College of Design, Construction and Planning

UF DCP Research Agenda-Setting White Paper

Resilient Built Environment

Workforce Development

Executive Summary:

The **Community-centered, Resilient, Integrated, Sustainable, and Educational Design (C- RISED)** project addresses the urgent need for resilience and sustainability in the built environment, which contributes over 32% of global energy use and 40% of greenhouse gas emissions [1,2]. By integrating cutting-edge research, innovative education, and community engagement, C-RISED establishes a comprehensive framework for mitigating and adapting to climate change impacts while advancing workforce development. The project aims to create a **multi-level educational pipeline** that introduces concepts of resilience and sustainability from K6-12 education to graduate studies and extends to mid-career professional development. C- RISED focuses on fostering community-centered, equitable solutions, ensuring that design practices meet real-world needs. Key objectives include embedding advanced research into higher education curricula, providing continuing education opportunities for professionals, and translating research into actionable strategies for resilient and sustainable design.

C-RISED employs diverse methods to achieve its goals, such as developing digital platforms for disseminating research, hosting professional conferences, and integrating Artificial Intelligence- driven tools such as Autodesk Generative Design into education and practice. It also prioritizes community partnerships to ground its initiatives in local realities, fostering equity and resilience. The project's **broader impacts** extend beyond education to include professional development, community engagement, and serving as a platform for nationally significant research grants. By advancing knowledge, fostering collaboration, and driving innovation, C-RISED lays the groundwork for a more sustainable, resilient built environment and a workforce equipped to meet the challenges of the 21st century.

WG Members:

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Lead: Ryan Sharston	Assistant Professor	School of Architecture, Rinker School of Construction Management, Florida Institute for the Built Environment Resilience	Academia
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Other members: Mary Jo Koroly	Director	UF Center for Precollegiate Education and Training	Academia
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Description of the Problem

The built environment stands as one of the most significant contributors to global environmental challenges, accounting for 32% of global energy use and nearly 40% of greenhouse gas (GHG) emissions [1,2]. This sector encompasses diverse human-made

structures, such as residential, commercial, and industrial buildings, as well as urban infrastructure. These structures demand vast amounts of energy for operations like lighting, heating, and cooling, all of which exacerbate global climate change and strain finite natural resources. The accelerating impacts of climate change, including hurricanes, floods, wildfires, and heatwaves, expose the built environment's vulnerabilities. Current built environment practices frequently fail to incorporate resilience and adaptability, leaving structures and systems unable to withstand or recover from such disasters. Furthermore, these practices often neglect the unique needs of vulnerable populations, further exacerbating societal inequities in the face of climate-related risks.

A major gap in existing approaches is the lack of integration between sustainability, resilience, and community engagement. Sustainability efforts typically focus on minimizing energy consumption and reducing carbon footprints, while resilience initiatives aim to improve a structure's ability to endure and recover from extreme events. Rarely do these approaches intersect in ways that address the multifaceted realities of the communities most affected by climate change. This disconnect limits the capacity of the built environment to mitigate climate risks while promoting long-term equity and environmental sustainability. Additionally, educational systems and professional training programs within built environment disciplines— architecture, urban planning, and construction management—often lag in integrating state-of- the-art research and innovative practices. While academic and industrial research has introduced groundbreaking technologies and methodologies, the translation of these findings into practical applications is often fragmented and slow. This gap leaves graduates entering the workforce and mid-career professionals seeking to adapt without the tools or knowledge required to design and implement sustainable, resilient solutions.

The problem is further compounded by the lack of early educational exposure to sustainability and resilience principles. K6-12 education systems rarely introduce these critical concepts, missing an opportunity to inspire and prepare future generations of architects, engineers, and planners to tackle the challenges of a changing climate. The absence of early engagement hinders the creation of a robust pipeline for future professionals in the built environment fields.

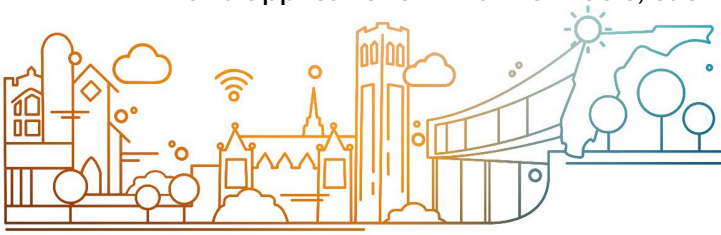
Key Research Areas / Priorities

The C-RISED project takes a comprehensive approach to bridging the gaps between academia, industry, and community needs in addressing sustainability and resilience. By focusing on strategic research areas and priorities, the project advances knowledge and fosters practical, innovative solutions tailored to educational and professional contexts.

