A framework for the co-benefits and trade-offs of resilience & sustainability certification programs

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ABSTRACT: Although concepts of resiliency and sustainability have long been tenets within the culture of design, their modern classification, measurement, and codification in the late 20th and early 21st century are fiercely debated. The need to reduce greenhouse gas (GHG) emissions and mitigate the impacts of global climate change influence current debates around the ways in which to operationalize sustainability and resilience within the built environment. This debate contributes to the confounding relationship between the consensus of 'sustainability' (i.e. carbon reduction) and the myriad domains of 'resilience' for designers, which include ecosystems, cities, communities, and individual buildings. The clarity of this debate is further attenuated in the variety of outcomes it seeks, the timescales in which it operates, and the necessary tradeoffs inherent in the process. While sustainability is concerned with resource use and the "carrying capacity of the earth" (Moffatt 2014), increases in manmade and natural disasters have focused attention on how design professionals evaluate both building's impact on the environment (sustainability) and the environment's impact on building (resilience). This paper proposes a framework for describing the synergies and discords that occur between several 'resilience' and 'sustainability' building certification programs (BCP). The evolution of various concepts of resilience are briefly explored and used to later inform this framework. Several BCPs are cited within this framework. A matrix showing the relationships between multiple green building rating systems and resilience rating systems is used to incorporate the interpretations of resilience cited in this paper. This comparison includes the rating system origin, application, and range of implementation as it considers resilience scholarship. The table aims to identify the problems, objectives, and co-benefits of various green building rating criteria and resilience criteria. Comparing several rating systems, the gaps and overlapping objectives in each system are identified as they relate to 'sustainability' or 'resiliency' outcomes.

KEYWORDS: Resilience, Sustainability, Adaptation, Vulnerability, Building Certification Programs

INTRODUCTION

Existing metrics for sustainability and emergent metrics for resiliency in architecture must seek a convergence considering carbon reduction goals now being set by governments (e.g. USA, EU) and municipalities (e.g. New York, Chicago) and because of the increasing impacts of rapid global climate change (hurricanes, droughts, and heatwaves). These considerations force an examination of how sustainability and resilience are operationalized and practiced by design and engineering professionals. However, the relatively narrow focus and long view of sustainable building practices are divergent to the immediacy of risk and the shorter temporal dimensions of resiliency. A broader framework for converging sustainability and resilience paradigms is necessary to improve design inquiry around risk, resilience, and sustainability.

A few key questions are in focus: How do existing voluntary sustainability and resilience certification programs - referred to here as building certification programs (BCPs) - address issues of risk, resiliency, and resiliency's closely related concept adaptation?; do current BCPs address emerging issues around resilience?; do building code cycles (every three-years), their voluntary adoption by states, and voluntary BCP's provide the right amount of flexibility to reduce GHG emissions and decrease risk?; and, do efforts to increase energy-efficiency and design optimization provide a cogent foundation for resilient buildings given variability in climate and weather? The comparisons made in this paper suggest that practical synergies exist between voluntary sustainability and resiliency metrics as they are defined in the various BCPs. However, the benefit to which more specificity is given on performance criteria (under normal operating conditions and under various disturbances) is subject to further investigation. The aim of this paper is to advance the modes of inquiry into sustainability, resilience, and adaptation by organizing various programs under a common framework

1.0. SUSTAINABILITY'S RELATION TO RESILIENCE

Scholarship on resilience and adaptation has expanded in the last half-century. The modern concept of resilience, that examines a system's behavior under stress, is largely credited to ecologist C. S. Holling. This definition of resilience, beginning in the 1970s, marks a change in thinking regarding disaster response, capacity building, and coping strategies (Holling 1973). Holling's systems theory and the non-equilibrium understanding of ecology and environment evolved alongside emerging notions of sustainability and energy efficiency in the 1970s. Today, Holling's work still provides the initial frameworks for resilience and a foundation upon which to view resilience and disaster risk reduction within the built environment. Based on this scholarship and later iterations, we begin with the notion of "[a stable system's tendency] to return to a position of equilibrium when disturbed" and how quickly it can return to a predefined "stable state" (Ludwig et al. 1996) provides the foundational idea of resilience. Another more detailed interpretation of resilience, as defined by the United Nations International Strategy for Disaster Reduction (UNSDR 2009, p. 24), is:

> [the] ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and function".

