

# FEMA Benefit-Cost Analysis (BCA)



**WIFI**  
**ODAPM: HM**  
**password:**  
**odapmhazmit**





# BCA TRAINING

# Objectives

1

Understand why BCAs are needed to complete a mitigation grant application

2

Know where to download FEMA BCA software and guidance documents

3

Identify what is categorized as a benefit

4

Learn how to appropriately document damages

5

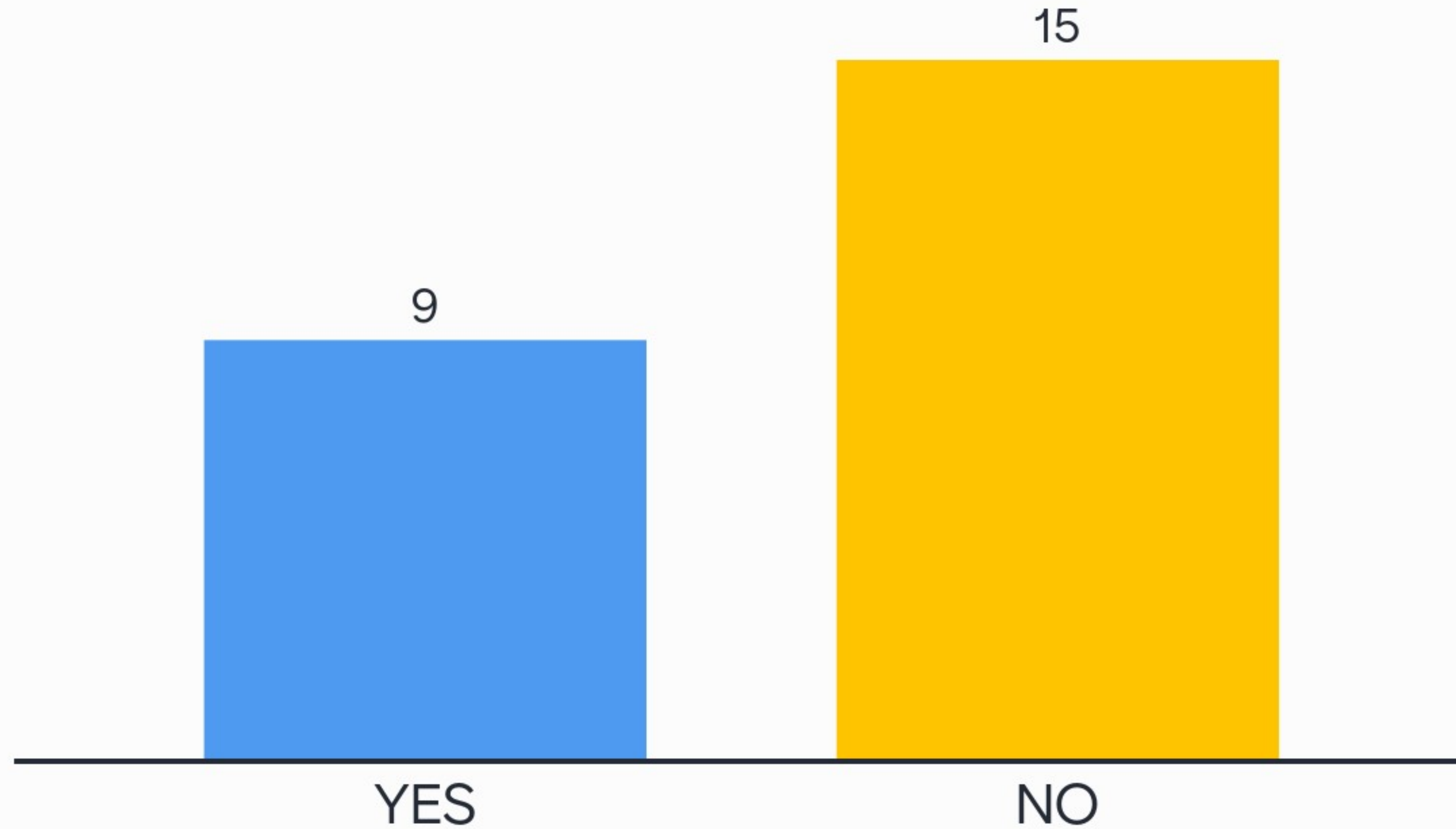
Review best practices for BCAs





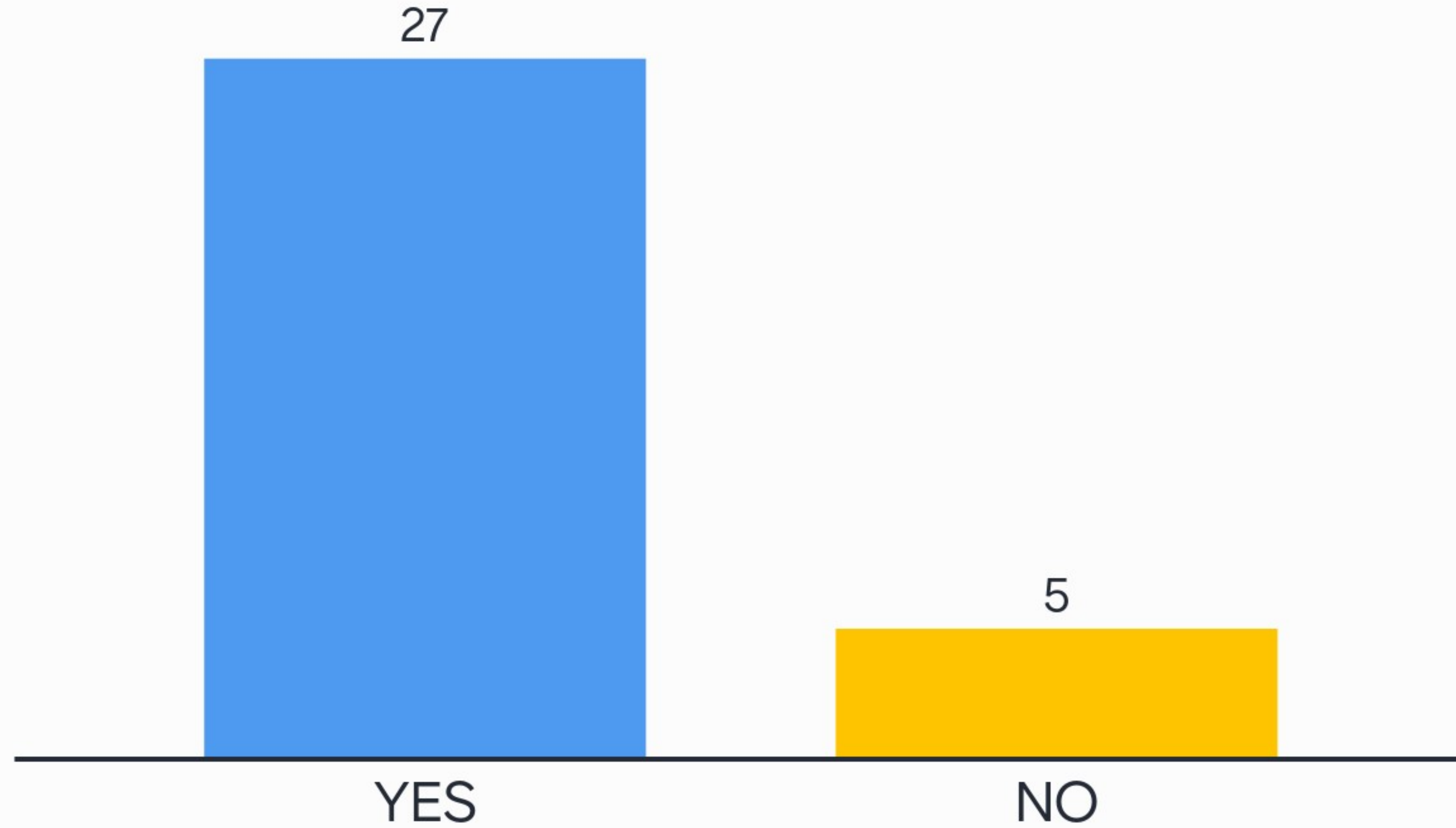
# Instructions

# Have you submitted an application for a Hazard Mitigation Grant (BRIC, HMGP, etc.) before?



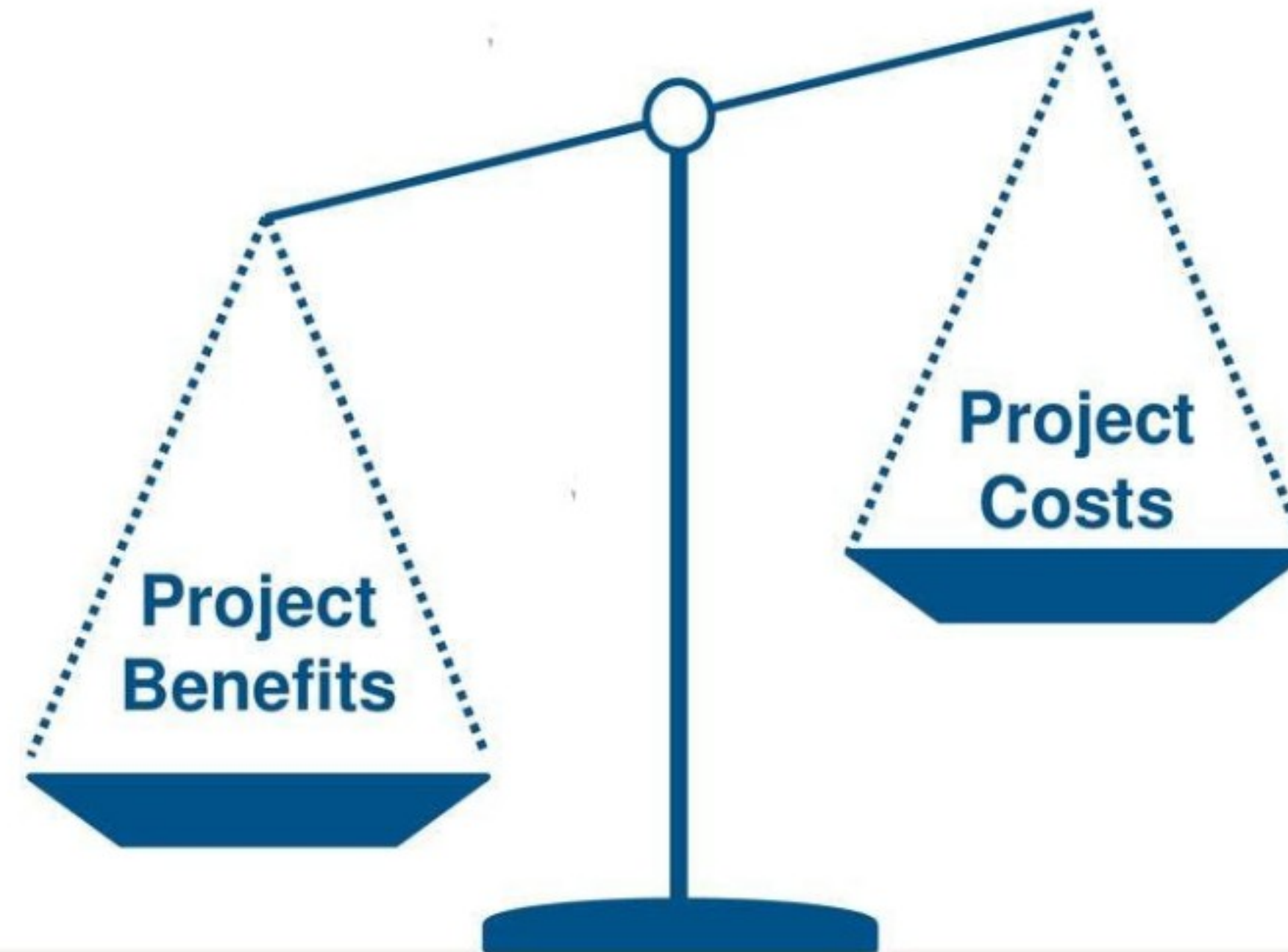


# Have you heard the term 'BCA'?



# What is a Benefit Cost Analysis (BCA) ?

- › **Benefit-Cost Analysis (BCA)** is a method that quantifies the benefits of a mitigation project compared to its costs.
  - **Goal:** break the cycle of damage, reconstruction, and repeated damage





# How do we use the BCA?

We practice the concept of BCA everyday – it just may look a little different.

- Think about how you evaluate decisions

What factors go into your decision?

- Cost
- Risk
- Convenience