A **primary focus** of the project is developing a multi-level educational pipeline that spans the full spectrum of learning and career development, from early education through mid-career professional training. In K6-12 education, programs will introduce foundational concepts of sustainability and resilience through engaging, hands-on activities such as interactive science fairs and experiments. Teacher training workshops will equip educators with the resources and knowledge necessary to integrate these principles into their classrooms. The aim is to ignite curiosity and foster early interest in built environment careers among young students, laying the groundwork for future generations.

Higher education initiatives will build on this foundation by embedding cutting-edge research into undergraduate and graduate curricula. Courses will incorporate practical applications of resilience metrics, sustainable technologies, and adaptive design, ensuring students gain both theoretical knowledge and hands-on experience. Through experiential learning opportunities, such as internships and field-based projects, students will bridge the gap between academic research and industry practice, emerging as well-prepared professionals ready to tackle evolving challenges in the built environment. Continuing education for mid-career professionals is another priority of C-RISED. The project will offer workshops, specialty conferences, and modular courses that address specific knowledge gaps and emphasize interdisciplinary collaboration. These programs will cater to professionals transitioning into built environment disciplines or seeking to advance within their current roles. By integrating the latest advancements in resilience and sustainability, these initiatives will foster lifelong learning and ensure that professionals remain competitive and capable of addressing emerging climate challenges.

The translation of research into actionable strategies is another critical focus of the project. By leveraging advanced technologies such as artificial intelligence and computer simulations, C- RISED seeks to bridge the divide between academic findings and real-world applications. AI- driven tools, such as Autodesk Generative Design, will enable users



to optimize built environment designs for both resilience and sustainability. Integrating these tools into educational programs will give students and professionals valuable hands-on experience with technologies shaping the future of the built environment. Field testing and computer simulations will further validate these strategies, ensuring they are both effective and applicable in diverse contexts. Community engagement forms the backbone of C-RISED's approach to addressing equity and inclusivity in the built environment. Recognizing that effective design must reflect the needs and priorities of the populations it serves, the project emphasizes participatory processes that involve local stakeholders such as schools, city councils, and community-based organizations. Collaborative planning workshops and forums will ensure that communities have a voice in shaping resilience and sustainability initiatives. Special attention will be given to underserved and vulnerable populations, addressing their specific challenges and promoting equity in design practices.

Workforce development is another essential priority. C-RISED aims to cultivate a highly skilled workforce capable of tackling climate-related challenges through interdisciplinary collaboration and advanced training. By bringing together architects, urban planners, engineers, and other professionals, the project fosters integrated solutions that balance technical innovation, social equity, and environmental sustainability. Career advancement programs will create pathways for professionals to transition into or advance within built environment fields, emphasizing resilience and sustainability as core competencies. Finally, the project will serve as a platform for broader impacts by supporting faculty and researchers applying for competitive grants. Through its comprehensive framework, C-RISED will assist applicants in demonstrating the societal relevance of their research, enhancing their ability to secure funding. Digital platforms and online tools will also play a pivotal role in disseminating research findings and curricular materials, ensuring that cutting-edge knowledge is accessible to a global audience.

Primary Research Question

To address these challenges and priorities, the C-RISED project investigates the following key research questions:

1. **How can the principles of resilience and sustainability be effectively introduced into K6- 12 education?**

- What types of hands-on activities and curricular materials are most effective in engaging younger students?
- How can teacher training programs be designed to equip educators with the tools needed to integrate these principles into their classrooms?

2. **What are the best methods for translating cutting-edge research into undergraduate and graduate curricula?**
   - How can advanced technologies, such as AI-driven design tools, be integrated into university programs?
   - What experiential learning opportunities can bridge the gap between academic research and real-world practice?
3. **What strategies are most effective for engaging communities in the design process?**
   - How can community input be incorporated into resilience and sustainability initiatives?
   - What are the specific needs and challenges faced by vulnerable populations, and how can these be addressed through design?
4. **What are the barriers to professional development in resilience and sustainability, and how can these be overcome?**
   - What types of training programs are most effective for mid-career professionals transitioning into the built environment field?
   - How can interdisciplinary collaboration be fostered to develop integrated solutions?
5. **How can research findings be effectively disseminated to maximize their impact?**
   - What role can digital platforms and online tools play in knowledge dissemination?
   - How can professional conferences and knowledge exchange events be structured to foster collaboration and innovation?