With mutable definitions of resilience as a result of shifting from ecological to social contexts, the concept of resilience has "blurred boundaries of meanings" rather than provided a straightforward definition (Davidson et al. 2016). Whatever the specific definition or application to date, the concept of resilience has been most useful as a "boundary object" which has helped communicate it across disciplines. A "boundary object" is "malleable" in nature, allowing it to be adopted by diverse disciplines and stakeholders (Brand and Jax 2007). Although increasingly more common in the lexicon of design professionals, the need to operationalize resilience in a meaningful way within the built environment requires an understanding of its conceptual basis as a "boundary object" as well as a more precise application and agreement on discipline-specific language and metrics pertinent to buildings and infrastructure (Davidson et al. 2016). The subset "engineering resilience", which recognizes a return to a single stable-state after a disturbance (Holling 1996), focuses on 'return-time-recovery' to a single operating state as the most critical attribute (Gunderson 2000, Hu 2018). The National Academy of Science (NAS) expands on this concept of resilience through a timeline that describes a system's capacity to "plan for, absorb, recover, and adapt" to disturbances over time. A system engineered for resilience resists (i.e. absorbs disturbances), recovers (i.e. rebounds within a desirable timeframe), adapts (learns, anticipates, operates flexibly, and continually changes), and hopefully transforms (to restore and/or improve upon a system's critical functions) (Folke et al. 2010). Critical functionality under various conditions is critical to this timeline (Angeler et al. 2016). And one must consider multiple outcomes, including diminished performance in the longer term (Ayyub et al. 2014).

It is important then to think about "sustainability" and "resilience" as complementary concepts. Both concepts, as they relate to the built environment, propose outcomes for long-term viability. The distinction is that, while sustainability might consider how a building draws on resources and impacts the environment, resilience addresses how a building responds to environmental impacts exerted upon it. The impetus of resilience as a paradigm for today's design professionals is the introduction of risk-assessment as a fundamental principle of sustainable design. A building, or any other asset, cannot by definition be sustainable if it does not incorporate risk mitigation, economic stability, community, and their interdependent relationships to the city as a vital network in short- and long-term timeframes (Tobin 1999, Asprone et al. 2014, Rose 2014). Therefore, when pursuing sustainability, all relatable direct and indirect factors from present and future must be considered.

2.0. SUSTAINABILITY, RESILIENCE, AND ADAPTATION

Modes of urban development in the United States have significantly changed in the past several decades. In terms of [sustainable] environmental planning, before the 1980s frameworks associated with "suitability" were based on matching characteristics of location, land use and type of design (Hill 2016). Since then, the focus of urban development has evolved toward "sustainable development" and later "ecological urbanism" and "landscape urbanism" which attempt to incorporate temporal patterns of resource use and availability in addition to the design of spatial patterns and functional production of development (Mostafavi 2010, Waldheim 2006). Most recently, the concepts of "resilience" and "adaptation" are being incorporated into the literature (Chelleri et al. 2015, Hill 2015). According to Kristina Hill, the shift from sustainability to resilience is the result of isolated [shock] events like storms and flooding rather than incremental [creeping] trends such as higher sea levels and warmer winters attributable to climate change (Hill 2015). Hill posits that the evolution from sustainability to resilience to adaptation represents a paradigm shift in today's urban planning efforts which are beginning to consider the unprecedented environmental and social changes contemporary cities are experiencing. In this regard, instead of existing as a desirable end-state, resilience is positioned as a "boundary object" that connects the longer temporal scales of both sustainability and adaptation.

Taken in isolation, "sustainability" as it relates directly to resilience has been problematic for architects and designers because of 'sustainability's narrow (positivistic) value system and timescale, and despite ever-evolving metrics, as a single value system sustainability still remains dependent on often erroneously defined boundary conditions (Reese 2009, Moffatt 2014). While environmental drivers exist as the main focus of 'sustainable' design, social, economic, and institutional metrics are bourgeoning principles of green building rating systems (Doan et al. 2017) However, it is the increased complexity and dynamism of 'resilience' that contributes to the difficulty of evaluating it in such a reductive manner. The context of place, the context of problem, and the absence of absolute-good are the driving issues behind this. Unlike the generally positive attributes of green building rating systems like LEED®, BREEAM, and others, 'resilience' requires a more nuanced approach due to the inherent trade-offs by definition. A building can be resilient against one perturbation, but not necessarily resilient to another, and increased resilience to one disturbance might result in decreased resilience to another. For example, locating sensitive materials or operations at the basement level of a building to increase resilience against criminal or terrorist attack makes these materials or operations more vulnerable to environmental shocks like flooding (Reference manual to mitigate potential terrorist attacks against buildings 2011). Additionally, tactical decisions at the site and building scale may inhibit more appropriate order of magnitude decisions at the urban or regional scale (Meerow et al. 2016). This, again, speaks to the importance of trade-offs when assessing risk, the difficulty of establishing "no-regret" adaptation policies, and the critical importance of a systems-based approach when attempting to operationalize resilience within the built environment (Preston et al. 2013). Asking - resilience for whom, for what, for when, for where, and why? - is critical (Meerow et al. 2016). With resilience defined as a desirable state, one must ask 'who defines the state of resilience?'. Asking 'resilience for when?' must determine a focus on short-term shocks (e.g. severe weather or storm events) or long-term "creeping" stressors (e.g. drought) and requires an examination of timescales and the desired return to time and to equilibrium (Miller et al. 2010).