- Timing



# What is the purpose of a BCA?

Shows if project is cost-effective

If an action's benefits are greater than its costs, then it is considered **cost-effective**.

Once benefits for an action are added up, that value is divided by the costs, which produces the **Benefit-Cost Ratio (BCR)**.

$$\frac{\text{Benefits}}{\text{Costs}} = \text{BCR}$$

*If the BCR is greater than or equal to 1.0, then the action is cost-effective.*





# Are BCAs required?

YES!

*Should be the FIRST action completed to validate project's eligibility*

- › Required component for HMA projects
- › Required for some 406 (Public Assistance) mitigation projects

Bonus:

- › Helps communities make informed decisions about their risks and **prioritize projects**





# Why are BCAs required ?

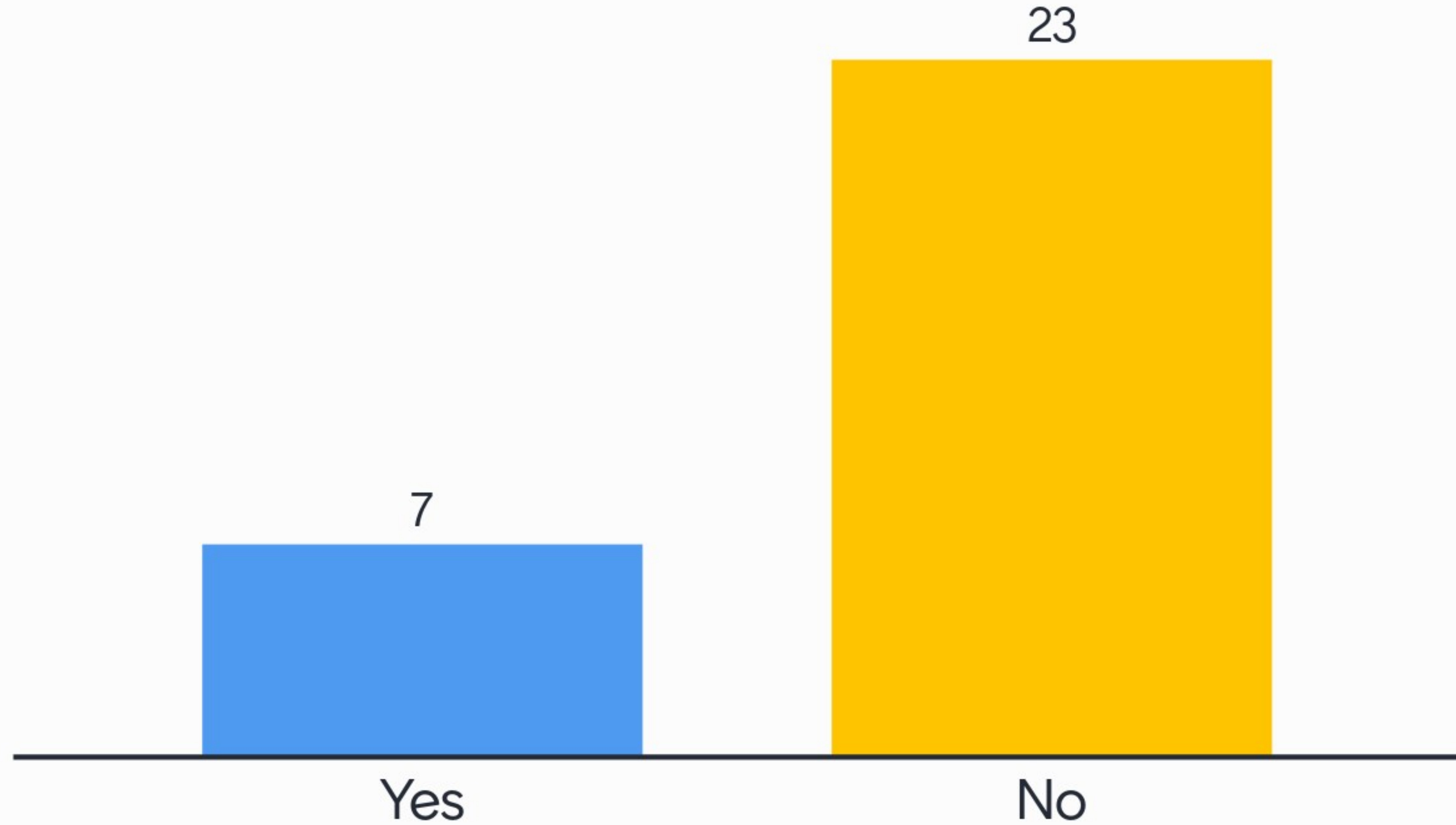
- › Demonstrate that a project is cost effective
- › FEMA National Benefit Ratio:
  - *For every \$1 spent, \$6 should be saved*
- › BCAs can help you set priorities among projects
- › BCAs help you determine if a project is a good investment
- › BCAs help “sell” good mitigation projects to the communities involved



