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FEMA Benefit-Cost Analysis 101

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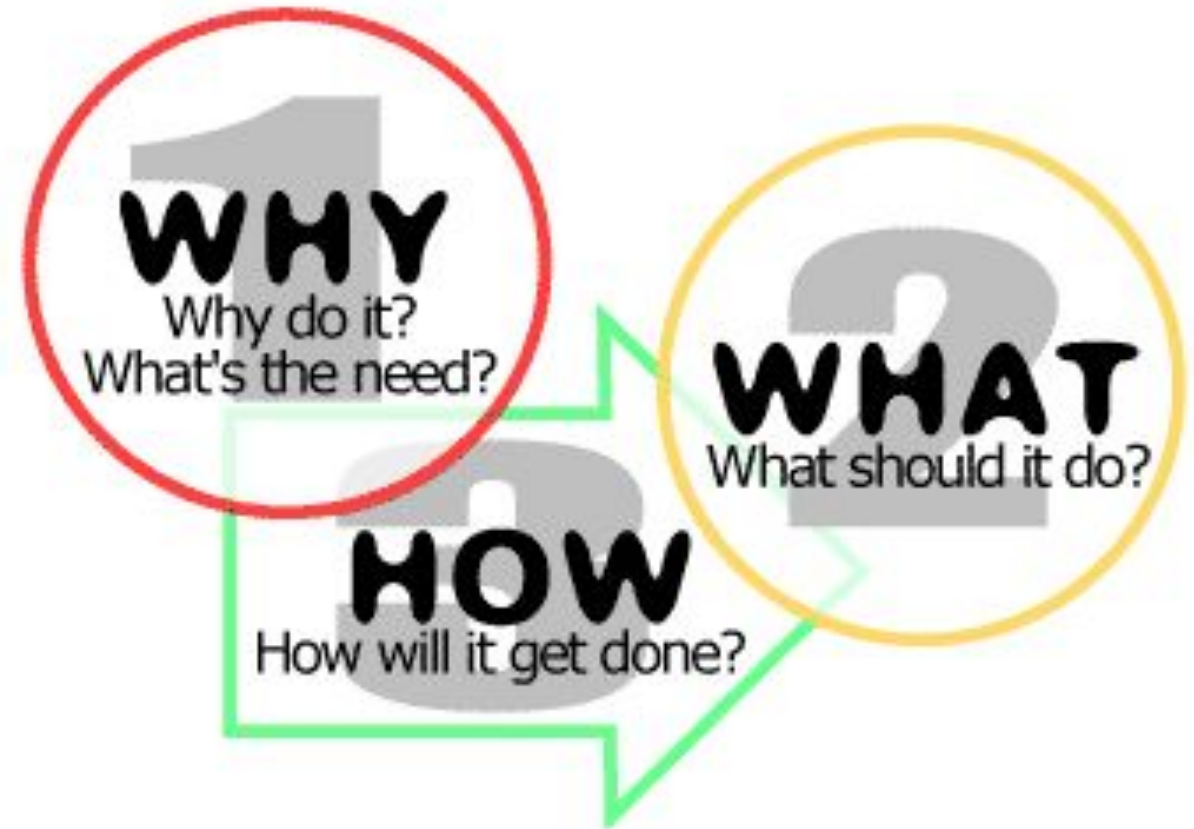
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Annual Conference 2023

Outline

- Background
- Overview
- Technical Part
- Takeaways



Acronyms: Benefit Cost Analysis (BCA) ; Benefit Cost Ratio (BCR)

Background

- **Applicability of BCA**
- **BCA/BCR required for certain FEMA grants, e.g.,**
 - * **Flood Mitigation Assistance (FMA)**
 - * **Building Resilient Infrastructure and Communities (BRIC)**

The Evolution of the 1936 Flood Control Act





Project subapplication

[Subapplicant information](#)

Contact information

Community

Mitigation plan

Scope of work

Schedule

Location


Project location

Project benefiting area

Project impact area

Project site inventory

Budget

 [Cost-effectiveness](#)

Environmental/Historic Preservation (EHP) Review Information

A. National Historic Preservation Act - Historic Buildings and Structures

B. National Historic Preservation Act - Archeological Resources

Overview

- **Definition: BCA | BCR**
- **BCA Methods**
- **FEMA BCA Toolkit**

$$\text{Benefit-Cost Ratio} = \frac{\text{PV of Benefit Expected from the Project}}{\text{PV of the Cost of the Project}}$$



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Grants

Tools

Benefit-Cost Analysis

How to Complete a Streamlined BCA

How to Perform a Full BCA

Benefit-Cost Analysis

English Español

How to Comply

Get the BCA Toolkit

Resources & Support

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

FEMA BCA Toolkit(v 6.0) – Template File (*.xlsx)

The screenshot shows the Microsoft Excel interface with the 'FEMA BCA Toolkit v6.0.0' ribbon tab active. The ribbon includes sections for Home, Insert, Page Layout, Formulas, Data, Review, View, Automate, and Help. The 'FEMA BCA V6.0' add-in is highlighted with an orange circle. The main content area displays a 'Welcome' message and 'Getting Started' instructions.