This contextualization is precisely what describes the importance of conceptualizing resilience as a modifier to sustainability and a function of adaptation. For the building industry, hazards, risks, and vulnerabilities vary from place to place, and design priority must focus on both imminent hazards and for general adaptive capacity (Meerow et al. 2016). Expanding on

Meerow's definition of urban resilience, optimizing for specific resilience outcomes with the co-benefits of general sustainability goals can build the 'adaptive capacity' of a building, organization, or individual (Keenan 2015). This is perhaps the most salient balance of resilience and sustainability moving forward.

Figure 1 attempts to diagram and better understand these dynamics. The interventions (and outcomes) of sustainability, resilience, and adaptation operate on different timescales. Sustainability metrics largely aim to reduce greenhouse gas emissions by increasing energy efficiency, reducing resource consumption to address the root cause of climate change, which is located the farthest point upstream on the diagram. Resiliency metrics largely respond to the impacts of climate change in the form of adaptation to shocks and stresses attributable to a warming climate. However, investing in buildings and infrastructure to adapt them to existing or future hazards bears more difficult questions: Are these responses to known disturbances only? How does one evaluate making known investments on unknown return on investments given the uncertainty and range of climate change projections (IPCC) and the unclear probability of risk?

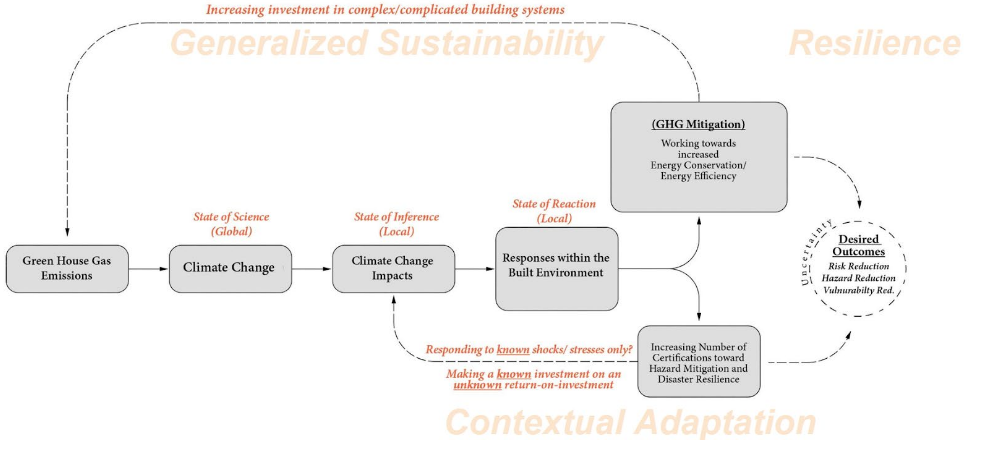

Figure 1. Diagram of sustainability, resilience, and adaptation to address GHG and Climate Change (Authors 2019)

3.0. OPERATIONALIZING SUSTAINABILITY, RESILIENCE, AND ADAPTATION

There have been many efforts to develop sustainability assessments (BCPs) as tools to assist decision-makers about actions they need or need not take on the path towards their sustainability goals and a healthier environment. The objective is to ensure that the contribution of the plans and activities by project stakeholders to sustainable development are optimal. Most sustainability assessments are developed based on the three-pillar definition of sustainability where environmental, social, and economic factors are equally important for the decision-makers (Pope et al. 2004). In 1995, an "institutional" dimension was introduced by the Commission on Sustainable Development as the fourth pillar for sustainability. It has been gaining attention in recent years to consider aspects such as political dimensions, non-discriminatory education, gender equality, etc. within sustainability assessments (Doan et al. 2017).