# Instructions

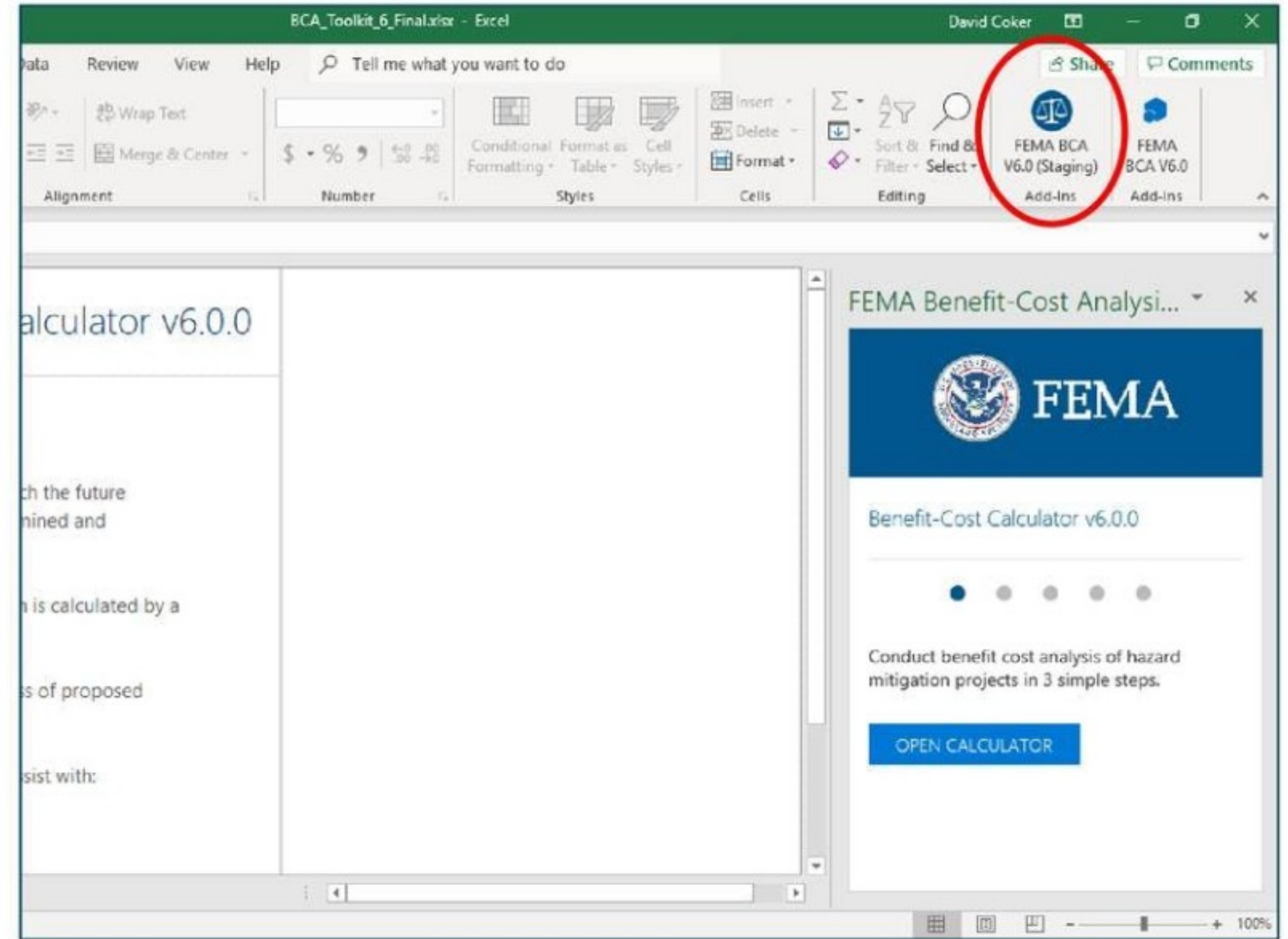


# Have you used FEMA's BCA Software Before?



# Overview of Software: Where to Download

- › FEMA has developed the BCA Toolkit.
- › The BCA Toolkit is an Excel-based tool





# Overview of Software: How to Access

- › Review Installation Instructions
- › Download BCA Toolkit Version 6.0
- › Open on desktop/laptop



<https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis>


## Benefit-Cost Analysis

Benefit-Cost Analysis (BCA) is a method that determines the future risk reduction benefits of a hazard mitigation project and compares those benefits to its costs. The result is a Benefit-Cost Ratio (BCR). A project is considered cost-effective when the BCR is 1.0 or greater. Applicants and subapplicants must use FEMA-approved methodologies and tools—such as the BCA Toolkit—to demonstrate the cost-effectiveness of their projects.

## Benefit-Cost Analysis Toolkit

To help complete an analysis within the required guidelines, you must use the BCA Toolkit, which is a calculator developed using FEMA-approved methodologies and tools to show the cost-effectiveness of your projects. Do your BCA early in the project development process to make sure you will meet the cost-effectiveness eligibility requirement.

Download the BCA Toolkit Version 6.0 

Installation Instructions 

Release Notes July 2020 



# Overview of Software: Reference Documents

## Get Support Conducting a Benefit-Cost Analysis

### Reference Guide

The BCA Reference Guide is the primary guide to conducting a Benefit-Cost Analysis. It gives an overview of:

- Benefits and costs
- How to use the software to get a Benefit-Cost Ratio for a single project or multiple projects
- Information about pre-calculated benefits

[View the BCA Reference Guide](#)

[Supplement to the BCA Reference Guide](#)



### Training

FEMA provides both classroom and online independent study courses for FEMA, state, local, territorial, and tribal staff to learn BCA fundamentals.

To see upcoming offerings and register for the classroom BCA course (E0276), visit the [FEMA training website](#) and search the course catalog for "Benefit-Cost Analysis." You can also download the [training materials used in the classroom course](#).





# Overview of Software: Advice

It is extremely important to keep in mind that the BCA Toolkit is a calculator, not a data validation or analysis tool.

***Garbage in = garbage out***

Properly sourced and documented data sources are always required as part of your project application!