Welcome

Benefit-Cost Analysis (BCA) is the method by which the future benefits of a hazard mitigation project are determined and compared to its costs.

The end result is a Benefit-Cost Ratio (BCR), which is calculated by a project's total benefits divided by its total costs.

FEMA requires a BCA to validate cost effectiveness of proposed hazard mitigation projects prior to funding.

For a community and/or property, this tool will assist with:

- Estimating Annual Hazard Risks
- Evaluating Mitigation Cost Effectiveness
- Developing Aggregate Benefit-Cost Models

For more information, including methodologies of the calculation models used in this tool, visit [FEMA BCA Website](#).


Getting Started

Click on the "BCA Calculator" button on the ribbon bar.

The 'FEMA BCA V6.0' button is highlighted with an orange circle in the 'Add-Ins' section of the ribbon.

FEMA BCA Toolkit (v 6.0) – Template File (*.xlsx)


FEMA BCA Calculator - [https://bcaofficeaddin-prod.azurewebsites.net/projects?_host_Info=Excel\\$Win32\\$16.01\\$en-US\\$telemetry\\$Dialog\\$0](https://bcaofficeaddin-prod.azurewebsites.net/projects?_host_Info=Excel$Win32$16.01$en-US$telemetry$Dialog$0)



FEMA | Benefit-Cost Calculator
V.6.0 (Build 20230324.2039 | Release Notes)

+ Add Project ← Import Projects → Export Projects 📄 Batch Processing 🗑 Delete Projects

Select	Project Title ▼	County, State	Using 7% Discount Rate			Using 3% Discount Rate (For FY22 BRIC and FMA only)			Copy
			Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
There are currently no projects in this file.									
TOTAL (SELECTED)			\$ 0	\$ 0	0.00	\$ 0	\$ 0	0.00	
TOTAL			\$ 0	\$ 0	0.00	\$ 0	\$ 0	0.00	

 View Case Studies



Floodproofing Measures @ 2 Post Rd E, Westport, Connecticut, 06880

Hypothetical Example / Data

Project Configuration

Project Title:

Property Location: Use Property Location? Yes

OR

Latitude: Longitude: Use Decimal Degrees? Yes

Property Structure Type:

Hazard Type:

Mitigation Action Type:

Property Title:

Damage and Frequency Relationship based on: Modeled Damages Historical Damages Professional Expected Damages

Color Legend:
- White (input)
- Gray (calculated)

Cost Estimation

Enter the Project Useful Life (years):

Enter the Initial Project Costs (\$):

Enter the Number of Maintenance Years:

Enter the Annual Maintenance Costs (\$):

Total Mitigation Project Cost (\$):

NEXT



Benefit-Cost Calculator

V.6.0 (Build 20230324.2039 | Release Notes)

- Home
- Project Summary
- Project Configuration**

Benefit-Cost Analysis

Project Name: Test Example RIFMA 2023

Hazard Type: Coastal A Flood

Mitigation Action Type: Floodproofing Measures

Property Type: Non-Residential Building

Hazard Probability Parameters - Flood

Enter the Lowest Floor Elevation of the Property (ft):

9.2

Enter the Ground Surface Elevation (ft):

9.2

Enter the Base Flood Elevation (ft):

10

Elevation for the Top of Barrier or Floodproofing (ft):

11

Enter Additional Projected Sea Level Rise above BFE (ft):

1.7

Basic building elevations

Enter below the Recurrence Interval and corresponding Water Surface Elevation:

