the coming together of insights and approaches from originally distinct fields—will make fundamental contributions in our drive to provide creative solutions to the most difficult problems facing us as a society."

<https://www.nap.edu/read/18722>



Convergence Research and its Purpose

According to the National Science Foundation (NSF):

"Convergence research is a means of solving vexing research problems, in particular, complex problems focusing on societal needs. It entails integrating knowledge, methods, and expertise from different disciplines and forming novel frameworks to catalyze scientific discovery and innovation."

<https://www.nsf.gov/od/oia/convergence>



Convergence Research and its Purpose

According to the National Academy of Sciences:

"The concept of convergence....is meant to capture two closely related but distinct properties:

-the convergence of expertise necessary to address a set of research problems,

-and the formation of the web of partnerships involved in supporting such scientific investigations ."

<https://www.nap.edu/read/18722>



Convergence Research and its Purpose

NSF identifies Convergence Research as having two primary characteristics:

- Research driven by a specific and compelling problem.

Such as Sustainable Urban Systems...

- Deep integration across disciplines.

Such as the research network we are forming here...

<https://www.nsf.gov/od/oia/convergence>



Convergence Research Network Summary

To form a CRN you should:

- Identify a compelling problem
- Convene experts from the required disciplines and
- Form a network.. moving from soloed experts towards a web

We added one more requirement...



User Driven Research / Participatory Research

Developing research with the end-user... in mind and involved.



Who are the Stakeholders in our Network?

Municipalities / Government

Industry

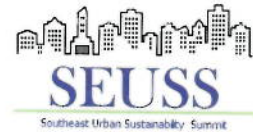
Nongovernmental Organizations

Academia



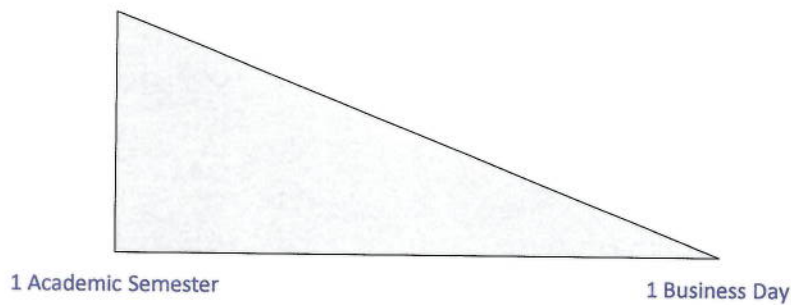
What are the Challenges to Collaboration?

Stakeholder Lexicon / Jargon



What are the Challenges to Collaboration?

Stakeholder Timescale / Urgency



What are the Challenges to Collaboration?

Stakeholder Frame of Reference / Organizational Culture



What are the Challenges to Collaboration?

Stakeholder Motivation / Reward System

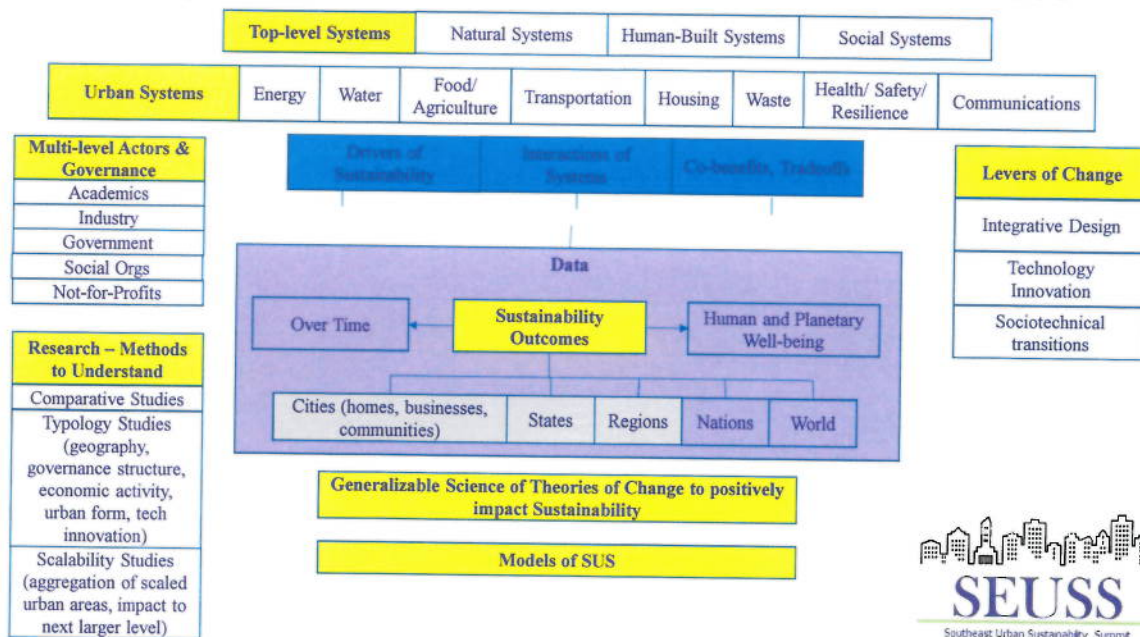


SEUSS CRN Proposal Diagrams


By Greg Monty
NCA&T, CERT



Key Features of Next-Generation SUS Science




What are Grand Challenges?