In the realm of disaster risk reduction and community development, there have been attempts to organize resilience in a pillar structure similar to sustainability, including more "resilience indicators" (Cutter et al. 2008). For example, Cutter explores the indicators of community resilience and examines ecological, social, economic, and institutional aspects among the first four. In this structured approach, factors such as wetlands and acreage loss and erosion rates are considered as ecological variables; demographics, social network, and cohesion of community values are named as social variables; factors like employment, wealth, and value of property are considered economic variables; and factors such as participation, hazard mitigation plans, and emergency response plans are introduced as institutional variables. The research then introduces infrastructure and community competence as the other indicators. However, more recent data shows nearly all single categories of resilience have little bearing statistically on rate and degree of recovery. Indicators in themselves are not so clear because they are more accurate indicators of *vulnerability* and not of resilience (Burton 2015, Sharifi 2016).

The concepts of vulnerability and adaptation have been subjects of much research (Gallopin 2006). However, interpretations of vulnerability remain understudied in architecture; approaches addressing vulnerability have largely developed within social and natural science fields. Adapting cities for future change is an increasing issue for designers and policy makers (Rose 2014); adaptation at the urban scale through land use and zoning policy is paramount for coastal and riverine communities (e.g. managed retreat policies), and the adaptations may be most reasonable scale to address specific issues concerning coastal and riverine flooding. Adaptation defined as:

> adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates, harms, or exploits beneficial opportunities (Gallopin 2006).

Adaptation involves decision-making processes and actions that need to be undertaken in order to prepare and maintain the capacity for significant future changes, without interruption of a system's functions, identity, or feedback of the system (Nelson et al. 2007). The need for large scale adaptation without interruption is indeed a challenge for practitioners and policy makers. Tools that use sustainability, resilience, and adaptation measures and metrics that adequately address contextual vulnerabilities at a useful magnitude must be made available to design professionals. Indeed, the market is already beginning to require that designers "exercise professional judgment in the context of resilience for climate-related risks [within the context of] an evolving professional standard of care" (GSA 2017 pp. 33). However, the states do not always adopt the most recent code cycles.

4.0. SYNERGIES AND DISCORDS OF VOLUNTARY BUILDING CERTIFICATION PROGRAMS

For design professionals, the operationalization of sustainability and resilience through certification programs is constantly evolving, and it is critical that scholars and practitioners work to develop frameworks that fully encompass sustainability, resilience, adaptation, and vulnerability metrics. Among the discourse of architects and designers today, there still exists two parallel modes of applied research. The more mature of the two is clearly within the voluntary green building assessment systems which primarily focus on energy efficiency and greenhouse gas mitigation (e.g. LEED, BREEAM, ENERGY STAR, Passive House). Emergent resilience metrics are now coming to the industry that are hazard-specific and contextual, and they incorporate methods of risk assessment (e.g. LEED Pilot Credits, RELi, Fortified, Envision). In order to begin to think about these metrics simultaneously in the design and planning phases of buildings and infrastructure, one must be able to evaluate the co-benefits and tradeoffs within them.

The modern concept of resilience is nascent in the professional practice of architecture and design and involves a wide range of meanings and interpretations. However, tools and methodologies are emerging (Linkov et al. 2018). These tools vary from simple checklists to quantifiable metrics and network modeling methods. Resilience assessment tools are developed by a large variety of agencies and entities including public and private sectors and are targeted for cities, industry administrators and operators, and even those inexperienced in resilience but willing to explore this emerging field. In recent years, there have been encouragements for US federal agencies to implement and mandate resilience in the form of regulations and policies (Linkov et al. 2018).

In the private sector, the RELi Resilience Action List Credit Catalog (2017) defines resilience as

> the capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance. It is the capacity to bounce back after a disturbance or interruption.

In the RELi framework, resilience is defined at different levels of individuals, households, communities, and regions. Based on this definition, resilience involves not only maintaining livable conditions during disasters but also includes adaptation to a wide range of impacts related to global warming and climate change. In the same catalog, resilient design is defined as the "intentional design of buildings, landscapes, communities, and regions in order to respond to natural and manmade disasters and disturbances" which is expandable to long-term changes because of climate change. This follows closely the definitions and concepts of resilience cited earlier in this paper.

