Innovative Solutions for Post-Disaster Code Enforcement – Development of Sustainable Permitting, Inspections and Building Code Programs

TU4C: The Steps behind Building Resilience

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2017 Hurricanes in PR & USVI

- Hurricane Irma, September 6 (Category 5)
- Hurricane Maria, September 19 (Category 4-5)
- Damage from wind, wind-driven rain, some storm surge, and some non-coastal flooding
2017 Hurricane Season Shows Need for Code Enforcement

- Inadequate number of trained, certified building officials
- Reconstruction means surge in demand
- Shortcomings in building departments at time of event
• Minimum Codes and Standards

• Disaster Recovery Reform Act (DRRA) of 2018
  • Building code enforcement & floodplain mgmt. (SD/SI) eligible under Stafford Act
  • Had been ineligible for reimbursement via EMAC

→ FEMA policies to ensure reconstruction is more resilient
Post-Disaster Building Code Support – Puerto Rico

HMGP

- Building code update ($10M)
  - Adopted 2018 I-Codes with local amendments
    November 2018, publishing February 2019

- Code enforcement ($79M)
  - More staff for PRPB & OGPe
  - Technology to increase permit/enforcement capacity
  - Robust training curriculum & outreach program
  - Better data collection & sharing among state agencies
  - Larger pool of experts in PR
Post-Disaster Building Code Support – Puerto Rico

Support to JFO

- MAT Report and six Recovery Advisories
- Building code update support (6 proposed amendments)
- Microzoning
- Cost & Constructibility Analysis
- Topographic Microzoning
- Training and SME Support
- Prescriptive Home Designs
Post-Disaster Building Code Support – USVI

- **Hazard Mitigation Grant Program (HMGP)**
  - $7.3M total project cost
  - Mitigation for critical facilities
  - Update building codes and land use planning
  - Promote mitigation for public & private property
  - Promote hazard-resistant construction, esp. residential
  - Train design professionals and construction industry on hazard-resistant construction

- **Emergency Management Assistance Compact (EMAC)**
  - Interstate mutual aid compact
  - Implemented by state emergency mgmt. agencies
Post-Disaster Building Code Support – USVI

• Support to JFO/DPNR
  – *Construction Information for a Stronger Home, 4th Edition*
  – Develop prescriptive home designs
  – Ongoing SME support for JFO, DPNR, other requests and support
  – Support for Building Code update to 2018 I-Codes
  – Provide Building Science training activities for designers, contractors, and local officials
Puerto Rico is...

- 13,790 km² (5,320 mi²)
- Located 1,000 miles SE of Miami, on the boundary of the Caribbean and North American plates
- Five islands (three inhabited year-round)
- Elevation ranges from sea level to 1,338 meters (4,390 feet)
- Subject to hurricanes, earthquakes, tsunamis, landslides, flooding

- 8,870 km² (3,420 mi²) is land
- 4,921 km² (1,900 mi²) is water
Before 2017

- Near-continuous recession since 1996
- Severe economic crisis since 2014
  - More than $70B in debt
  - 45% poverty rate
    - Child poverty rate of 56%
  - 4.7% unemployment rate (2016)
- Structural, demographic, health, social and infrastructure stresses as a result
Pre-Event Code and Enforcement

Puerto Rico Building Code (2011)
- 2009 I-Code with local amendments (including seismic)

Single permit application process became law in April 2017

Central government is largely responsible for code adoption, enforcement, and permitting

Autonomous municipalities and Authorized Professionals also have enforcement and permitting responsibilities
Economic crisis resulted in significant cuts to Central Government staffing and resources for building inspections, permitting, and code enforcement.

<table>
<thead>
<tr>
<th>9 permitting auditors</th>
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</thead>
<tbody>
<tr>
<td>11 compliance inspectors</td>
</tr>
<tr>
<td>48 permit staff</td>
</tr>
</tbody>
</table>

Year prior to Irma/María:

| 12,364 construction permits |
| 9,311 use permits |
| 10,065 fire prevention certificates |
| 10,083 health & safety certificates |
Informal Construction

Combination of a complicated permitting process and the economic crisis, combined with existing social norms, resulted in a high percentage of informally constructed residential structures.