SDGs:
our societies'
Grand Challenges

Sustainable Development Goals, by UN WMO



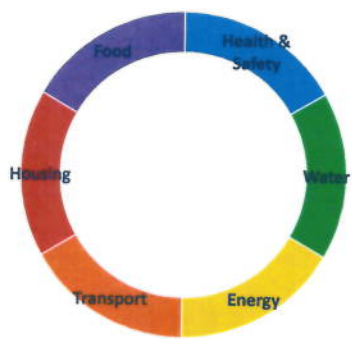
Grand-Challenges

Grand Challenges by Sector, by Loughborough University




What are Grand Challenges?


High impact but very difficult problems or initiatives whose solution involves expertise from several different disciplines.



Urban Systems by Sector



Stakeholder Groups



Breakout Session Round 1: Step 1

Identify Grand Challenges



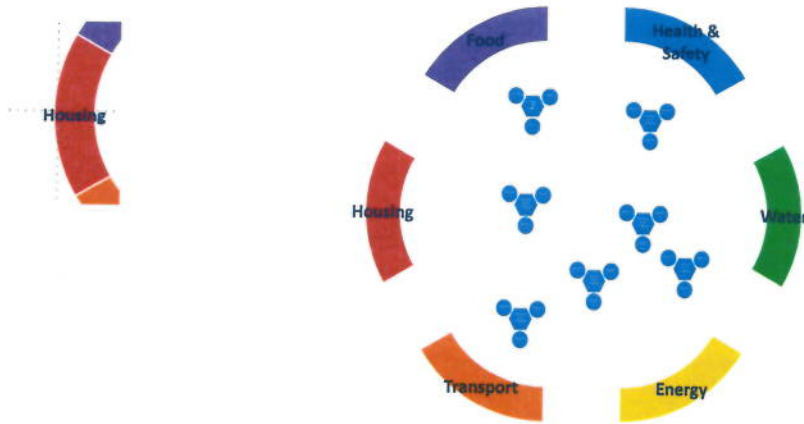
Breakout Session Round 1: Step 2

Identify the Barriers that stand in your way of solving each Grand Challenge

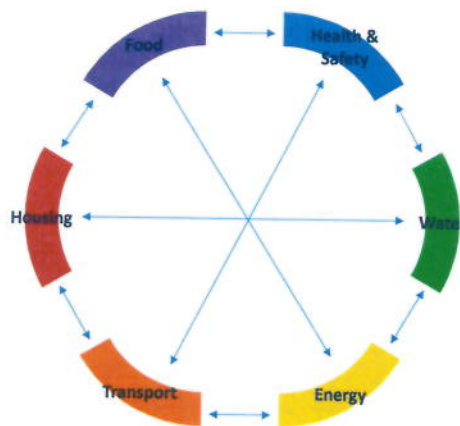


Breakout Session Round 1: Step 3

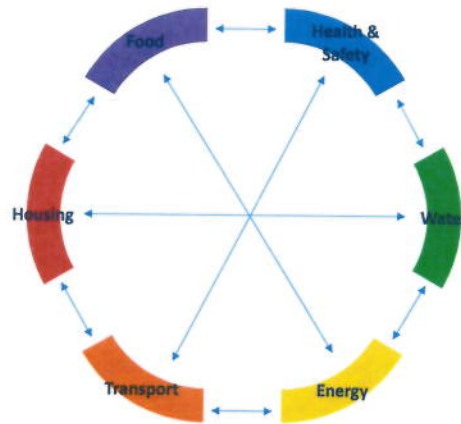
Identify any Overlaps with the other sectors



Breakout Session Round 2: Mix it Up...

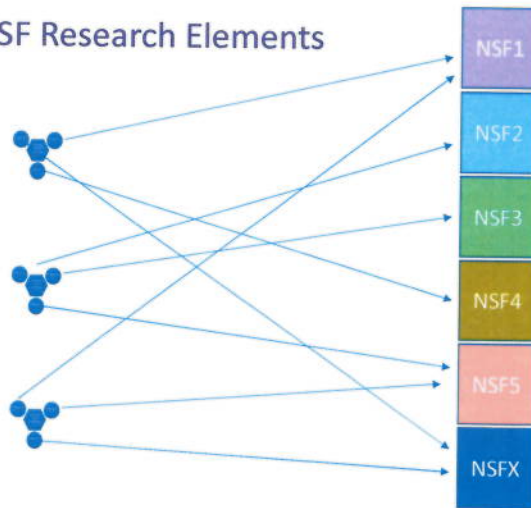


Breakout Session Round 3: Mix it Up AGAIN



Breakout Session Round 4 (Final Round)

Map Barriers onto NSF Research Elements



Appendix E

Cities Initiative



Background

In 2018, EDF launched the North Carolina Cities Initiative. The program was designed to support North Carolina local governments in reducing their greenhouse gas (GHG) emissions.

