
The Zurich Flood Resilience Measurement Framework

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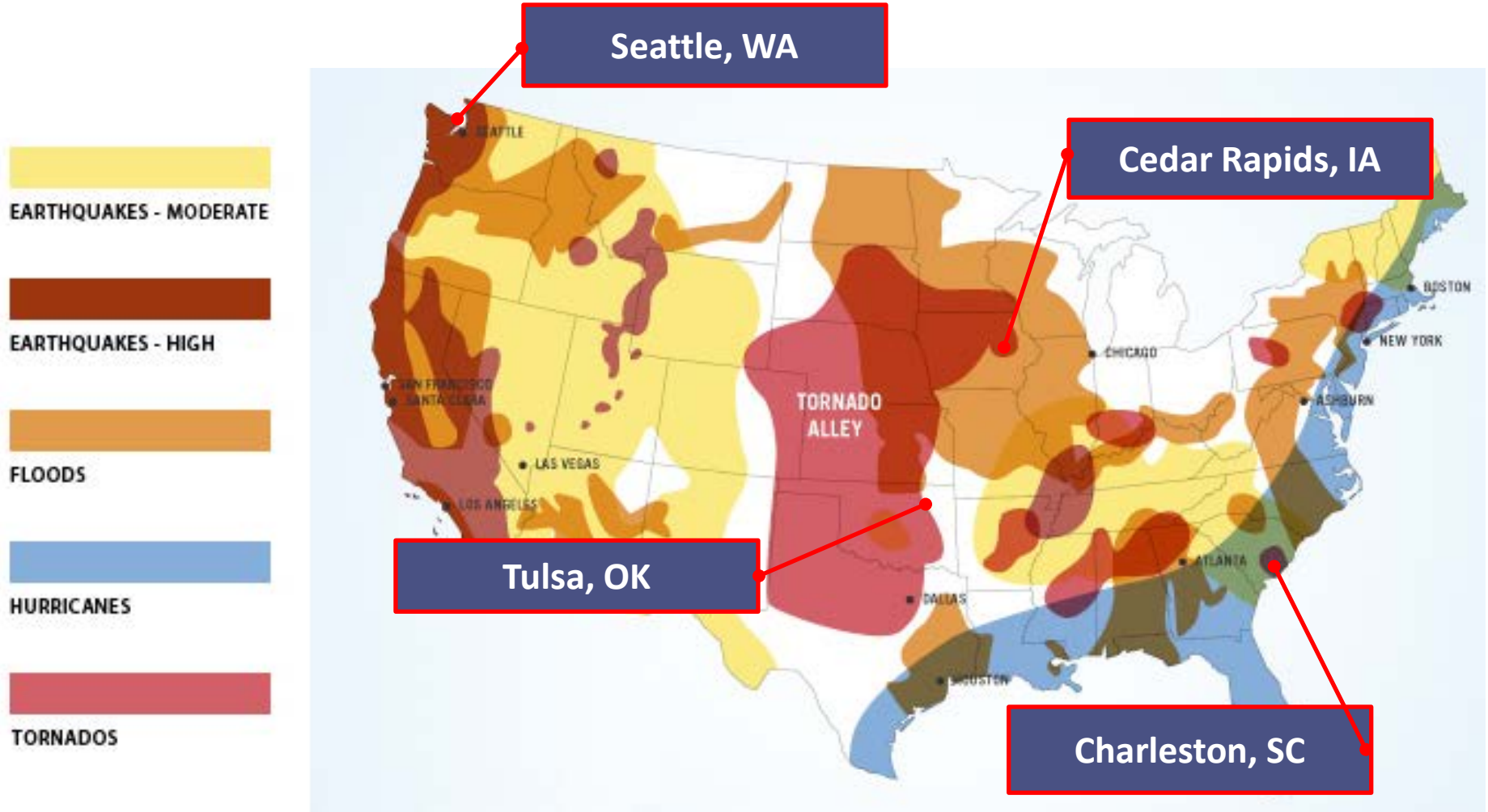
Danielle Nagele

Measuring Flood Resilience Webinar

Resilient America Program

- Launched in January 2014
- Based on the 2012 report, [*Disaster Resilience: A National Imperative*](#)
- Focused on engaging diverse sets of stakeholders in communities to build resilience

Community Pilot Program



Natural Disaster Risk Map from <http://www.crisishq.com/why-prepare/us-natural-disaster-map/>

