Enterprise: Who We Are

Create opportunity for low- and moderate-income people through fit, affordable housing in diverse, thriving communities.
15 Years of Work in Housing Resilience, Recovery, Rebuilding
Disasters Impact Housing Security

Hurricane Katrina
August 23, 2005
800K Homes

Super Storm Sandy
October 22, 2012
650K Homes

Hurricane Harvey-
Houston
August 17, 2017
135K Homes

Hurricane Maria-
Puerto Rico/USVI
September 20, 2017
370K Homes

Fires, California
October 2017, 2018,
2019 60K Plus
We have an Affordable Housing Crisis in the United States

- For the majority of states, between 10% and 15% of households are housing insecure. California and New York have the most housing insecurity; 20% of households face housing insecurity. Island communities
COVID-19 SHELTERING IN PLACE
“The house is the place where both planning and community development impact upon the family and individual. Planning for housing must therefore take into account more than the physical structure and spatial requirements; it should consider the social, economic and psychological needs of the individuals and families who will occupy the housing. And housing must be considered within the community context.”

Lucilla Fuller Marvel
<table>
<thead>
<tr>
<th>Total Name Storms</th>
<th>Average</th>
<th>CSU Forecast</th>
<th>2019</th>
</tr>
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<tbody>
<tr>
<td>Hurricanes</td>
<td></td>
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<tr>
<td>Major Hurricanes</td>
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</tbody>
</table>

Major Hurricane is Category 3 or higher.
THE SPREAD OF ILLNESS AND DISEASE IN THE WAKE OF NATURAL DISASTERS

Building Resilient Homes helps mitigate impacts to the health and well-being of residents and communities facing extreme weather and natural hazard Risks. See Keep Safe for guidance.

Untreated sewage after a flood can introduce bacteria, viruses and parasites

Heavy rain and flooding can create conditions for mosquitos and other vectors that cause malaria and dengue fever

Moisture after flooding leads to mold, which can cause asthma and other respiratory problems

Particle pollution from fires can trigger asthma attacks, heart attacks and strokes

Carbon monoxide from fires can lead to headaches, nausea, dizziness and, in high concentrations, premature death

Extreme heat can lead to cardiovascular and respiratory disorders

Earthquakes can create dust clouds that carry fungus spores, which can cause asthma
Call upon Diversity of Community Members to inform and define what resilience and mitigation planning is. Build Prototypes for peer to peer learning and sharing.

Consider regional planning not just locality—especially in consideration of flood plain management and resource management.

Jurisdictions identify how to leverage the Weatherization model to ensure homes are fortified in advance of storms with focus on Structural Risk (Roofs, Anchorage), Energy and Health Related Conditions.

Consider importance of non-profit sector in implementation of work.
Models: Rapido Temp to Perm Housing Houston, Texas
OPPORTUNITY

- FEMA-BRIC
- HUD- CDBG, CDBG-DR, CDBG-MIT
- DOT
- USDOE
- Community Reinvestment Act
- ESG
Mitigation - Investment in Community Development

- Advance other community objectives
- Capital improvements, infrastructure protection, open space preservation, and economic resiliency
- A one-time cost for implementing a mitigation action often results in long-term savings to the community.
Faces of Resilience

- **People**: The extent of personal discomfort, harm, injury, or loss of life.
- **Physical Assets**: Loss or damage to structural and architectural building components, MEP and IT equipment, utilities, landscaping, contents.
- **Operations**: Disruption to building operations and functionality, occupancy, egress/ingress, critical systems, or lab activities.
- **Revenue**: Loss of revenue due to business interruption, specifically in relation to tenants.
- **Reputation**: Negative media attention or impact on industry reputation in the aftermath of an impactful shock or stress.
MANTÉNGASE SEGURO
UNA GUÍA PARA EL DISEÑO DE VIVIENDAS RESILIENTES EN COMUNIDADES ISLEÑAS

KEEP SAFE
A GUIDE FOR RESILIENT HOUSING DESIGN IN ISLAND COMMUNITIES
KEEP SAFE
A GUIDE FOR RESILIENT HOUSING DESIGN IN ISLAND COMMUNITIES
Collaboration