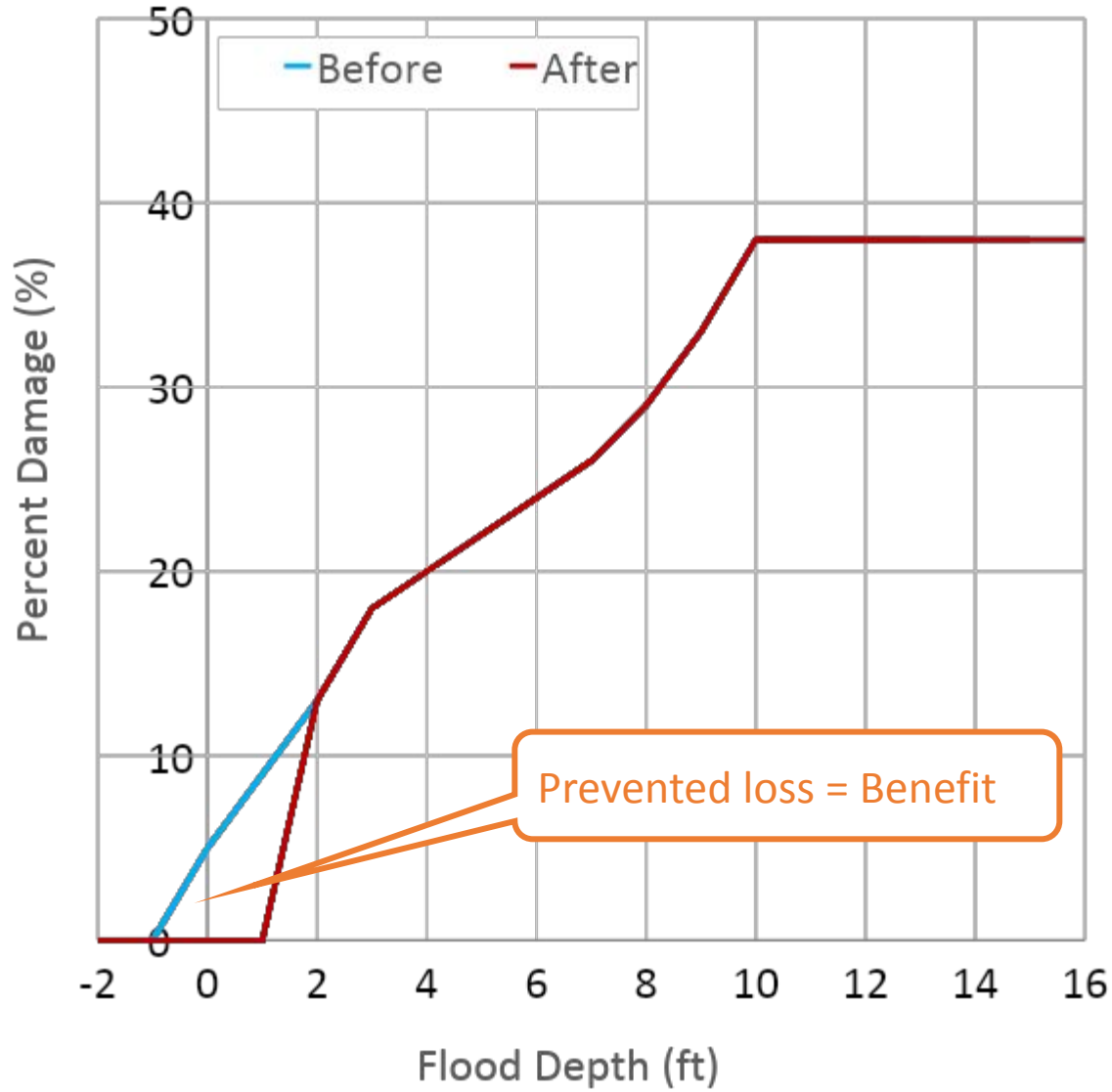
Use Default Recurrence Intervals?