- This is a **pilot program** to test this framework
- It is **being tested in dozens of communities** across the world.
- **Ultimate goal:** Develop an empirically validated flood resilience measurement tool

The Zurich Alliance Partnership

Five organizations partnered to develop this flood resilience framework:

- Zurich Insurance
- The International Federation of Red Cross and Red Crescent Societies
- Practical Action
- The International Institute of Applied Systems Analysis
- Wharton Risk Management and Decision Processes Center



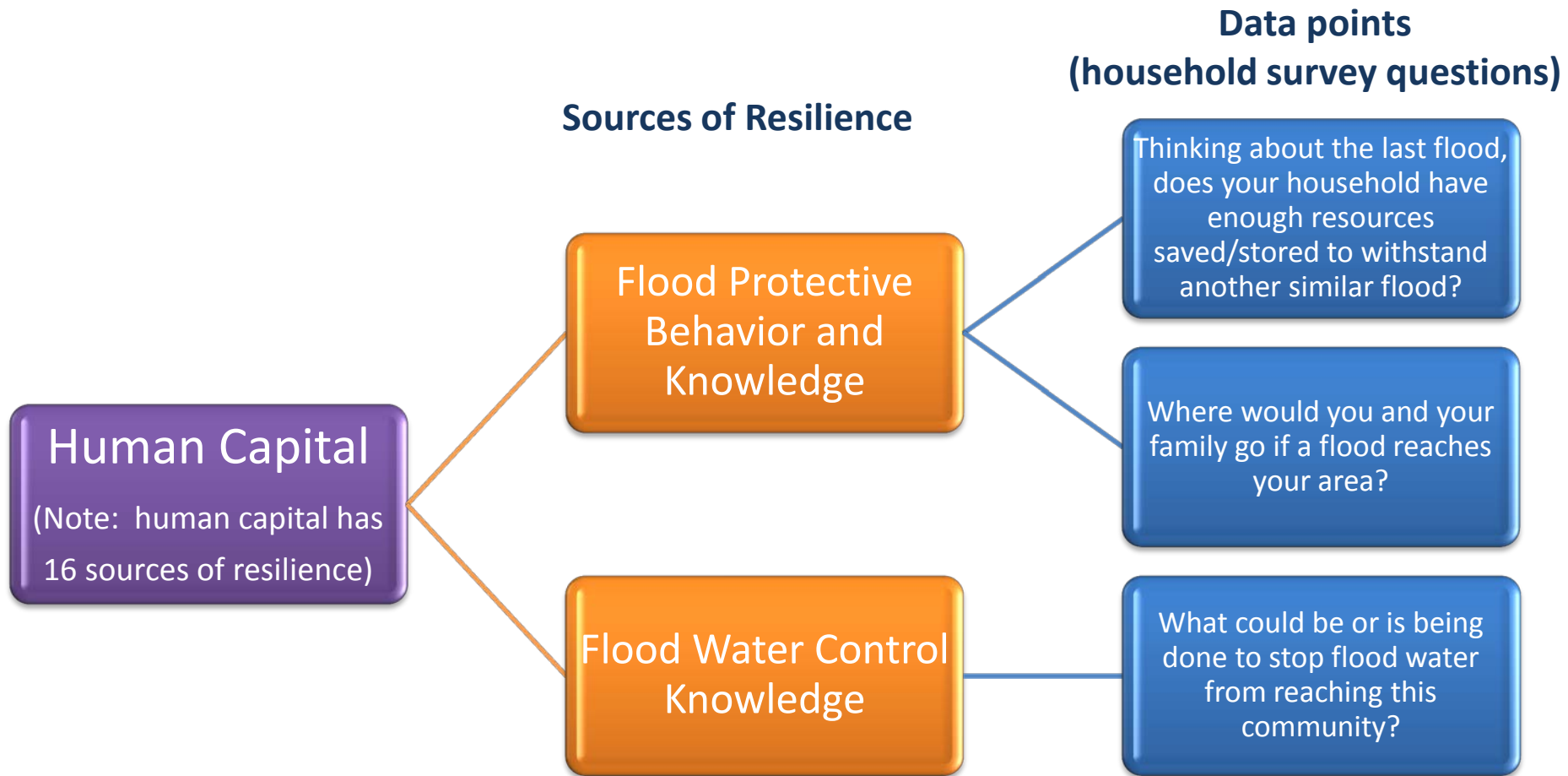
Benefits of Using the Framework

- Can help communities:
 - Identify their resilience strengths, challenges, and priorities
 - Identify actions/interventions they could take to build resilience
 - Better plan for disasters

How can we characterize a resilient community?

