Chapter 3

Community Disaster Resilience for the Built Environment

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The Built Environment

Buildings

Individual structures including the equipment and contents that house people and support social institutions

Building Clusters

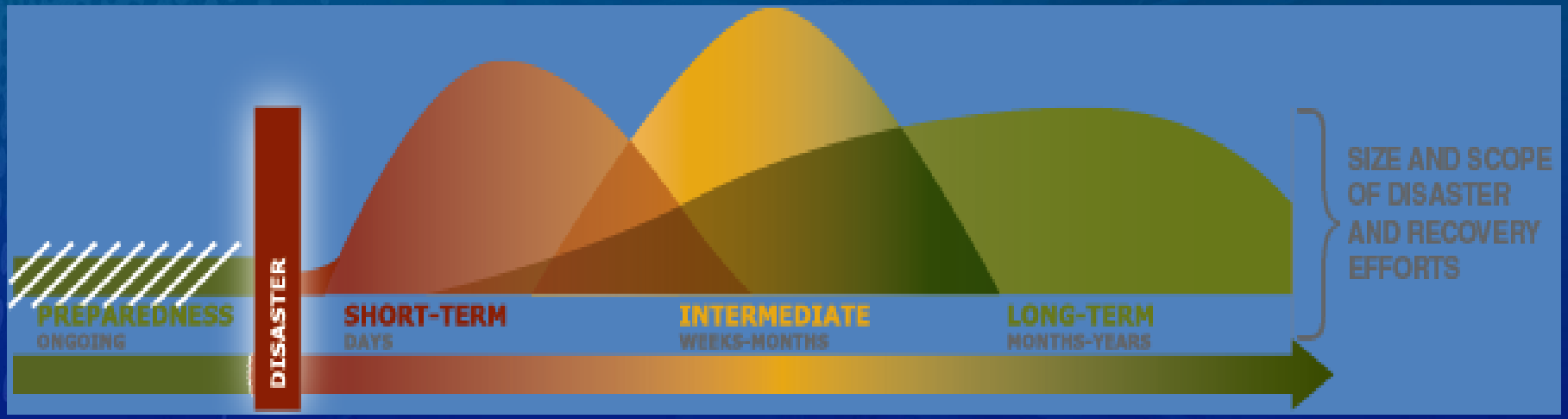
A set of Buildings that serve a common function such as housing, healthcare, retail, etc.

Infrastructure

Physical networks, systems, and structures that support community social institutions including transportation, energy, communications, water and waste water.

Recovery of the Built Environment

Organize around recovering functionality over time



When is each cluster and system needed for recovery?

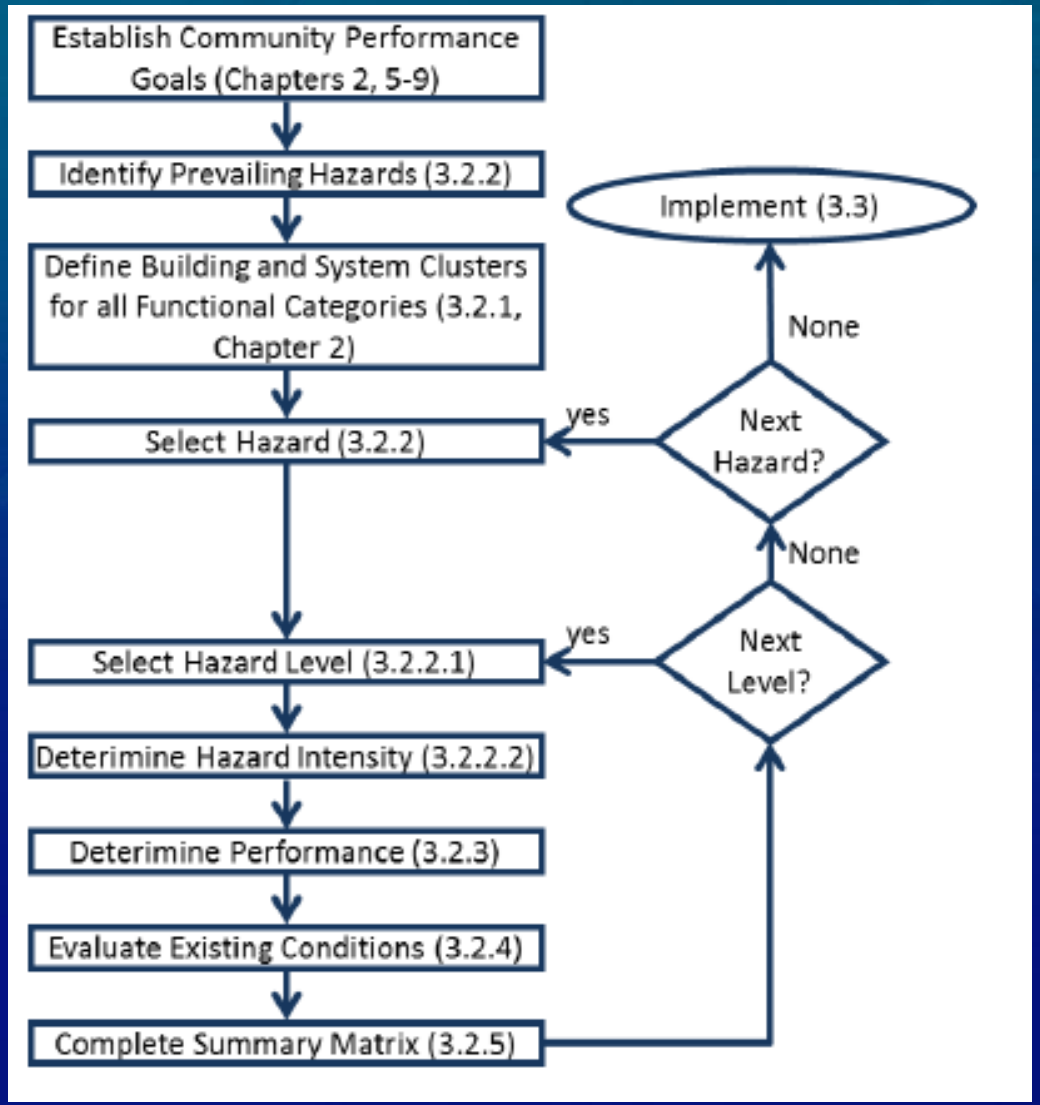
Source: National Disaster Recovery Framework