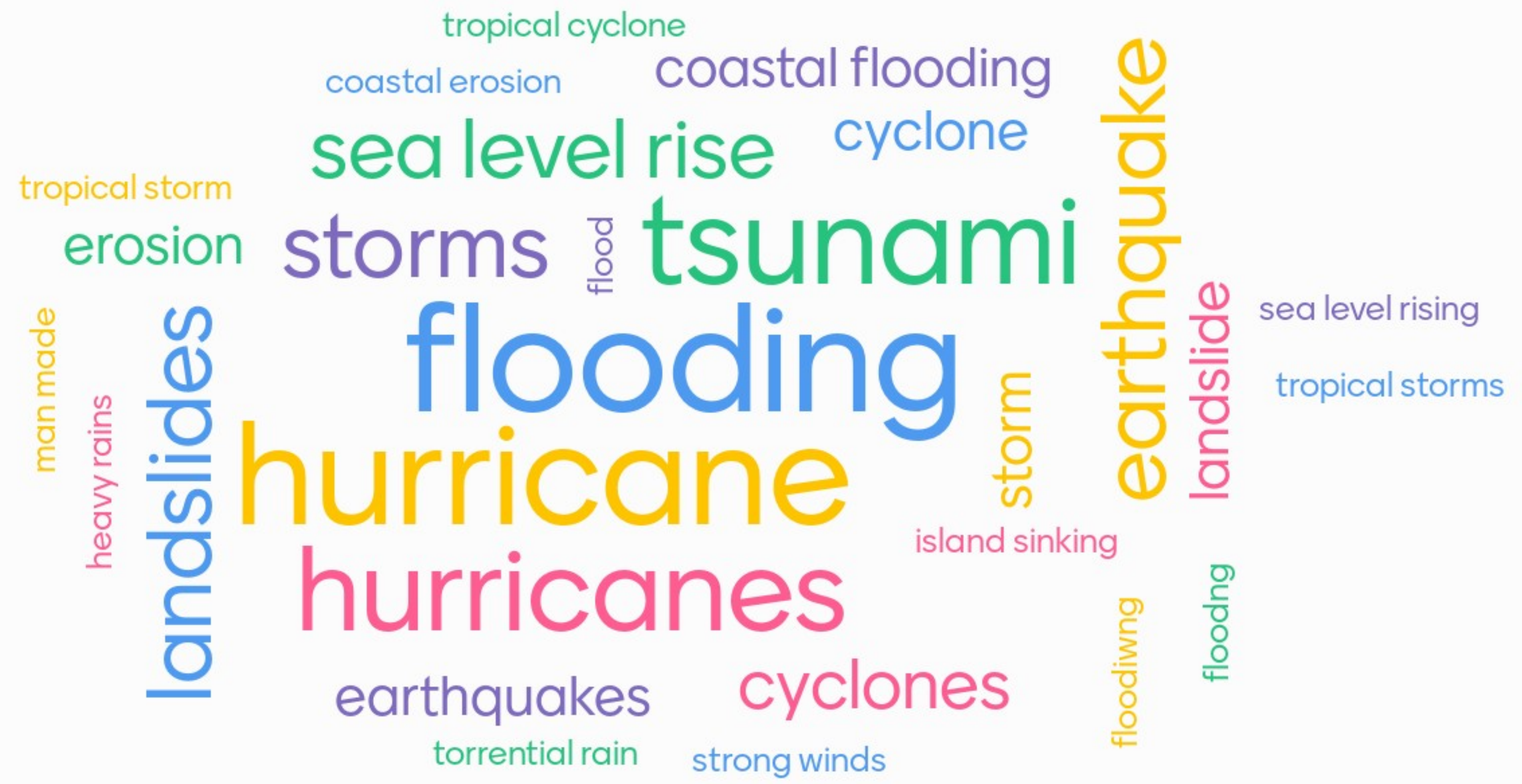
***Document, Document, Document***



# Instructions

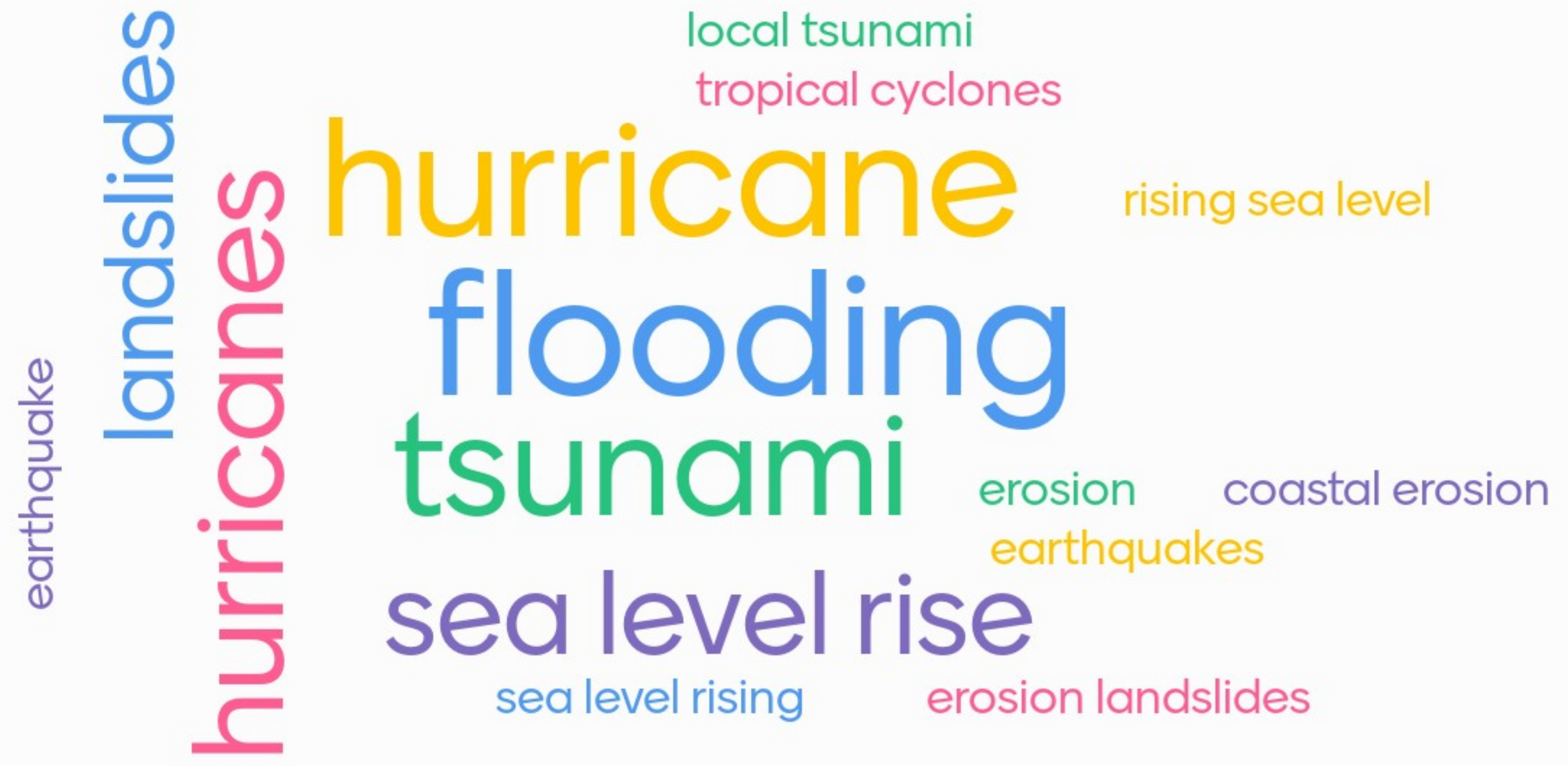


# What types of disasters occur most frequently in American Samoa?





# What type of disaster is of most concern to you?



# What is a benefit?

**Benefits** are any future costs or losses that can be avoided by completing a mitigation project

- › The difference in the costs before mitigation and costs after mitigation

$$\frac{\text{Benefits}}{\text{Costs}} = \text{BCR}$$
  
$$\text{Benefits} = \text{Costs Before Mitigation} - \text{Costs After Mitigation}$$

- › *Future costs should be included: no matter who is responsible for the cost*





# What is a benefit?

The difference between expected damage and loss **BEFORE** and **AFTER** mitigation

Benefit Categories:

- Avoided Physical Damages
- Avoided Loss of Function Costs
- Avoided Casualties
- Avoided Emergency Management Costs

## What Is a Benefit?

The benefit of a mitigation project is simply the difference in expected damage and loss before and after the project is completed. Benefits of a proposed mitigation project can be sorted into four main categories:

### *Avoided Physical Damage*

Buildings  
Contents  
Infrastructure  
Landscaping  
Site Contamination  
Vehicles  
Equipment

### *Avoided Loss-of-Function Costs*

Displacement costs for temporary quarters  
Loss of rental income  
Loss of business income  
Lost wages  
Disruption time for residents  
Loss of public services  
Economic impact of loss of utility services  
Economic impact of road/bridge closures







# How to Identify Benefits?

- › Avoided future costs/losses can include:
  - › *Physical damage*
  - › *Loss of service/function*
  - › *Injury or death*
  - › *Displacement costs*
  - › *Emergency management costs*
- › What benefit might be the result of a mitigation measure in this area?