Solutions and Methodological Considerations

The Community-centered, Resilient, Integrated, Sustainable, and Educational Design (C-RISED) project provides a thorough and innovative framework for tackling the pressing challenges of the built environment. By integrating advanced research, fostering community participation, reforming education, and building workforce capacity, the project seeks to address critical issues related to sustainability, resilience, and equity. Through a multifaceted approach, C-RISED aims to implement impactful solutions guided by robust methodologies that ensure effectiveness, inclusivity, and scalability.

Proposed Solutions

A core focus of C-RISED is developing an educational pipeline that supports workforce development across all stages of academic and professional growth. This begins with K6-12 education, where foundational concepts of resilience and sustainability are introduced. Programs such as science fairs, teacher training workshops, and summer camps will engage students through hands-on activities and real-world problem-solving exercises. These initiatives are designed to foster early interest in the built environment, laying the foundation for a continuous stream of motivated individuals entering the fields of architecture, engineering, and urban planning. In higher education, the project emphasizes embedding advanced research into undergraduate and graduate curricula. Students will acquire practical skills in critical areas such as resilience metrics, adaptive design, and sustainable technologies. Field-based projects and internships will provide experiential learning opportunities, bridging the gap between academia and industry and preparing students to address real-world challenges with cutting-edge knowledge and tools.

For mid-career professionals, C-RISED will offer tailored professional development opportunities, including workshops, modular training courses, and specialty conferences. These programs will emphasize lifelong learning, fostering interdisciplinary collaboration among architects, engineers, urban planners, and other professionals. By equipping individuals with the knowledge and skills needed to advance their careers or transition into new roles, the project ensures that the workforce remains agile and capable of addressing the evolving demands of the built environment. Another critical solution proposed by C-RISED is the effective translation of academic research into practical strategies. Advanced technologies will play a pivotal role in achieving this goal. Tools such as Autodesk Generative Design in Fusion 360 will enable users to explore optimized built environment designs that prioritize sustainability and resilience. By incorporating these technologies into education and professional practice, C-RISED ensures that emerging innovations are leveraged to address real-world challenges effectively.

Simulation tools and field testing will further support research translation by developing and validating design strategies. Simulations will model the impacts of extreme weather events on built environment performance, while field testing will ensure that theoretical solutions are applicable and effective in diverse contexts. Additionally, data analytics will

be employed to assess the performance of sustainable and resilient design strategies, providing valuable insights that inform iterative improvements and the development of best practices. Community- centered design is another cornerstone of C-RISED. Recognizing the importance of addressing local needs, the project emphasizes participatory processes that actively involve stakeholders such as non-profit organizations, schools, and city councils. Workshops and forums will enable community members to provide input on design priorities and challenges, ensuring that their voices are heard and incorporated into decision-making. Special attention will be given to underserved communities, with a focus on equity-centered interventions such as affordable

housing solutions and public spaces that foster social cohesion and safety. C-RISED also prioritizes cultural relevance by working with local stakeholders to align design solutions with community values and priorities, fostering trust and enhancing the long-term success of interventions. Interdisciplinary collaboration is integral to C-RISED's approach. The complexity of challenges in the built environment requires the integration of expertise from multiple disciplines, including architecture, engineering, urban planning, and the social sciences.

Collaborative research projects will bring together faculty and researchers from diverse fields to develop solutions that address sustainability, resilience, and equity comprehensively. Cross- disciplinary education will expose students to varied perspectives, preparing them to tackle complex problems with integrated approaches. Partnerships with industry leaders will ensure that educational programs and research initiatives remain aligned with the latest trends and practical needs, strengthening the link between academia and professional practice. To maximize its reach and impact, C-RISED will leverage digital platforms for knowledge dissemination. Online learning modules will host courses, instructional materials, and training programs, making them accessible to students, educators, and professionals worldwide.

Knowledge-sharing portals will provide access to case studies, research findings, and best practices, fostering collaboration among stakeholders. Virtual conferences and webinars will create additional opportunities for knowledge exchange, enabling academics, industry professionals, and community members to connect and share insights.

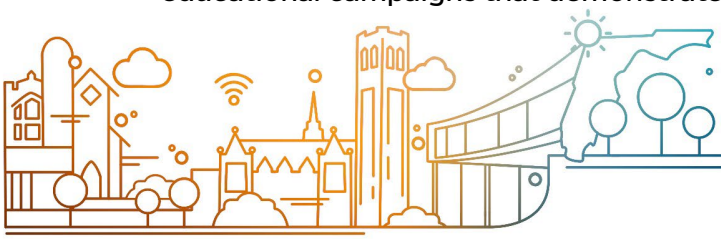
Methodological Considerations

The successful implementation of C-RISED's solutions depends on rigorous and inclusive methodologies that ensure relevance and adaptability. A combination of quantitative and qualitative research methods will be employed to address the multifaceted challenges of sustainability and resilience. Quantitative metrics, such as energy efficiency, carbon reduction, and built environment performance under stress, will evaluate the technical effectiveness of design strategies. These measurements will be complemented by qualitative insights gathered through community feedback, stakeholder interviews, and case studies, providing a deeper understanding of the social and cultural dimensions of resilience and sustainability.