Just in Time Functionality Needs

- **Short -Term**: Secure, Rescue, Stabilize, Clear Routes
  - Clusters: Critical Facilities, Emergency Housing
    Related Infrastructure Systems
- Mid-Term: Restore Neighborhoods, meet social needs
  - Clusters: Housing, healthcare, main street, schools, Churches
  - Related Infrastructure Systems
- Long-Term: Community Social and Economic Recovery
  - Clusters: Commercial and Industrial Businesses
  - Related Infrastructure Systems

Pathway to Resilience

Figure 3.1b



Determine and characterize Hazards

- **Prevalent Hazards**
  - Wind, Earthquake, Inundation,
  - Fire, Snow, Rain,
  - Human caused

- **Hazard Level:**
  - Routine level that is expected to occur frequently
  - Expected level equal to the design level used for buildings
  - Extreme level that is the maximum considered possible
-
- **Hazard Intensity**:
  - Area affected defined as “local, community, or regional”
  - Disruption Level defined as “minor, moderate, or severe”

Performance Metric for Buildings

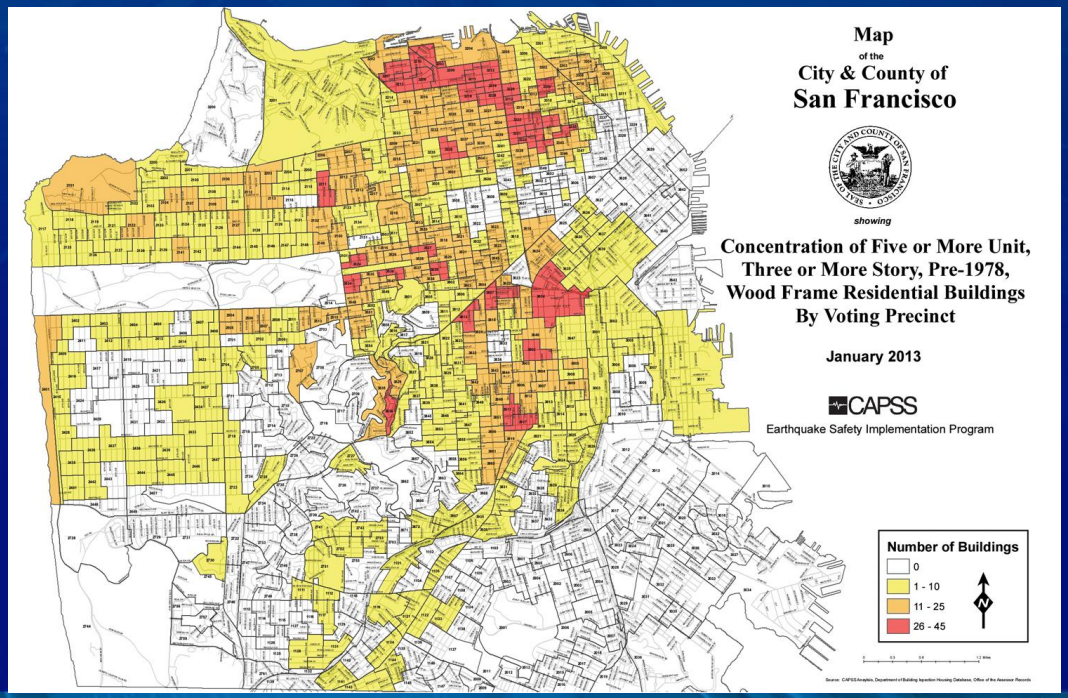
- **Level of Functionality** after the event
  - Operational,
  - Useable during Repair,
  - Not Usable,
  - Collapse