# Benefits: Physical Damages

- › Benefit: avoided physical damages
  - › *Example: if mitigation project is an acquisition where the structure is being demolished, there is no longer any risk at that location*
- › Physical damages can include:
  - › Structural damage to buildings or infrastructure
  - › Contents damage
  - › Damage to historic/cultural resources
  - › Site contamination





# Avoided Loss of Service/Function: Type

- › Within BCA software default values and categories are available
- › Loss of:
  - Electricity
  - Potable Water
  - Wastewater
  - Roads and Bridges
  - Critical Facility Properties





# Avoided Loss of Service/Function: Values

Loss of Service Type	FEMA Standard Value
Electrical power	\$174/person/day
Potable water	\$114/person/day
Wastewater	\$58/person/day





# Additional Benefits

- › Avoided Displacement Costs
- › Avoided Emergency Management Costs
- › Avoided NFIP Administration Costs







## Other Benefits

- › In addition to avoided costs, hazard mitigation projects can have other benefits.
  - *Social benefits*
  - *Environmental benefits*





# Social Benefits

- › **Social benefits** capture the avoided costs associated with:
  - Mental stress & anxiety
  - Lost wages
- › Only projects that protect residential structures

Social Benefit	FEMA Standard Value
Mental stress & anxiety	\$2,443/person
Lost productivity	\$8,736/person





# Environmental Benefits

**Environmental benefits** are benefits resulting from an improved natural environment.

- › Applicable projects include:
  - *Acquisitions, Relocations, and Floodplain, Stream, or Coastal Restoration*
- › Default values are in software

Type of space	FEMA Standard Value
Green Open Space	\$8,308/acre/year
Riparian	\$39,545/acre/year
Wetlands	\$6,010/acre/year
Forest	\$554/acre/year
Marine & Estuary	\$1,799/acre/year





# Pre-Calculated Benefits

- › What are pre-calculated benefits?
  - FEMA **pre-calculated benefits** that provide pre-determined cost effectiveness values.
- › Pre-calculated benefits eliminate requirements to conduct a separate BCA for eligible projects:
  - Acquisitions and Elevations in the Special Flood Hazard Area (SFHA)
  - Residential Hurricane Wind Retrofits
  - Non-Residential Hurricane Wind Retrofits
  - Residential Tornado Safe Rooms
  - Post-Wildfire Mitigation
- › **Projects must still meet all other HMA application requirements**
- › *Visit software for details and amounts*

**FEMA's BCA website**





# Instructions



# How are disaster damages documented?

yes

Kinda

Yes

Yes

Much better now, than previous years.

not sure

taking photos

some but not all

hopefully



# How are disaster damages documented?

yes

Yes but inconsistent insufficient

picture

disaster report

Reports

yes

Yes

Yes

Through Detailed Damage Inspectors  
Reports (DDIR)



# How are disaster damages documented?

Photos

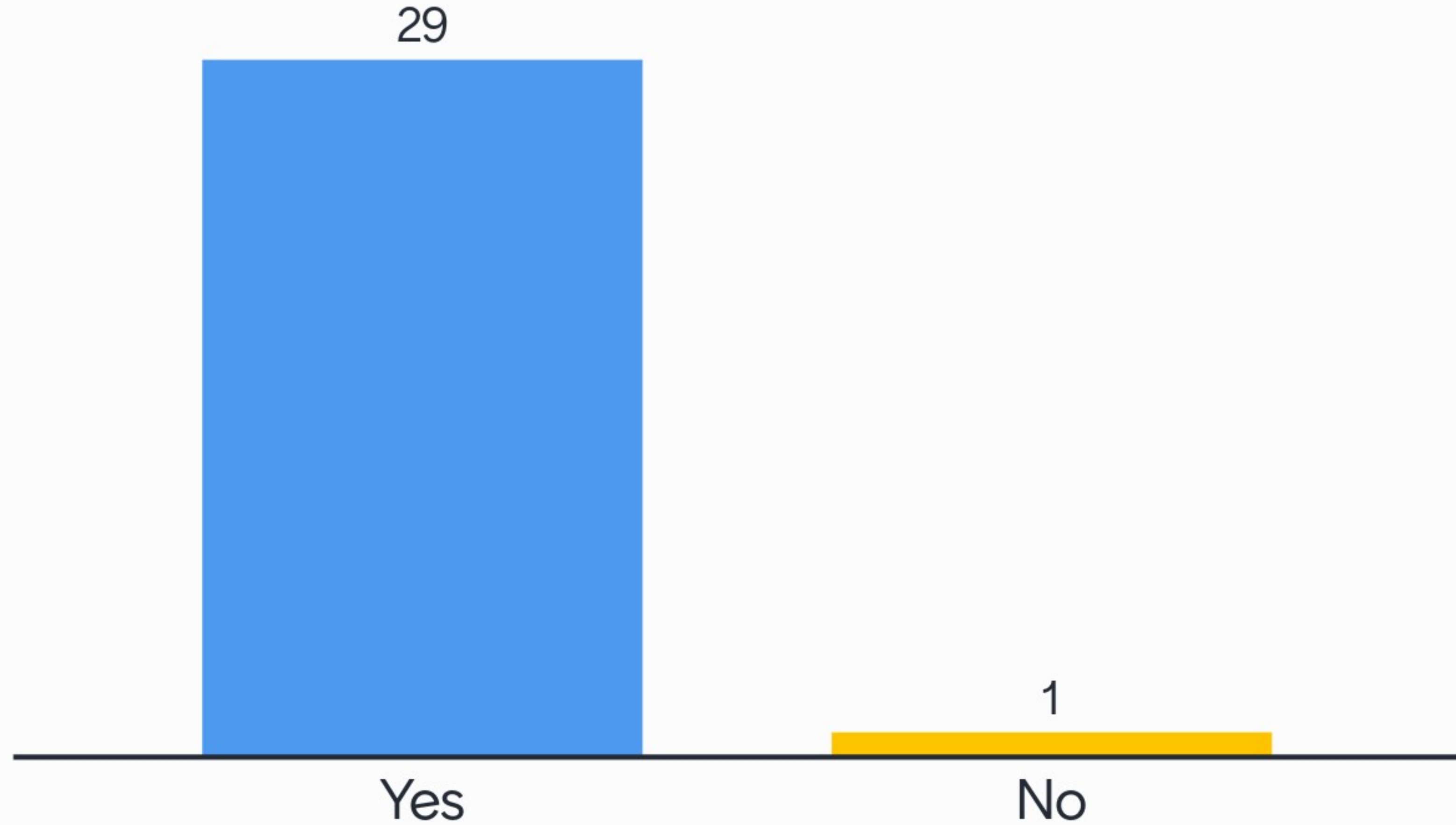
Yes No Maybe So

pics

Photos



# Do you think documentation could be better?





## What is a Damage?

- › An application must contain actual or projected damage
  - › *Clearly explain the purpose and need for the project*
- › Damage data should include:
  - › *Damage figures and dates*
  - › *Details about the storm event*



# How to Document Damages?

Sources of information for damage include:

- › Insurance claims/records
- › FEMA mapping data
  - Frequencies or Reoccurrence Intervals (RIs) linked to documented Flood Insurance Study (FIS) data
  - State NFIP representatives: repetitive loss, documented damages
- › U.S. Army Corps of Engineers (USACE)
- › U.S. Geological Survey stream gauge data or National Oceanic and Atmospheric Administration (NOAA) tide gauge data
- › Water management agencies
- › Newspaper accounts citing credible sources, such as a public agency
- › Copies of engineering/technical expert reports

## Understanding the FEMA Benefit Cost Process





# What to do with Expected Damages

If historical damage are unknown or undocumented, use Expected Damages

› Professional Expected Damages:

- Based on damage estimates from a licensed and qualified professional with known recurrence intervals (RI)
- Identified RI(s) and estimated damages for each event.
- Must identify and document data

› Examples:

- *Hydrology and hydraulics (H&H) studies that indicate expected flood damages*
- *Technical studies containing project area*
- *Qualified engineer report and/or analysis*
- *Hazus with project specific depth grids*