Current Participants

- Asheville
- Boone
- Buncombe County
- Canton
- Carrboro
- Cary
- Chapel Hill
- Charlotte
- Durham
- Durham County
- Greensboro
- High Country COG
- Highlands
- Hillsborough
- Kannapolis
- LRCOG
- Orange County
- Raleigh
- TJCOG
- Wilmington
- Winston Salem

Phase 1 Goal

Identify and prioritize **statewide** barriers to reducing GHG emissions and identify consensus action items that will reduce barriers and foster partnerships to enable faster and deeper GHG reductions.

Consensus Action Items

- Get additional locally-controlled revenue for transportation
- Adjust State Transportation Improvement Program (STIP) allocations
- Incorporate GHG scoring for state funded projects
- Develop a voluntary carbon credit tracking system
- Aggregate data access at a safe level to allow for program prioritization
- Create a utility billing platform that helps cities and customers understand energy use
- Allow for new renewable energy procurement options
- Increase speed and transparency of the interconnection process
- Address barriers to Commercial Property Assessed Clean Energy (C-PACE) in North Carolina
- Develop a local government supported green energy bank
- Improve energy impact of building codes
- Change makeup of the NC Building Code Council

Related Cities Initiative Activity

- Presented
 - NC Metro Mayors Association Annual Meeting
 - UNC Clean Tech Summit
 - Appalachian Energy Summit
- Inclusion in EO 80
- Cooper Administration Briefing
- Third Parties

Phase 2 Goal

Develop implementation goals and strategies for the consensus action items

Phase 2 Process

- A series of half-day roundtables held over two years. Started June 2019.
- Facilitated working and break out sessions
- Consensus Action Items prioritized by
 - Difficulty
 - Impact
 - Alignment with local goals
 - Timeliness

Current Work

- Adjust State Transportation Improvement Program (STIP) allocations
- Incorporate GHG scoring for state funded projects
- Develop a voluntary carbon credit tracking system
- Aggregate data access at a safe level to allow for program prioritization
- Allow for new renewable energy procurement options
- Develop a local government supported green energy bank
- Change makeup of the NC Building Code Council



Building Codes



Residential Energy Building Codes

Residential Buildings

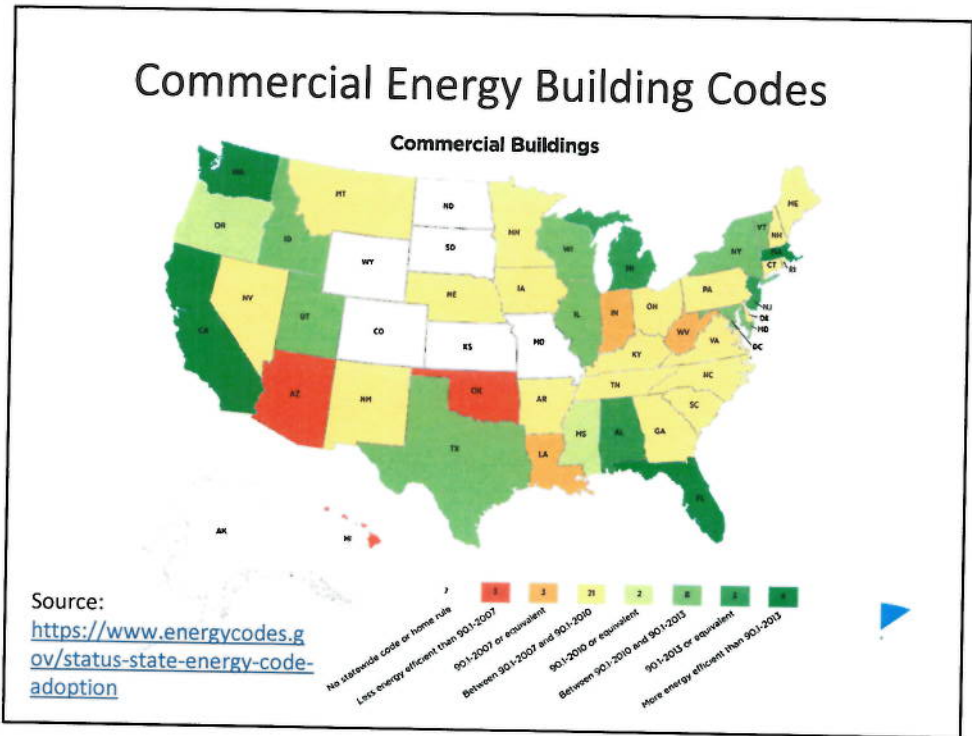


Source:
<https://www.energycodes.gov/status-state-energy-code-adoption>

Legend:
No statewide code or home rule
Less energy efficient than 2009 IECC
2009 IECC or equivalent
Between 2009 and 2012/2015 IECC
2012/2015 IECC or equivalent
More energy efficient than 2012/2015 IECC



Commercial Energy Building Codes



Building Codes

