**12** Summary of the Webinar Presentation

# Mohamed Hamdy

**Norwegian University of Science and Technology (NTNU)**

10 May, 2025

Hosted by: Spatial Analysis and Simulation Lab/Community (SASL)

Title: **Resilience of Building Energy Performance: How can it be assessed for improvement?**

## Introduction

The Spatial Analysis and Simulation Lab (SASL) hosted a timely and methodologically rich webinar on the resilience of building energy performance, featuring Professor Mohamed Hamdy. The session explored the theoretical underpinnings, practical frameworks, and region-specific considerations for quantifying and improving building resilience in the face of climate variability and energy disruptions. Dr. Randa Medhat opened the session by welcoming participants and highlighting the growing relevance of resilience thinking in building performance evaluation and energy policy.

## Speaker Profile

Prof. Mohamed Hamdy is a globally recognized scholar in building energy simulation and resilient design. He has authored significant contributions in thermal performance modeling, optimization-based retrofit strategies, and adaptive comfort research. His work focuses on bridging the gap between academic modeling, real-world applications, and policy development, particularly in climate-vulnerable regions.

## Presentation Insights: Frameworks and Methodological Approach

The webinar introduced a multi-scalar framework for understanding and assessing **building energy performance resilience**, centered around quantitative metrics, adaptive design strategies, and contextual modeling.

### 1. Conceptualizing Building Energy Performance Resilience

Prof. Hamdy positioned building energy performance as a multidimensional construct that includes:

- Thermal comfort
- Indoor air quality

- Energy efficiency
  He emphasized that even highly energy-efficient buildings (e.g., net-zero energy) rely on an uninterrupted energy supply to maintain performance, thus making resilience a vital metric.

**2. Defining Resilient Design in Buildings**

Prof. Hamdy elaborated on the foundational components of resilient design:

- **Four key dimensions:** “Resilience of what?”, “To what?”, “Based on what?”, and “In what state?”
- The framework accounts for the **entire disruption timeline**, from initial conditions through absorption, adaptation, and recovery.
- Resilience metrics must be **bound by clear system definitions**, relevant disruptions (e.g., power outages, heatwaves), and performance indicators tied to well-being and functionality.

**3. Quantifying Resilience Using Thermal Metrics**

Prof. Hamdy presented a technical methodology for quantifying resilience through:

- **Weighted Unmet Temperature Hours (WUTH)**, a performance metric that measures deviation from thermal comfort over time.
- **Adaptive Thermal Comfort models**, which account for psychological adaptation, building zone differences, and user behavior.
- **Case Study – Oslo, Norway:** Demonstrated how integrating solar panels, batteries, and demand-side management improves resilience scores using the proposed benchmarking system—envisioned as analogous to energy labels.

## Applications in Egypt and Region-Specific Insights

**1. Adaptive Comfort Models for Hot Climates**

Prof. Hamdy explored how adaptive thermal comfort models are especially relevant in **hot, arid regions** like Egypt. He stressed:

- The **importance of contextualizing models** using localized weather data.
- The **educational role of universities** in preparing students and professionals to implement resilient building strategies in fast-growing markets like Egypt’s real estate sector.
- A call for integrating energy resilience into **building codes and rental regulations**.

**2. Use of ASHRAE Guidelines in Absence of Local Standards**

In contexts lacking national thermal comfort standards, Prof. Hamdy recommended using **ASHRAE temperature and humidity set points** as proxies. He noted the importance of:

- **Cost-optimality studies** to build the case for resilience investment.
- **Scenario-based modeling** to demonstrate the financial and human cost of not addressing resilience gaps.
- Leveraging existing tools and frameworks from his doctoral research to guide resilience assessments.

## Interactive Session (Q&A)

The Q&A discussion further deepened the engagement with the topic and raised several practical and methodological concerns:

- **Implementation in Egypt:** How Hamdy's framework could be adapted for Egypt's unique climatic and urban conditions. This included interest in collaborative pilot studies on adaptive thermal comfort in informal settlements and new developments.
- **Cost vs. Value in Resilience Measures:** Participants discussed how economic arguments—grounded in **cost-optimality and loss-prevention**—could persuade policymakers and private developers to invest in resilience, especially under budget constraints.
- **Integration with Real Estate and Policy:** There was interest in how the framework could inform **new property regulations**, particularly in rental markets, by establishing resilience as a measurable asset akin to energy efficiency.
- **Data Localization and Future Climate Scenarios:** Hamdy emphasized the urgent need to localize **future weather datasets** for accurate simulation and policy development. He offered to connect participants with researchers working on **weather data generation** for Egypt and North Africa.
- **Knowledge Transfer and Education:** Echoing earlier points, Hamdy reinforced the importance of **training architects, engineers, and urban planners** in resilience thinking. Participants agreed on the value of SASL serving as a platform for **cross-university collaboration** in resilience research and education.

## Key Takeaways

1. **Building energy resilience is distinct from energy efficiency**, focusing on a building's ability to maintain thermal comfort during disruptions.
2. **Resilience assessment frameworks must account for full event cycles**, from preparation through adaptation and recovery.
3. **Weighted unmet temperature and adaptive thermal comfort** are useful metrics for quantifying and benchmarking resilience.

4. **Localized climate data and modeling** are critical to ensuring accuracy in simulations, particularly in developing regions.
5. **Cost-optimality studies** can strengthen the policy case for investment in resilience, especially in countries lacking regulatory mandates.
6. **ASHRAE guidelines can serve as interim standards**, but there is an urgent need to develop national comfort benchmarks aligned with local conditions.
7. **Education and interdisciplinary collaboration** are essential to advancing resilient building practices, especially in climate-vulnerable regions like Egypt.

## Next Steps

- Explore **collaborative research pilots** applying the resilience framework in hot, arid climates such as Cairo.
- Investigate the **feasibility of adapting ASHRAE setpoints** to Egypt temporarily until local standards are defined.
- Consider **cost-optimality case studies** to quantify the return on investment in resilience upgrades.

**How to cite:**
Hamdy, M. (2025, May 10). *Resilience of Building Energy Performance: How Can It Be Assessed for Improvement?* [Webinar]. Summary provided by R. Khalil, Spatial Analysis and Simulation Lab (SASL). Prepared with the assistance of AI.