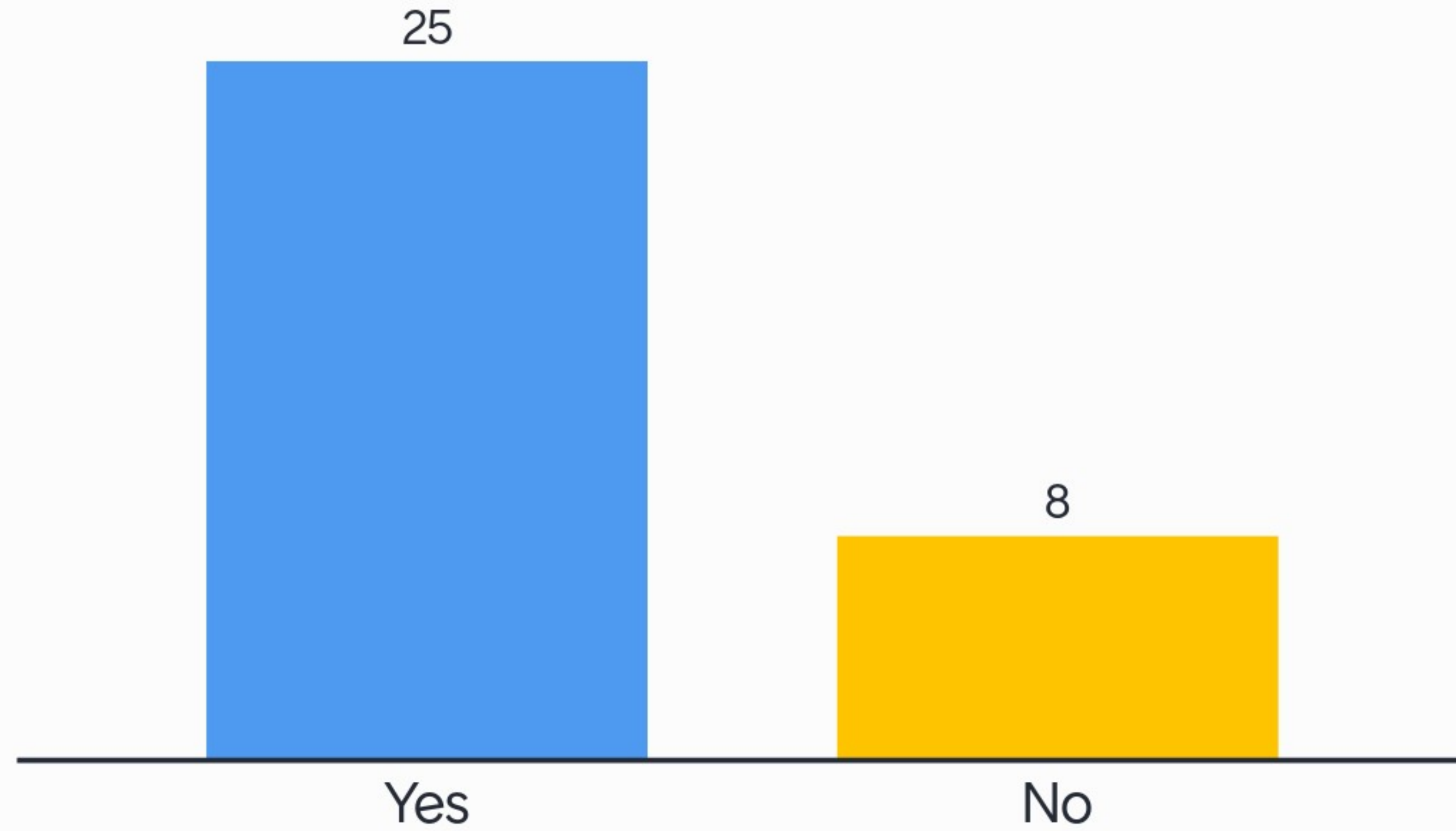




# Instructions



# Has you ever viewed your FEMA flood map data?





# Recurrence Interval (RI)

A **recurrence interval (RI)** is how often a hazard event of specific severity is likely to occur in a particular location.

- › An RI is often talked about as the “X-year” or “Y% annual chance” event
  - For example, the “100-year flood” is the 1% annual chance flood, meaning that in any given year, there is a 1% chance it will occur.

Historical Damages Before Mitigation

Damages Before Mitigation

+ Add Row    🗑️ Delete Row(s)

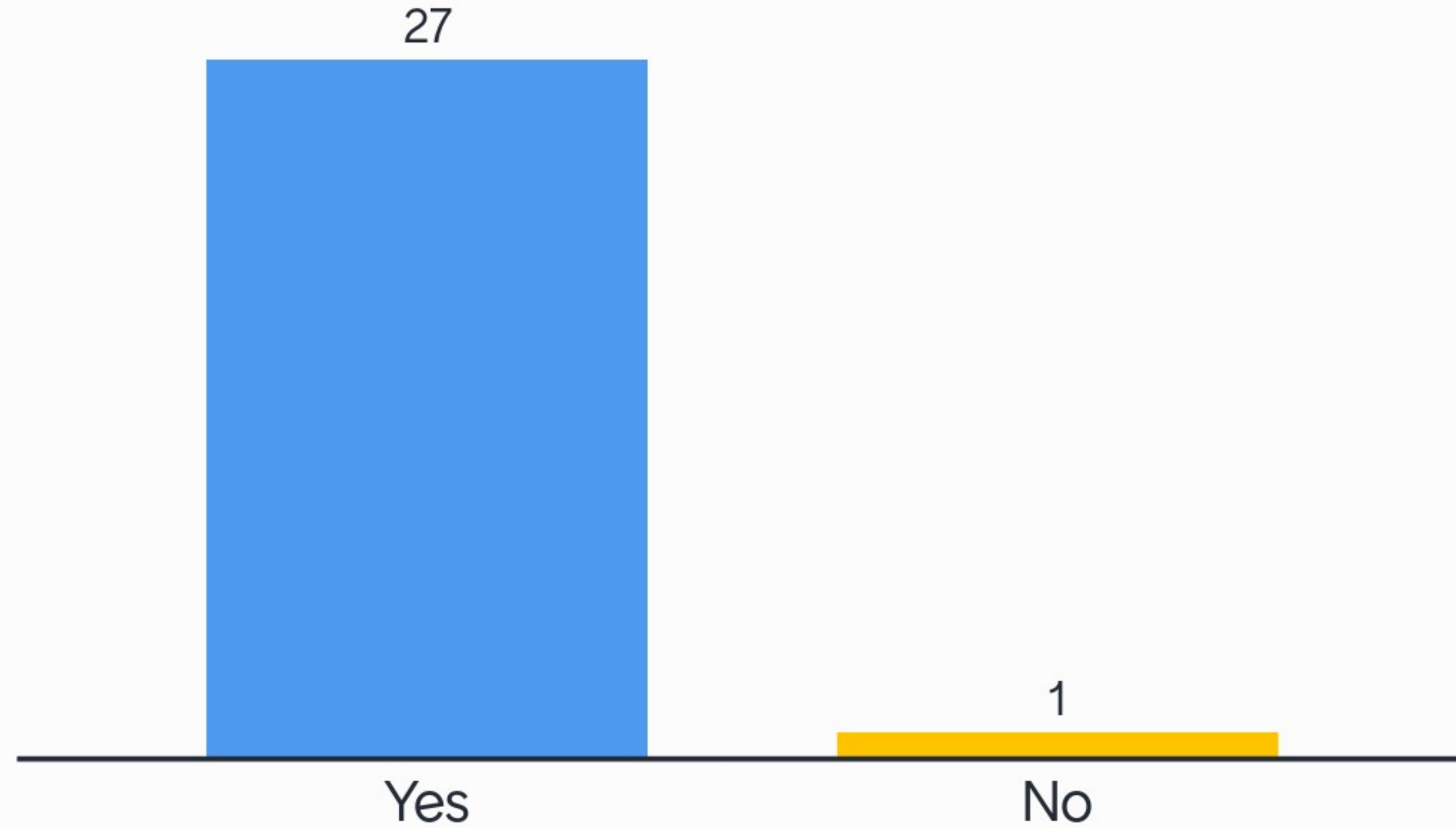
SELECT	DAMAGE YEAR	RECURRENCE INTERVAL (YEARS)	DAMAGES (\$)	Category 1 (\$)	OTHER
<input type="checkbox"/>	0	10.00	1,500	0	0
<input type="checkbox"/>	0	50.00	25,000	0	0
<input type="checkbox"/>	0	100.00	2,300	0	0

View Annualized Results





# Do you know where to find your FEMA flood map data?





# FEMA Flood Map Data Locations

- FEMA Map Service Center: <https://msc.fema.gov/portal/home>
- FEMA National Flood Hazard Layer Viewer: <https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd>





# Unknown Recurrence Interval

If specific Recurrence Intervals are not known for a damage event, the BCA Tool provides an Unknown Frequency Calculator.

- › The Unknown Frequency Calculator can determine and use the recurrence intervals as long as the Damage Year is known for at least three historic events.
  - Must have documentation for at least **THREE** occurrences/events
- › Damage years **MUST** be within the project's analysis duration (*Year Built to Year Analysis Conducted*)

Historical Damages Before Mitigation

Damages Before Mitigation

+ Add Row    Delete Row(s)

SELECT	DAMAGE YEAR	RECURRENCE INTERVAL (YEARS)	OTHER DAMAGES (\$)	Category 1 (\$)
<input type="checkbox"/>	1999	0	2,500.00	0.00
<input type="checkbox"/>	2004	0	20,000.00	0.00
<input type="checkbox"/>	2012	0	5,000.00	

View Annualized Results





# Project Effectiveness

**Project effectiveness** measures how well the project will reduce future damages

- › Is the level of protection being increased?
  - *Yes > move forward with project BCA*
  - *No > back to drawing board*
- › After Mitigation Damages:
  - *Only structure acquisition/demolition projects are 100% effective – i.e., they have \$0 costs after mitigation*
  - *ALL other project types assume some (but reduced) hazard risk upon project completion—this is called **residual risk***





# Overview of Software: Advice

It is extremely important to keep in mind that the BCA Toolkit is a calculator, not a data validation or analysis tool.