- **Recovery time available**
  - Days,
  - Weeks,
  - Months

Set goals for Building Clusters

Percentage of functional building's in a cluster available

30%: Able to initiate Assigned Activities
60%: Able to initiate usual operations
90%: Operating at normal capacity



Infrastructure Systems Performance Metrics and Goals

Level of functionality after the event

I: 90% service within days, 100% within weeks
II: 90% service within weeks and 100% within months
III: 90% service within months and 100% within years

Percentage of service available for each system

30%: Initiate assigned activities
60%: Initiate usual operations
90%: Operating at normal capacity

Example Summary Resilience Matrix

Centerville Example: Routine, Localized, Minor disruption

Functional Category: Cluster	Overall Recovery Time for Hazard and Level Listed								
	Routine Hazard Level								
	Phase 1 – Short-Term			Phase 2 – Intermediate			Phase 3 – Long-Term		
	Days 0	Days 1	Days 1-3	Wks 1-4	Wks 4-8	Wks 8-12	Mos 4	Mos 4-24	Mos 24+
Critical Facilities									
Buildings	90%	X							
Transportation	90%	X							
Energy	90%	X							
Water	90%		X						
Waste Water		90%	X						
Communication	90%		X						
Emergency Housing									
Buildings	90%		X						
Transportation	90%	X							
Energy	90%	X							
Water	90%		X						
Waste Water		90%	X						
Communication	90%			X					
Housing/Neighborhoods									
Buildings	90%		X						
Transportation		90%	X						
Energy		90%	X						
Water		90%		X					
Waste Water			90%	X					
Communication		90%		X					
Community Recovery									
Buildings		90%	X						
Transportation			90%	X					
Energy		90%	X						
Water			90%	X					
Waste Water			90%	X					
Communication		90%		X					

Example Summary Resilience Matrix

Centerville Example: Expected, Community, Moderate

Functional Category: Cluster	Overall Recovery Time for Hazard and Level Listed								
	Expected Hazard Level								
	Phase 1 – Short-Term			Phase 1 – Short-Term			Phase 1 – Short-Term		
	Days	Days	Days	Wks	Wks	Wks	Mos	Mos	Mos
	0	1	1-3	1-4	4-8	8-12	4	4-24	24+
Critical Facilities									
Buildings	90%							X	
Transportation		90%	X						
Energy		90%	X						
Water			90%		X				
Waste Water				90%				X	
Communication		90%		X					
Emergency Housing									
Buildings				90%					X
Transportation			90%	X					
Energy			90%	X					
Water			90%		X				
Waste Water				90%				X	
Communication				90%	X				
Housing/Neighborhoods									
Buildings						90%			X
Transportation			90%	X					
Energy			90%	X					
Water				90%				X	
Waste Water					90%			X	
Communication				90%			X		
Community Recovery									
Buildings								90%	X
Transportation				90%	X				
Energy			90%	X					
Water				90%				X	
Waste Water							90%	X	
Communication				90%			X		

Example Summary Resilience Matrix

Centerville Example: Extreme , Regional, Severe Disruption

Functional Category: Cluster	Overall Recovery Time for Hazard and Level Listed								
	Extreme Hazard Level								
	Phase 1 – Short-Term			Phase 1 – Short-Term			Phase 1 – Short-Term		
	Days	Days	Days	Wks	Wks	Wks	Mos	Mos	Mos
	0	1	1-3	1-4	4-8	8-12	4	4-36	36+
Critical Facilities									
Buildings						90%			X
Transportation			90%		X				
Energy				90%					
Water							90%	X	
Waste Water					90%			X	
Communication	90%			X					
Emergency Housing									
Buildings						90%			X
Transportation				90%		X			
Energy				90%					
Water					90%		X		
Waste Water					90%			X	
Communication				90%			X		
Housing/Neighborhoods									
Buildings							90%		X
Transportation				90%		X			
Energy				90%	X				
Water					90%			X	
Waste Water						90%		X	
Communication					90%		X		
Community Recovery									
Buildings								90%	X
Transportation				90%		X			
Energy				90%	X				
Water							90%		X
Waste Water								90%	X
Communication					90%			X	

Disaster Resilience and the Built Environment

Input sought from the Breakout sessions

- **Confirm that the Pathway to Resilience is complete and doable.**
- **Identify experiences in implementing similar plans**
- **Determine effective strategies to integrate the plan into Community Planning efforts**