Informal structures are constructed with no permit and are therefore not in compliance with applicable building codes.

Current estimate: 85,000-90,000 informal structures.
### 2017 Hurricane Season

**September 06, 2017: Hurricane Irma**
- Category 5 at landfall
- **160 km (100 mph) winds**
- **2/3 of main island lost power**

**September 20, 2017: Hurricane María**
- Category 4 at landfall
- **249 km (155 mph) winds**
- **Storm surge of 3-9 feet**
- **35 miles wide (the width of the main island)**
Hurricane María

Wind speed
mph
1. 155
2. 15
3. 138
4. 116
5. 109
# Hurricane María: The Numbers

<table>
<thead>
<tr>
<th>Event</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>River surge</td>
<td>Surges up to 47 feet</td>
</tr>
<tr>
<td>Localized flooding</td>
<td>Up to 38 inches</td>
</tr>
<tr>
<td>Landslides</td>
<td>Estimated 40,000</td>
</tr>
<tr>
<td>Immediate fatalities</td>
<td>64</td>
</tr>
<tr>
<td>Additional fatalities</td>
<td>Estimated 3,000 due to cascading storm impacts</td>
</tr>
<tr>
<td>Electrical grid</td>
<td>Complete destruction</td>
</tr>
<tr>
<td></td>
<td>Largest and longest blackout in history</td>
</tr>
<tr>
<td></td>
<td>Temporary restoration and repairs complete in May 2018</td>
</tr>
<tr>
<td></td>
<td>Grid remains fragile for years to come</td>
</tr>
<tr>
<td>Residential structures</td>
<td>Estimated 1,138,843 damaged or destroyed</td>
</tr>
<tr>
<td></td>
<td>65,000 Blue Roofs</td>
</tr>
<tr>
<td>Transportation and supply chains</td>
<td>Damaged or destroyed</td>
</tr>
<tr>
<td>Recovery and reconstruction</td>
<td>Estimated $139B needed for</td>
</tr>
</tbody>
</table>
Post-María Code Adoption

$5.5M HMGP Code Adoption Support Grant

Committee review, amendment development, and adoption of 2018 i-Codes

Six local amendments, including:

- Corrosion protection (island-wide)
- SFHA documentation requirement
- 423.3 Storm shelters in critical facilities
- 423.4 Storm shelters for Group E Occupancy

2018 Puerto Rico Building Code adopted November 15, 2018
Post-María Code Enforcement

$144M HMGP Code Enforcement Grant

- Significant increase in staff support (20 fold)
- Significant investment in technology support
- Establishment of robust training & outreach programs (public, professionals, legislature, judiciary)
- Increased data collection & sharing between agencies
- Increased pool of experts on-island, including 50 new CFMs

Goal: Support activities to create self-supporting code enforcement and permitting programs

Project timeline: 6 years

Largest and broadest FEMA-funded code enforcement project in HMGP history
Post-María Storm Water Regulations

Pre-María storm water regulations dated from 1975

$400,000 HMGP Grant to re-model and update storm water regulations (island-wide)

Expected to be effective Summer 2019
USVI Case Study

- U.S. Virgin Islands
  - St. Thomas
  - St. Croix
- Two Category 5 hurricanes in less than 15 days
- High-wind in excess 140-160 mph
- Significant rainfall
- Little storm surge damage
EMAC is an all hazards - all disciplines mutual aid compact that serves as the cornerstone of the nation's mutual aid system – ratified into law by Congress & enacted into law by each member state

- Implemented within the State Emergency Management Agency on behalf of the Governor of the State
- Offers assistance during governor-declared states of emergency or disaster
USVI Case Study
USVI Case Study

- DPNR Building Department Needs Post-Disaster:
  - Inspectors
  - Plan Reviewers
  - Permit Techs
USVI Case Study