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Properly sourced and documented data sources are always required as part of your project application!

***Document, Document, Document***

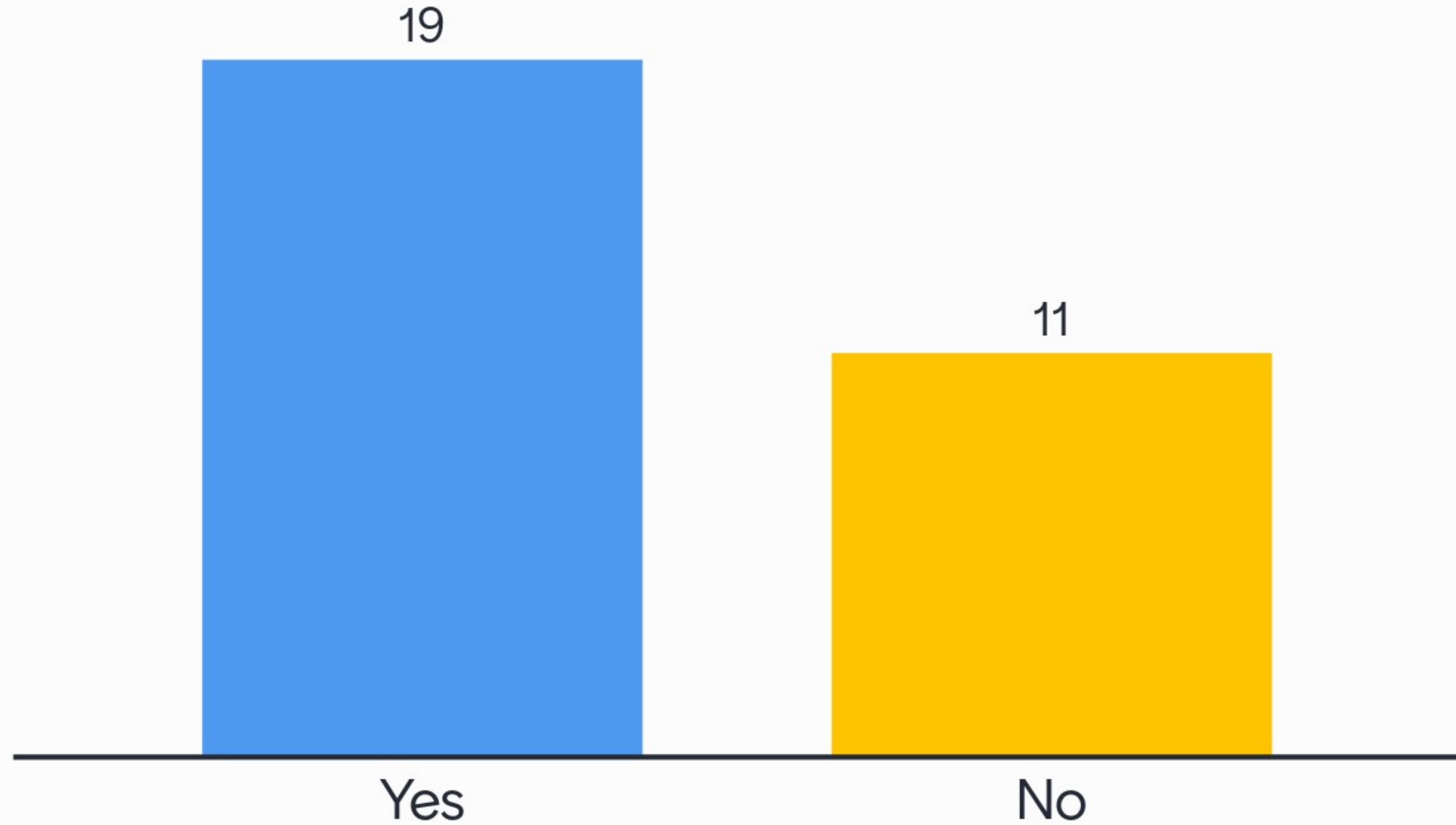




# Instructions



# Do you know where to get BCA input data?





# Can you think of resources in your area? Please share them.

ODAPM old projects

Odapm

JUST COME TO PUBLIC WORKS

ODAPM

DOC Utilities DPW ODAPM

Dpw

TECHNICAL STUDIES

DOC Maps

Doc



# Can you think of resources in your area? Please share them.

stats from ODAPM, DOC

DHS; TEMCO; DPW; DOC; ODAPM

Statistical YB DPW Technical Studies  
Utilities

Other departments

epa

DPW, DHS, ODAPM, SamoaNews,  
Library or Archives

Statistical yearbook

google

odapm/ Public works/ASPA/ ASTCA/



# Can you think of resources in your area? Please share them.

DOC GIS, Stats division at DOC

Public library

master plans?

ASG, MWR, FBPL,

old projects



# Documentation Best Practices



**DOCUMENT ALL DATA,  
NUMBERS, INFORMATION,  
ANYTHING SUBMITTED IN  
AND WITH THE BCA**



**ORGANIZE LIKE TELLING A  
STORY OF THE DAMAGE:  
WHAT, WHERE, WHY, HOW**



**PICTURES! PICTURES OF  
DAMAGE AND/OR DAMAGE  
EVENT DOCUMENTS  
OCCURRENCE AND  
SEVERITY (IN SOME CASES)**





# Documenting Data

- › Document and Communicate the Data that is being used within the BCA Software
  - *Provide all data used in the BCA so a review could recreate the BCA and get the same BCR*
  
- › Suggestion: Use the FEMA Data Documentation Template (DDT) to identify numbers and data used for BCA Software input





## Professional Expected Damages Before Mitigation

### Damages Before Mitigation

+ Add Row    🗑️ Delete Row(s)

ROADS AND BRIDGES			OPTIONAL DAMAGES	
SELECT	RECURRENCE INTERVAL (YEARS)	IMPACT (DAYS)	Road Damages	Building Damages
<input type="checkbox"/>	1	1	15,405	0
<input type="checkbox"/>	50	0		

View Annualized Results

Documentation Summary	Potential Sources	Software Input/Justification
<p><u>1-year Recurrence Interval Damage</u>                      Road Damage amount: \$15,405</p> <ul style="list-style-type: none"> <li>• 24-hour work turnaround</li> <li>• Road clean-up</li> <li>• Repaving</li> <li>• Cement stabilization sand</li> <li>• Stabilization of road infrastructure for safety</li> </ul> <p>Loss of Road:</p> <ul style="list-style-type: none"> <li>• 1 day: duration of when the road will be receiving repair</li> </ul>		<ul style="list-style-type: none"> <li>• Erosion Rate Calculations.xls</li> <li>• Matagorda County Structure Damage_Revision.xls</li> <li>• Residential Structure Info.xls</li> <li>• Matagorda County Data Documentation_RFI.pdf (Pages 3-20)</li> </ul>





# Organizing Data

- › Tell the project's "story"
- › Include source references for ALL data within the BCA
- › Organize documented data in relation to how it is used in the BCA
  - *Tip: Place all documentation data within one pdf file – all data and sources in one spot*
  - *Tip: Divide up documentation data reflecting the Software categories, such as 'Cost Estimation' page to designate data related to Cost*
  - *Tip: Have all documentation on letterhead with designation of agency providing data*





# Traffic Counts/ Detours

**Wright, Stacy F**

**From:** [Redacted]  
**Sent:** [Redacted]  
**To:** Wright, Stacy F  
**Cc:** Kendro, Hilary A  
**Subject:** Lakeland Village - Av