Sponsors

Contributing Partners

Funders
Designing for the Future

**SATELLITE DATA: 1993-PRESENT**

Data source: Satellite sea level observations.
Credit: NASA Goddard Space Flight Center

RATE OF CHANGE

↑ 3.3 millimeters per year
THE GUIDE IS COMPRISED OF THE FOLLOWING CHAPTERS:

**Introduction**

**Chapter 1: A Safer Site**

**Chapter 2: Building Protection**

**Chapter 3: Passive Habitability**
PUTTING IT ALL TOGETHER

- Funding
- Contracting
- Building to Code
- Pulling Permits
- Insurance
- Design
Who is it for?

IS THIS GUIDE FOR ME?

Homeowner or Building Owner
As the owner of your home, be it a townhouse or a detached building, you wield the power to make decisions regarding your structure's resiliency. You can choose to make major, permanent changes to your site and home to ensure safety before, during, and after a natural disaster.

Community leader
The community regards you as their representative. Your communication and organizational skills enable you to serve as a liaison between governmental/external efforts during times of distress. By taking on a leadership role to bring your community together in the face of an emergency, you are catalyzing a collaborative effort towards resiliency that can persist long after the disaster hits.

Tenant
Renting at a multifamily building may limit the actions you can take in terms of fortifying your home against natural disasters because you have limited ability to determine how the building is prepared but you can still provide the authority with suggestions and key information found in this guide to improve your home.

Administrator
You may be an administrator of a housing program or are able to determine how to regulate a housing facility or home. This guide can help you determine ways to safeguard the building from hazards or set up a program to fund or support housing resilience.

Property Operator
You are the legal owner of a property which you rent out and you are responsible for ensuring it is safe and has emergency plans in place. Your tenants can certainly engage in some of the preventive and prescriptive measures included in this guide.

Construction Professional
As an architect, engineer, contractor, master builder, inspector, or other professional in the construction industry, the information included in the main corpus of this guide may seem basic to you. However, it is becoming increasingly important to bear these principles in mind.
### Type of Home

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
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</table>
| Wooden Detached | - Wooden Structure  
|             | - Can have zinc roof |
| Concrete Detached | - Concrete/brick and slab structure  
|             | - 1-3 stories |
| Town Houses | - "Mediana" or shared wall  
|             | - One corner per vertical unit |
| Wake-Up     | - Multiple owner  
|             | - Up to 3 floors from ground |
| High Rise Condominium | - Multiple Owner  
|             | - 3 floors and up  
|             | - Administrator oversees 25% decisions  
|             | - Requires elevators |

### Type of Community

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
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</thead>
</table>
| Informal Community | - Area of mixed use  
|             | - Linear block geometry limits  
|             | - Organic growth  
|             | - Public areas are only accessible via alleys  
|             | - Limited outdoor spaces |
| Urbanification | - Defined lots  
|             | - Planned growth  
|             | - Formal roads  
|             | - Many extra share walls  
|             | - Area of mixed use |
| Urbanization | - Defined lots with dedicated outdoor space  
|             | - Homogeneous building typologies  
|             | - Car to glance |
| FINCA       | - Irregular topography  
|             | - Lot distribution and form varies  
|             | - Dispersed construction |
| Independent Mega-Lot | - Strictly defined lots  
|             | - Defined areas for parking or outdoor spaces |
“A RESILIENT HOME”
ANTONIO LUIS VÁSQUEZ ROSADO
C. BEGIN THE PLANTING PROCESS

Hydroponic Gardening

- a. Hydroponics is a method of growing plants without soil by using mineral nutrient solutions in a water solvent.

- b. The nutrients used in hydroponic systems can come from an array of different sources; these can include, but are not limited to, byproduct from fish waste, duck manure, or purchased chemical fertilizers.

- c. For all techniques, hydroponic reservoirs are usually designed to be biologically closed systems, which are built of plastic, but other materials have been used, including concrete, glass, metal, vegetable solids, and wood. Containers should exclude light to prevent algae and fungal growth in the nutrient solution.