- **5 Capitals** (a.k.a., the 5Cs) :
 - Human
 - Social
 - Physical
 - Natural
 - Financial

Structure of the Data Collection



Data Collection Methodologies

- Household Survey
 - Charleston: Online
 - Cedar Rapids: Phone
- Community Discussion Groups
 - Select neighborhoods representing diverse flood risks and income levels
- Focus Groups
 - Academia
 - Businesses
 - Disaster Preparedness and Response
 - Natural Environment
 - Public Health

Data Collection Methodologies

- Key Informant Interviews
 - Emergency Management
 - Natural Resources
 - Planning
 - Transportation
 - Utilities
 - And more...
- 3rd party, secondary sources

How Each Source is Tagged

Each source of resilience is tagged in 5 different ways:

- **By Capital**
 - Human
 - Social
 - Natural
 - Physical
 - Financial
- **By Disaster Risk Management Cycle**
 - Crisis preparedness
 - Coping
 - Reconstruction
 - Corrective risk reduction
 - Prospective risk reduction
- **Context (i.e., sphere of influence)**
 - community-level
 - external
- **By the Four Resilient Properties**
 - Robustness
 - Resourcefulness
 - Rapidity
 - Redundancy
- **By Theme**
 - Assets and livelihoods
 - Education
 - Energy
 - Food
 - Governance
 - Life and health
 - Natural environment
 - Transport and communications
 - Waste
 - Water

- A training environment
- An online application to set up the study
- A smartphone app to collect the data
- An online environment to assess levels of resilience
- A database to store all data

Study Setup

Communities

CREATE NEW COMMUNITY

Community

National Academy of Sciences Test 2 (National Academy of Sciences / USA)

CREATE STUDY

+ TestCommunity (National Academy of Sciences / USA)

POST EVENT STUDY

+ Zurichtest1 (National Academy of Sciences / USA)



Selecting the Data Collection Method(s)

Communities > Edit Study

Show questions

TEMPLATE

SAVE DRAFT

PREVIEW

ACTIVATE

Name of study

This is required

Number of household interviews

0

RESILIENCE SOURCES

FIELD WORKER

Resilience Source	Household	Community	Key Informant	Interest Group	Third Party Source
<input type="checkbox"/> Human					
<input type="checkbox"/> Social					
<input type="checkbox"/> Physical					
<input type="checkbox"/> Natural					
<input type="checkbox"/> Financial					

5 Capitals

5 data collection methods

Selecting the Data Collection Method(s)

RESILIENCE SOURCES		FIELD WORKER			
Resilience Source	Household	Community	Key Informant	Interest Group	Third Party Source
Human					
Flood protective behaviour and knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personal safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
First aid knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value of education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood Water Control Knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood exposure perception	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood exposure management knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood vulnerability perception and management knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Understanding of future flood risk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sources of resilience

available data points

Selecting the Data Collection Method(s)

Communities > Edit Study

Show questions

TEMPLATE

SAVE DRAFT

PREVIEW

ACTIVATE

Name of study

This is required

Number of household interviews

0

RESILIENCE SOURCES

FIELD WORKER

Resilience Source	Household	Community	Key Informant	Interest Group	Third Party Source
Human					
Flood protective behaviour and knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personal knowledge/skills about how to behave during a flood event, in order to prevent death and injury.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
First aid knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value of education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Selecting the Data Collection Method(s)

Question	Option	Type
When it becomes obvious that there will be a flood, when is the best time to evacuate you and your family?	As soon as I know the flood is coming / As soon as the authorities call for evacuation (through radio and/or TV) / When I can see the flood water / When the flood water is coming into the house / I would not evacuate / I don't know	Single Choice
Where would you and your family go if a flood reaches your area?	Pre-designated flood evacuation location / A safe place at higher ground / Outside - eg leave the community / Stay where we are / I don't know	Single Choice
What would you take with you if you had to evacuate during a flood? (Tick all options mentioned by respondent, do not read list.)	fresh water / non-perishable food / Can opener / Essential medication / first aid kit / portable radio / torch / spare batteries / mobile phone and charger / Sealable bags to protect items / important documents / cash / valuables such as jewellery / infant needs / waterproof bags / toiletries / Other	Multiple Choice

Resilience Source	Household	Community	Key Informant	Interest Group	Third Party Source
Human					
Flood protective behaviour and knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personal safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
First aid knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value of education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Smartphone App

UATest1 / Initial / Household / Household Interview 1 / Life and Health / Question 3 of 9

← →

What would you take with you if you had to evacuate during a flood? (Tick all options mentioned by respondent, do not read list.)