C-RISED will adopt an iterative approach to design and implementation, allowing for continuous improvement and refinement. Prototyping will serve as an initial stage, enabling the development and testing of design solutions in controlled environments. These prototypes will undergo rigorous assessment to evaluate their feasibility and effectiveness. Solutions that demonstrate promise will then be deployed in real-world settings, where they will be monitored and evaluated to ensure their success and scalability. This iterative process ensures that interventions remain adaptable to evolving conditions and stakeholder needs. Inclusive stakeholder engagement is a key methodological consideration for C-RISED. The project will prioritize the representation of marginalized and underserved populations in workshops and forums, ensuring that their perspectives and needs are reflected in design solutions. Regular consultations with industry professionals will also be conducted to align interventions with practical constraints and opportunities. Technological tools will be leveraged to scale C-RISED's initiatives and enhance their accessibility. Predictive analytics and machine learning algorithms will be used to identify patterns and inform decision-making, while virtual reality simulations will provide immersive environments for testing and refining design solutions. These tools will not only enhance the precision and impact of interventions but also ensure that C-RISED remains at the forefront of innovation in the built environment.

Anticipated Challenges and Mitigation Strategies

Despite its comprehensive approach, C-RISED acknowledges the potential challenges that may arise during implementation. Resistance to change among stakeholders, for example, could hinder the adoption of proposed solutions. To address this, the project will conduct educational campaigns that demonstrate the tangible benefits of interventions, fostering



buy-in and support. Limited resources for implementation in underserved communities represent another challenge. C-RISED will mitigate this by securing funding from grants, partnerships, and philanthropic organizations to offset costs. Technological barriers, such as limited access to advanced tools, will be addressed through the development of low-cost alternatives and targeted training programs that build local capacity.

WG's Strengths, Weaknesses, Opportunities, and Challenges:

Strengths	• **Comprehensive Educational Pipeline:** Spanning K6-12, undergraduate, graduate, and professional development levels, ensuring inclusivity and lifelong learning. • **Interdisciplinary Collaboration:** Strong integration of architecture, engineering, urban planning, and social sciences for holistic solutions. • **Advanced Technological Integration:** Utilizes AI tools like Autodesk Generative Design and simulation models to address real-world challenges. • **Community-Centered Focus:** Emphasis on participatory design processes that ensure equity and cultural relevance. • **Global Knowledge Dissemination:** Use of digital platforms and online repositories for broad accessibility and impact.	• **Limited Early Adoption:** Challenges in introducing resilience and sustainability concepts effectively in K6-12 education. • **Resource Dependency:** Heavy reliance on external funding for implementing advanced technologies in underserved areas. • **Translation Gap:** Potential delays in converting cutting-edge research into practical applications due to fragmented processes. • **Stakeholder Resistance:** Hesitation from some industry or community groups to adopt innovative solutions or change established practices. • **Scalability Barriers:** Difficulty in ensuring all interventions are universally scalable across diverse geographic and socio economic contexts.	Weakness
Opportu...	• **Workforce Development:** Addressing workforce gaps in sustainability and resilience	• **Technological Access:** Ensuring underserved regions have the infrastructure and training needed to utilize advanced tools.	Challeng...

	through targeted training for mid- career professionals. • **Emerging Technologies:** Leveraging advancements in AI, data analytics, and VR for innovative design and educational methodologies. • **Grant Support and Collaboration:** Opportunity to secure funding and collaborate with organizations like NSF, NIH, and community-based partners. • **Global Impact Potential:** Establishing scalable and replicable models that can influence international sustainable design standards. • **Equity and Inclusion Focus:** Positioning equity-centered interventions as a model for addressing underserved communities' specific needs.	• **Educational Integration:** Overcoming systemic inertia in incorporating resilience and sustainability topics into existing curricula. • **Climate Complexity:** Adapting solutions to varied climate risks and evolving environmental conditions. • **Community Trust:** Building trust and ensuring genuine engagement with marginalized populations • **Long-Term Sustainability:** Maintaining momentum and funding over extended project timelines for lasting impact.

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