- d. With hydroponic farming, there are two types of watering systems: continuous flow or static. In continuous flow systems, water needs continuous circulation through the system and this requires a pump.
**BUILD A STRONG FOUNDATION**

**STRATEGY IN ACTION**

**STEP 1 - WALL DESIGN PRINCIPLES**

- Maintaining a continuous load path is like a chain that holds a home together from the roof to the foundation. A continuous load path is critical during an earthquake or hurricane because it holds a home together when ground forces or high winds try to pull it apart. Maintain a continuous load path by using vertical reinforcement, from the foundation to the roof, through the structural walls.

- Anchor interior partition walls into the structural frame for stability.

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**APPROXIMATE COST**

- Wood frame with panels $ per sq. ft.
- Concrete columns with fill-in walls $ per sq. ft.
- Cast-in-place concrete with blocks $ per sq. ft.
ENERGY GENERATION + BACKUP

Strategies that provide critical needs for power when a facility loses power or other services

INTRO  Introduction

STRATEGY 15  Reduce your Energy Use

STRATEGY 16  Integrate Solar Electricity

STRATEGY 17  Integrate Solar Thermal Energy

STRATEGY 18  Install Energy Backup
WATER MANAGEMENT + STORAGE
Strategies that provide critical needs for water when a facility loses power or other services.

INTRO Introduction

STRATEGY 19 Reduce your Water Consumption

STRATEGY 20 Collect and Use Rainwater

STRATEGY 21 Improve Septic Waste Disposal System

STRATEGY 22 Prevent Wastewater Backflow in Homes
Keep Safe USVI
Creamos este recurso para ayudar a las comunidades a diseñar centros comunitarios resilientes para fortalecer la capacidad organizativa, promover la educación durante todo el año y poder enfrentar cambios climáticos, sociales y económicos. Ofrece sugerencias prácticas, incluido el desarrollo organización comunitaria, capacidad operativa y activos físicos relevantes para lograr resiliencia.
**Systems of a Community Resilience Center**

**COMMUNICATIONS**
- IP phone
- Satellite phone
- Local phone
- WiFi/DSTV access for social media/community feedback
- Access for communication
- Community police radio station
- Access to emergency phone
- Silo system allows testing and GPS without internet

**STRUCTURAL**
A professional structural engineer should be consulted to verify the building meets code requirements for seismic movement. Depending on location, ensure the structure can withstand forces caused by strong winds produced by hurricanes or typhoons.

**ENERGY STORAGE**
Design a storage system that includes lithium batteries for energy storage. Ensure that backup energy systems are accessible and can be easily maintained.

**ENERGY GENERATOR**
Have a backup energy generator for emergencies. Ensure that the generator is placed outdoors, at least 10 feet from the structure, and is protected from debris.

**RAINWATER COLLECTION**
Install a rainwater collection system for non-potable water use, such as irrigation, flushing toilets, and cleaning. If necessary, water can be used for drinking. Rainwater storage tanks could be located on the roof or ground.

**SOLAR POWER**
Install solar panels with batteries. Some systems might also have a connection to the grid for selling power during low use or consuming power during high use, fuel, or other forms of renewable energy. Other recommendations for the community center or individual houses: portable solar panels or chargers for mobile phones, solar lamps, portable solar power generators, dedicated solar panels for critical & patients (e.g., requiring oxygen or respirators, solar refrigerators, or heat-up plate generators).

**SOLAR THERMAL HEATER**
Use solar energy to heat up water.

**OPENINGS**
Design using operable windows and doors. Keep windows closed and seal with weather stripping. Maximize space by allowing the exterior areas to be used. Shade openings to reduce amount of energy cost for heating.

**VENTILATION**
Use natural ventilation to increase passive cooling, mitigate excessive sunlight, reduce heat gain, and generate breezes. Thoroughly reducing energy costs.

**VENTILATION**
Design a ventilation system in which air is always moving through the interior spaces. This ventilation system could provide natural breezes or mechanical ventilation systems, such as air conditioning.

If new construction, place the building above the Design Flood Datum (DFD). If it is a multi-story building, ensure equipment that might get damaged with water is stored below the DFD.
Deployment Partners
KEEP SAFE

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Ischoeman@enterprisecommunity.org