- fresh water
- non-perishable food
- Can opener
- Essential medication
- first aid kit
- portable radio
- torch
- spare batteries
- mobile phone and charger

Assessing Level of Resilience

A **small team** assesses the level of resilience for each source based on whether the data demonstrate:

A = Best practice

B = Good industry standard

C = Deficiencies

D = Significantly below standard

Assessing Level of Resilience

Community Flood Resilience Measurement COMMUNITIES LOGOUT

Context: Community level Theme: Life and Health DRM Cycle: Crisis preparedness 4R: Robustness Capital: Human

Flood protective behaviour and knowledge (1/16)

Behavior during a flood event is critical to protecting lives. Assess people's knowledge/skills about how to behave during a flood event, in order to prevent death and injury.

Grade

- A Across all groups in the community there is high level of awareness and accuracy of knowledge about evacuating and safety during flood.
- B The majority of people in the community have a high level of awareness and accuracy of knowledge about evacuating and safety during floods.
- C Across all groups there is some awareness and knowledge about evacuating and safety during floods, however knowledge is not widespread and/or it contains substantial inaccuracies.
- D Very few people in the community report accurate knowledge about evacuating and safety during flood.

Rationale

Why did you choose this grade?
There are major impacts and human losses by flooding and people take not full account of the risk unfortunately. This can be further improved.

Context, theme, DRM cycle, 4Rs, 5Cs

Description of the source

Grading rubric

Rationale statement

Data points

If there is an evacuation point, do people know where it is, and would they use it?

Yes they know and they use it / Yes they know but it is not used / under-used / No there is no evacuation point

Yes they know but it is not used / under-used

Community

In the last 4 floods, how many deaths or serious injuries were there from people evacuating from a flood situation too late?

12.0

Community

In the last 4 floods, have people been stuck without essential emergency supplies while evacuating?

Yes a small proportion of people / Yes a large proportion of people / No

Yes a large proportion of people

Community

What would you take with you if you had to evacuate during a flood? (Tick all options mentioned by respondent, do not read list.)

Fresh water / non-perishable food / Can opener / Essential medication / first aid kit / portable radio / torch / spare batteries / mobile phone and charger / Sealable bags to protect items / important documents / cash / valuables such as jewellery / infant needs / waterproof bags / toiletries / Other

spare batteries - 20%
torch - 20%
waterproof bags - 20%
infant needs - 20%
cash - 20%

Household

When it becomes obvious that there will be a flood, when is the best time to evacuate you and your family?

As soon as I know the flood is coming / As soon as the authorities call for evacuation (through radio and/or TV) / When I can see the flood water / When the flood water is coming into the house / I would not evacuate / I don't know

As soon as the authorities call for evacuation (through radio and/or TV) - 100%

Household

Summary of results

Comments

Please provide any feedback you have on this source, the grade definitions and how easy it was to grade based on the answers.

This source is well defined and easy to understand. I believe it is very applicable to overall flood resilience.

113/1000

Comments box

Three Levels of Assessment

- The resilience assessment will provide results at three levels:
 - Overall resilience score (between 0-100)
 - By capital (score between 0-100)
 - By source (grade)

Using the Results

The data can be analyzed to understand community resilience in different ways:

- **By Capital**
 - Human
 - Social
 - Natural
 - Physical
 - Financial
- **By Disaster Risk Management Cycle**
 - Crisis preparedness
 - Coping
 - Reconstruction
 - Corrective risk reduction
 - Prospective risk reduction
- **Context in which a source is embedded**
 - internal
 - external
- **By Theme**
 - Assets and livelihoods
 - Education
 - Energy
 - Food
 - Governance
 - Life and health
 - Natural environment
 - Transport and communications
 - Waste
 - Water
- **By the Four Resilient Properties**
 - Robustness
 - Resourcefulness
 - Rapidity
 - Redundancy

Please join us for our next webinar:

September 28, 1:00 pm EDT

Thank you!

Visit us: <http://ResilientAmerica.nas.edu>

Contact us: Resilience@nas.edu