Stacy,

**From our Transportation Department:**

**Grand Avenue – 15,532 trips per day (2013)**  
**Adelpha Street – 1,780 trips per day (2009)**

Best Regards,

Mark H. Wills

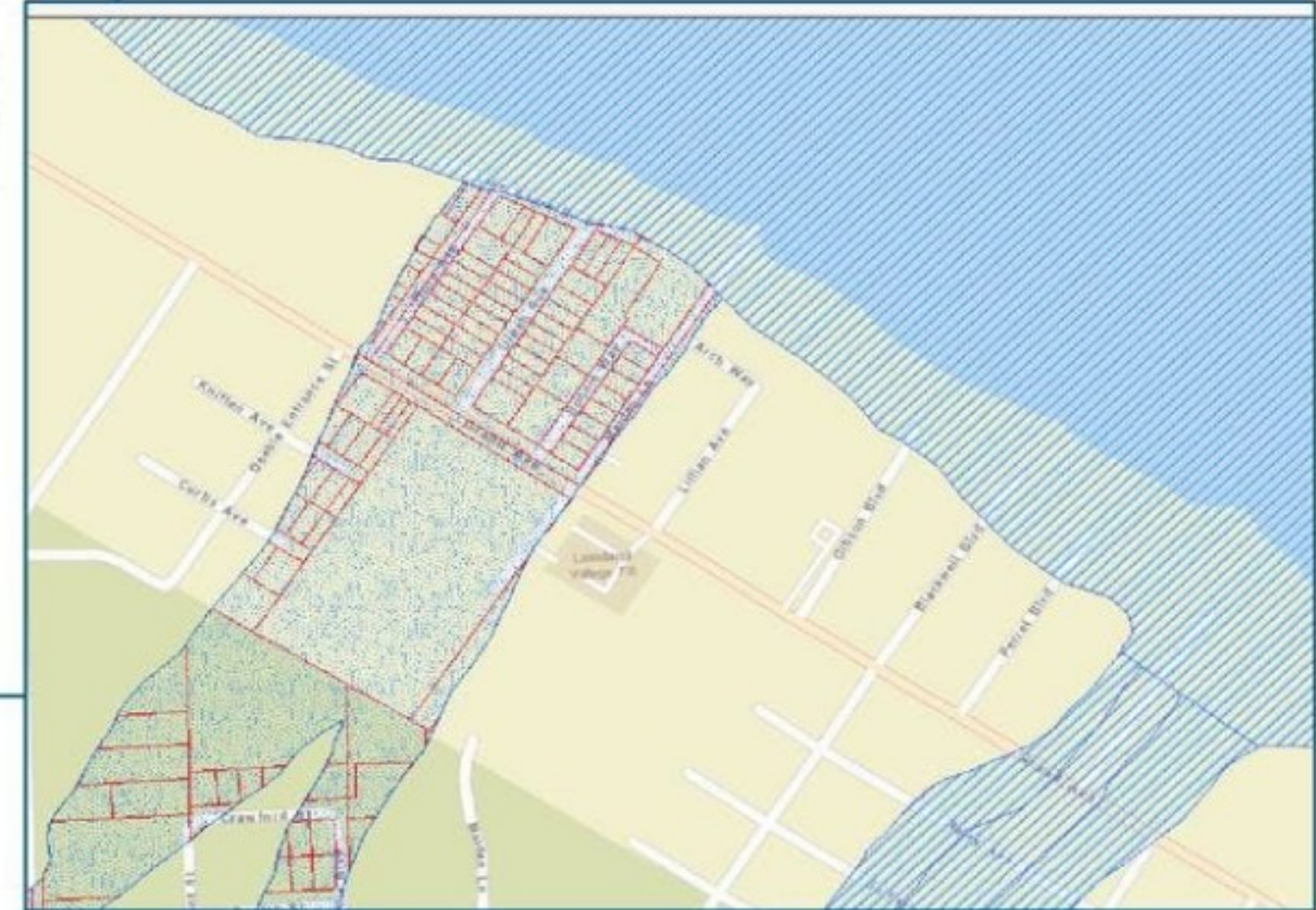
Google Maps 17280 Grand Ave, Lake Elsinore, CA 92530 to Drive 15.9 miles, 29 min  
17390-17400 Cottrell Blvd, Lake Elsinore, CA 92530



via Grand Ave 29 min  
29 min without traffic 15.9 miles

Google Maps

Detour if project  
area portion of  
Grand Ave is closed





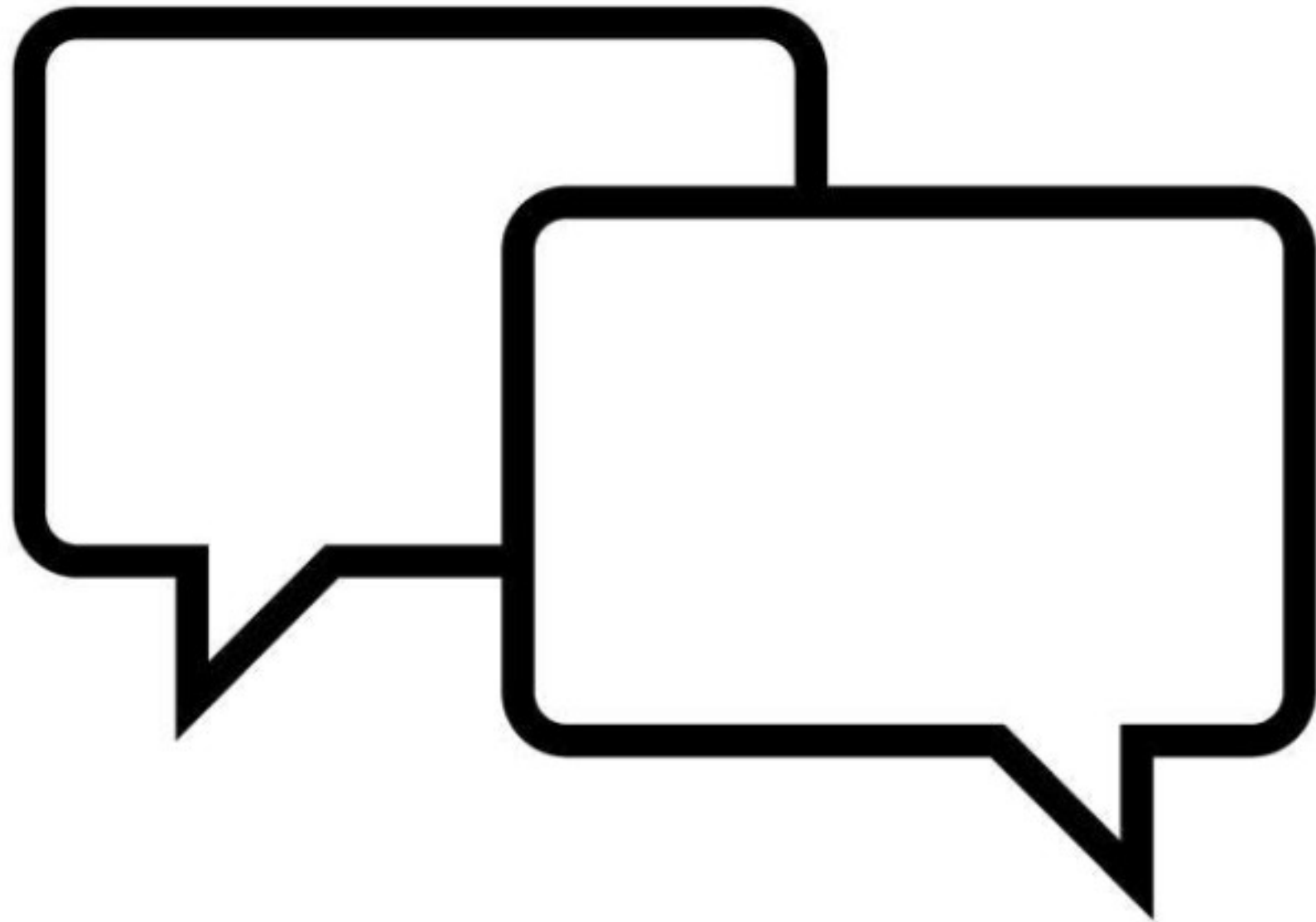
# References

## Helpful Online References:

- › [FEMA Benefit Cost Analysis Toolkit](#)
- › [Understanding the FEMA Benefit-Cost Analysis Process](#)
- › [FEMA BCA Reference Guide](#)
- › [FEMA Supplement to the Benefit-Cost Analysis Reference Guide](#)
- › [BCA Software Guidance](#)







## Contact:

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[lima.fiatoa@odapm.as.gov](mailto:lima.fiatoa@odapm.as.gov)

(684) 699-1329





# BCA Examples

## Example Project Types:

- Shutters
  - Disaster: Hurricane
- Damage Frequency Assessment (DFA)
  - Disaster: Riverine Flooding
- Modeled Damage
  - Disaster: Coastal Flooding





# Documentation

# Examples