The U.S. Green Building Council (USGBC), largely known for its work on the LEED green building certification program, has begun to adapt its credit system toward operationalizing resilience. In November 2015, the USGBC approved new credits in resilient design as part of an effort to increase awareness about natural and man-made disasters. The objective is to encourage project teams to understand vulnerabilities and the most important risks to projects to address them in design. There are three LEED pilot credits (LEED Pilot Credits on Resilient Design 2019; Pearson 2019): Ippc98, *Assessment and Planning for Resilience* is the first credit. The objective of this credit is to encourage project stakeholders to plan for potential effects of disastrous events in building design in addition to addressing the impacts of long-term changes like climate change on building performance. The credit requires a hazard assessment prerequisite and one of the two options of "Climate-related Risk Management Planning" and "Emergency Preparedness Planning" (LEED Credit Library 2019). The second credit is IPpc99, *Design for Enhanced Resilience*: The objective of this credit is to encourage the design of buildings that can survive expected natural disasters and weather events with minimal damage. Mitigation strategy processes must be introduced in this credit for the hazard related risk identified in the first IPpc98 credit. The credit provides options for each hazard separately (LEED Credit Library 2019). IPpc100, *Passive Survivability and Back-up Power During Disruptions*, is the third pilot credit. The objective of this credit is to ensure passive survivability and building functionality during emergencies. The credit offers two options and multiple paths in each option. The first option ensures passive survivability and safe thermal conditions in the event of extended power outages, while the second option demonstrates the ability to provide enough backup power for critical loads in case of an extended power outage (LEED Credit Library 2019). Passive survivability refers to "the ability of a building to maintain critical life-support conditions for its occupants if services such as power, heating fuel, or water are lost for an extended period" (Wilson 2005).

5.0. COMMON FRAMING CERTIFICATION PROGRAMS

To reduce the noise surrounding the various interpretations and applications of resilience and adaptation, it is critical that designers first begin to make judgments through an evaluation of the criteria laid out in the academic scholarship and broader policy. Considering various evolving sustainability and emerging resilience certification programs, it is critical that designers unpack the material into its constituent parts and decide how the parts relate to one another as well as to the overall structure and intent of each program. Taking these two approaches, designers may then be able to form a novel or at least coherent product that addresses the positivist tenets of sustainability while incorporating tradeoffs inherent in resilience frameworks. Taking the scholarship of Bruneau et al. (2003), Miller et al. (2010) and Woods (2015) as a starting point, Table 1 begins to lay out a framework in which to examine sustainability and resilience certification programs together. The table incorporates Woods' (2015) four basic concepts of resilience: 1) "resilience as *rebound*", 2) "resilience as *robustness*", 3) "resilience as *graceful extensibility*", and 4) "resilience as *sustained adaptability*" The concept "rebound" is characterized by a return to a previous set of "capabilities or resources" (Woods 2015), and importantly these resources must be able to be deployed in the event of a shock or stress. This concept includes important aspects of organizational and operational planning. It is the most commonly interpreted concept of resilience according to Woods. “Robustness” can be thought of as the ability to absorb disturbances; this concept expands the range of disturbances a system can deal with and it is perhaps the most operationalized within engineering resilience applications. “Graceful Extensibility” increases the adaptive capacity of a system and allows it to degrade gracefully if the disturbance exceeds the system’s capacity to rebound. The sub-optimal, but acceptable performance of a system under stress (as it pertains to this concept of resilience) is understudied in design. “Sustained Adaptability”, the most comprehensive notion of Woods’ characterizations of resilience, incorporates adaptive capacity as a clear criterion at the scale of a single system and its inclusion in a larger network of dependencies.

Table 1. Matrix weighting of resilience and sustainability voluntary certification programs (Authors 2019)

External Impacts \ Certification Programs			LEED Pilot Credits	RELi (RS)	Envision (RS)	Fortified (Cert)	LEED (RS)	BREEAM (RS)	ENERGY STAR (Cert)	PHIUS (Cert)
Short-term Shocks and Long Term Stressors****	Natural	Earthquakes	Dark	Dark	Light	Dark				
		Tsunamis & Floods	Dark	Dark	Medium	Dark		Dark		
		Fires and Wildfires	Dark	Dark	Light	Dark				
		Storms & Hurricanes	Dark	Dark	Medium	Dark				
		Other disasters such as landslides, etc.	Dark	Dark	Light	Medium		Light		
	Environmental	Climate Change (GHG emissions)	Dark	Dark	Dark		Dark	Dark	Dark	Dark
		Extreme Weather (extreme heat/cold; heat island)	Dark	Dark	Light	Dark	Light	Dark		Dark
		Resource Management (energy/water scarcity)	Light	Dark	Dark		Dark	Dark	Dark	Dark
	Social	Society (neighborhood connections, criminal activity, etc.)		Dark	Dark		Dark	Dark		
		Health (public health and welfare)		Dark	Dark		Dark	Dark		Dark
	Econ	Economic Risks (affordability) (economic competitiveness)		Dark	Dark		Dark	Dark	Dark	Dark
Stages of Resilience**	Resilience (as)***	Rebound	✓	✓	✓					
		Robustness	✓	✓	✓	✓	✓	✓	✓	✓
		Graceful Extensibility	✓	✓						
		Sustained Adaptability		✓				✓		

