



## ARISE Case Studies in Disaster Risk Management



The FIU 12-fan Wall of Wind (WOW) Research and Testing Facility was inaugurated on August 24, 2012, the 20th anniversary of Hurricane Andrew’s devastating landfall in South Florida. The WOW facility is capable of controlled testing in flows that replicate hurricane winds up to Category 5, accompanied by wind-driven rain. The WOW has confirmed the effectiveness of large and full-scale wind and rain testing approaches and is advancing the understanding of hurricane impacts on buildings and developing/validating innovative damage mitigation products to foster hurricane resilient communities.

| RISK  | ACTION  | IMPACT   | OUTPUT   |
|---|---|--|--|
| <p>The U.S. National Oceanic and Atmospheric Administration (NOAA) has noted that from 1980 to 2017, the distribution of damage from major weather and climate disaster events (defined as causing more than \$1bn in economic loss, also known as a U.S. billion-dollar disaster event) is dominated by tropical cyclones.</p> <p>Protecting homeowners, businesses, and communities from wind hazards involves public and private sector stakeholders across many geographical boundaries and industry sectors.</p> | <p>The Wall of Wind program is the product of a strong partnership between U.S. state and federal agencies (including the Florida Division of Emergency Management, the U.S. Department of Energy, and the U.S. National Science Foundation) and the private sector (Weather Predict, Renaissance Reinsurance, and the Roof Alliance Industry, among others).</p> <p>The WOW team continues to engage with industry partners (Disney, Florida Power &amp; Light, Bison, RWDI) on vulnerability testing of building and infrastructure products and standards – all of which will improve hurricane resilience in the U.S. and abroad.</p> | <p>In addition to testing for large enterprises and government agencies, the WOW team has worked with small and medium-sized businesses to test mitigation products so that they can be validated and sold to private residents and for commercial uses.</p> <p>Large, medium, and small enterprises devising and testing mitigation solutions at all scale levels are important because every \$1 spent on mitigation saves at least \$4 in response and recovery costs, according to the U.S. National Institute of Building Sciences.</p> | <p>Innovative hurricane damage mitigation products have been patented based on WOW research, and have been featured in such prestigious publications as <i>Smithsonian Magazine</i>.</p> <p>Full-scale experimentation results have also been applied to improve the Florida Building Code’s wind load provisions for roof-mounted equipment, including in its High Velocity Hurricane Zones.</p> <p>The WOW has provided a platform for FIU STEM (Science, Technology, Engineering, and Mathematics) students to be exposed to, and learn, unique skillsets and to successfully enter the workforce at high levels.</p> |



FIU’s NSF-NHERI Wall of Wind Experimental Facility



Experimental Facility Workshop to build collaboration



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## Lessons Learned

It is very difficult to design (and then build) a large-scale testing facility capable of reaching, and sustaining, Category 5 wind speeds. It requires not only major investments but also physical and computer testing of both components and the complete ensemble. Noise during early stage testing effectively precluded any gasoline/petrol options; only electric motors for the fans were deemed feasible for an on-campus facility.

## BUSINESS CASE

While computer modeling is very useful, at a certain point for many designs and components, physical testing is important, particularly large-scale testing. A university-based facility has the advantage because it helps train successive generations of students to advance the state-of-the-art in engineering (and architecture).

## REPLICATION OPPORTUNITIES

Although costly, a large-scale wind (and wind-driven rain) testing facility is feasible for replication and offers results that can be checked with computer modeling, providing corrective or fine-tuning feedback to strictly computer modeling.

## How does the project support the implementation of the Sendai Framework targets?

|   |   |   |   |
|---|---|---|---|
| 1 | <i>Reduce disaster mortality by 2030</i>  | X | In tropical cyclone areas, more wind-resistant buildings and infrastructure are essential to limiting life loss, economic loss, and damage in general, and to increase the speed of recovery. The mission of the FIU Wall of Wind is to help achieve those goals by testing and validating new products, methodologies and standards that protect homeowners, businesses, and communities locally, nationally, and globally through collaborative research in windstorm mitigation and implementation of innovations. |
| 2 | <i>Reduce number of affected people by 2030</i>   | X |   |
| 3 | <i>Reduce economic loss by 2030</i>   | X |   |
| 4 | <i>Reduce infrastructure damage and disruption of services by 2030</i>                      | X |   |
| 5 | <i>Increase countries with DRR national/local strategies by 2020</i>                        |   |   |
| 6 | <i>Enhance international cooperation to developing countries</i>                            |   |   |
| 7 | <i>Increase the availability of and access to EWS* and DR information to people by 2030</i> |   |   |

## How does the project contribute to the ARISE Themes?

|   |  |   |  |
|---|--|---|--|
| 1 | <i>Disaster Risk Management Strategies</i> | X | With some overlap but contributing to all seven of the ARISE Themes, the FIU Wall of Wind focuses on helping find risk management solutions to real world wind (and wind-driven rain) design, construction, and maintenance problems in hazard-prone areas, particularly urban. As now a U.S. national Experimental Facility based in a university, the WOW conducts research that (a) transfers findings to public, private, and the NGO sectors, (b) informs practice, standards and regulations (and in the long-term, public and private sector investment and insurance decisions), (c) develops and trains students for high-end professional careers, and (d) contributes to designing and fine-tuning DRR, DRM, and resilience strategies. |
| 2 | <i>Investment metrics</i>                  |   |  |
| 3 | <i>Benchmarking and Standards</i>          | X |  |
| 4 | <i>Education and Training</i>              | X |  |
| 5 | <i>Legal and Regulatory</i>                | X |  |
| 6 | <i>Urban Risk Reduction and Resilience</i> | X |  |
| 7 | <i>Insurance</i>                           |   |  |

## For More Information



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