USVI DPNR submits formal Resource Request to VITEMA

FEMA All-Call Announcements To Membership Organizations

ICC forwards All-Call to Membership

ICC Inspectors & their State EOC Answer DPNR All-Call

Reimbursement to assisting States through Advanced Assistance HMGP Funding
USVI Case Study

Resource Request - the broadcast for assistance

• Issued by USVI DPNR Building Department
• Broadcasted by VITEMA
• Used by state EOCs to help interested personnel deploy to USVI
• Contains unique ID Ex: #1306-RR-7432
USVI Case Study

1) Reasoning & Personnel Types
• “USVI DPNR Building Department is requesting individuals or teams of building professionals capable of performing permit processing, buildings inspections, and plan review for structures impacted by Hurricanes Maria and Irma. Personnel will perform residential/commercial plan review of all trades as well as perform building, electrical, plumbing, mechanical, and flood inspections in accordance with the 2018 International Codes, USVI Codes, USVI Stronger Home Guide, and ASCE 24 Flood Standard.”
Resource Request

2) Deployment Specifics

“Deployment shall consist of a three to four week timeframe. Personnel will be split between the St. Croix district and the St. Thomas and St. John districts. Requested deployment dates are as follows:

6/1/18 – 8/31/18: Special immediate focus on Plan Reviewers (2), Electrical Inspectors (2), and Building Inspectors (2)

“Special Notice: any qualified individual, including individuals from multiple states, can be deployed to meet the needs of each phase. A full team from a single state is not necessary for the deployment of personnel needed by USVI DPNR”
3) Requirements for Interested Personnel

• “Individuals interested in this mission should first receive permission from their direct supervisor to participate and then contact your state EMAC Coordinator, to respond to the request (#1306-RR-7432).”

• “Must be employed by a municipal or county government agency. Private sector entities are not yet reimbursable through EMAC in most states.”
Resource Request

Requirements for Interested Personnel

• “All personnel must have a copy of certificate in their specialty, proof of credentials to perform request duties, and must be physically able to perform the required duties for each position.
  
  • **Plan Examiners** must have a current ICC Certification in Building, Plumbing, Mechanical or Electrical trades. Multi-licensed preferred.
  
  • **Inspectors** must have a current ICC Certification in Building, Plumbing, Mechanical or Electrical trades. Multi-licensed preferred.
  
  • **Permit Technicians/Coordinators** must have a current ICC Certification.”
Resource Request

Requirements for Interested Personnel

• “Personnel MUST be able to interpret and enforce the 2015/2018 International Codes.
  – Bring paper or electronic ICC code references (for each trade)
  – Download USVI code and Stronger Home Guide prior to deployment
  – DPNR staff will orient you on local ordinances and processes”
Resource Request

Requirements for Interested Personnel

• “Each individual will be responsible to coordinate their own air travel, rental car, accommodations and food.
  – All personnel including plans examiners and permit technicians will need a vehicle to get from hotel accommodations to each permitting facility.”

• “Each jurisdiction will be responsible to keep the required documentation to submit for reimbursement directly to the USVI DPNR.”
Resource Request

Requirements for Interested Personnel

• “Each individual must bring their own work equipment.
  – Cell phone in the event 2-way radio equipment is not available.
  – PPE including rain and safety gear, hard hat, boots, flash light, sunscreen, etc.
  – Equipment used in regular performance of their job (e.g. tape measures, laser measuring devices, digital cameras, tablets and laptops)
• “Immunizations or vaccinations advised. Light Hazards (mold) may exist.”
Deployment Success

• Personnel Deployed: 10+
  – Arizona
  – Georgia
  – Maryland
  – Minnesota

• Types of Assistance Provided:
  – Building Inspections
  – Plan Review
  – Permit Tech.

• Reimbursement Success:
  – All states reported no issues with reimbursement
Deployment Success

Minnesota team assisting DPNR Building Department
Deployment Success

Minnesota team assisting DPNR Building Department