** Stages of resilience as defined by the NAS
*** Concepts of resilience as defined by Woods (2015)
**** Disturbances as defined by Miller et al. (2010)

Not Considered — Highly Considered (scale: white, light grey, medium grey, dark grey)
(RS) - Rating System
(Cert) - Certification System

White	**Rating Systems (RS):** In no credit the external impact has been addressed. **Certificates (Cert):** There is no guideline or goal to address that external impact.
Light grey	**Rating systems (RS):** In just one or two credits/goals/requirements the external impact has been addressed. **Certificates (Cert):** The external impact has been addressed briefly in few places.
Medium grey	**Rating Systems: (RS)** In more than two and less than five credits/goals/requirements the external impact has been addressed. **Certificates (Cert):** The external impact s not considered as main goals, but it has been addressed in several places.
Dark grey	**Rating systems (RS):** In more than five credits/goals/requirements the external impact has been addressed. **Certificates (Cert):** The external impact is considered as one of main goals that has been addressed.

6.0. DISCUSSION & CONCLUSION

Although broader concepts of resilience and sustainability have been linked together by ecologists and ecological economists, their relationships and how their interdependencies can help inform the design of cities must be further developed (Rose 2014). While adaptation of resilience and sustainable strategies is more complex in urban scale compared to building scale due to larger number of variables, working at a reasonable order of magnitude, land use planning and zoning codes are critical tools for increasing sustainability and resilience in the future. In the meantime, tools available to work on the building, site, and neighborhood scale are necessary to manage the current realities of the built environment. And synergies do exist between sustainability and resilience at these scales. For example, strategies such as increased insulation and a “tight” building envelope that increase energy efficiency and passive survivability, is an area where sustainable design and resilient design outcomes align (Samuelson et al. 2015, Baniassadi et al. 2018). Increased insulation contributes to a building that can maintain comfortable temperatures and thus passive survivability if a storm event disables power to a building for some length of time. A more efficient building envelope and mechanical systems also extend the usefulness of backup power systems (e.g. well-anchored photovoltaic system and batteries to supplement conventional electricity grid-supply). Furthermore, by driving down the cost of energy for the building occupant, it’s possible to build capacity (e.g. fiscal resources). However, the translation of these synergies into design metrics must recognize the limitations of GHG mitigation and disaster risk reduction within the confines of the building industry. Architects and designers will only balance these limitations by promoting sustainability, resilience, and adaptive capacity in a more literate and informed manner by engaging in cross-disciplinary work at all stages of design. Bourgeoning examples of this is early design evaluation of buildings under increasing timescales and design conditions. For example, because of the interdependent nature of building systems, uncertainty in design, construction and occupancy timescales of buildings, more work is being done on understanding the performance of such systems (e.g. HVAC and building enclosure design) under stress and under extreme conditions (Eleftheriadis & Hamdy 2017, Waddicor et al. 2016, Wang & Hong 2013). Taking the author’s above framework as a guide, more granularity in investigating the elasticity of buildings and their systems is a much-needed step in the design process.

There is a clear tension between careful analysis of design decisions and reliance on reductive tools like checklists or metrics. However, tables like the one proposed by the authors help frame and evaluate the application of real-world technologies and behaviors for increasing resilience within the built environment. Indeed, RELi as an integrative approach seeks early synergies for planning sustainability and resilience goals. For example, RELi was cited as a critical tool for buildings such as Christus Spohn Hospital in Corpus Christi, TX. RELi’s integration with LEED prerequisites and credits and other guidelines help identify its position as an evolution in sustainability centered certification programs, building on and refining the long history of sustainable design outlined in this paper (Perkins + Will 2017). Given the above complexities, the authors conclude that understanding how the synergies and discords of sustainability and resilience are codified and operationalized within a comprehensive framework coupled with performance evaluation in early design are critical steps in effectively operationalizing sustainability and resilience.

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