Yes

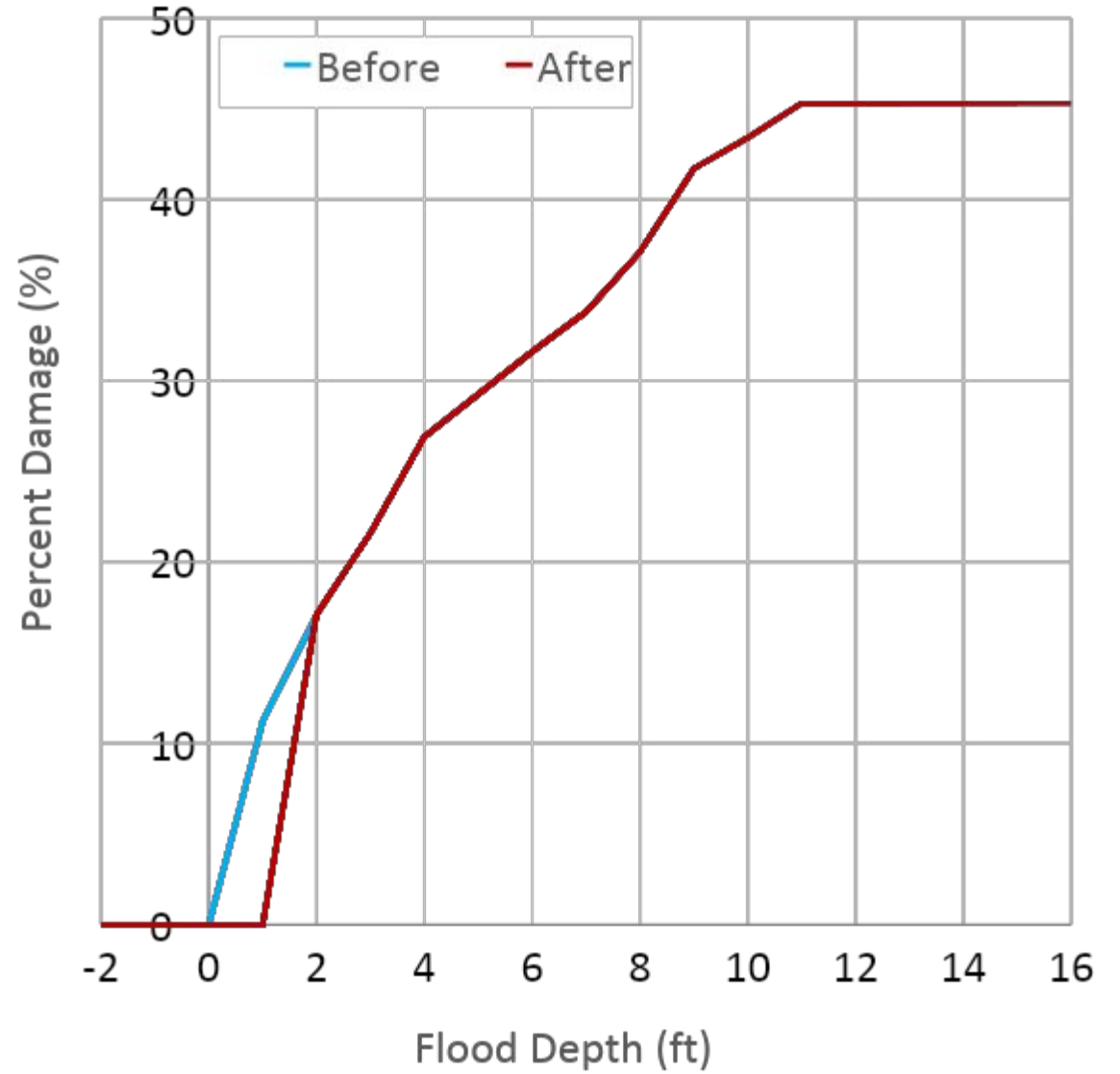
Recurrence Interval (years)	BEFORE MITIGATION	
		Stillwater Elevation (ft)
10		8.4
50		9.5
100		10
500		11

FEMA stillwater elevations

Residential



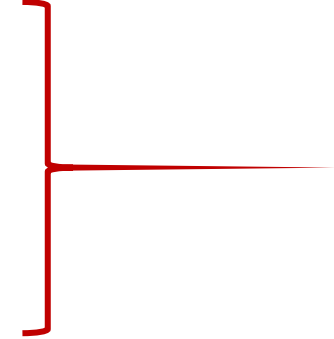
Commercial



Building Information



- Is the building elevated on an open foundation? No
- Is there an obstruction below the lowest horizontal structural member? No
- Building Use:
- Building Type:
- Is the Building Located Outside a Hundred-Year Flood Zone? Yes
- Is the Building Engineered? Yes
- Does the Building have an Active NFIP Policy? Yes



Standard Benefits - Building



- Select Damage Curve:
- Enter the First Floor Area (sq.ft):
- Enter Building Size (sq.ft):
- Building Replacement Value (\$/sq.ft): Use Default? Yes
- Demolition Threshold (%): Use Default? Yes
- Expected Annual Losses due to Building Damages before Mitigation (\$):
- Expected Annual Losses due to Building Damages after Mitigation (\$):
- Expected Annual Benefits - Building (\$):

[View Damage Curve](#)

Standard Benefits - Contents



Enter Contents Value (\$):	195,000	Use Default (65% of BRV) ? <input checked="" type="checkbox"/> Yes	
Expected Annual Losses due to Content Damages before Mitigation (\$):	8,309		
Expected Annual Losses due to Content Damages after Mitigation (\$):	2,804		
Expected Annual Benefits - Content (\$):	5,504		

[View Damage Curve](#)

Standard Benefits - Displacement



Monthly Cost of Temporary Space (\$/sq.ft/month):	1.36	Use Default? <input checked="" type="checkbox"/> Yes	
One-time Displacement Cost (\$/sq.ft):	0.95	Use Default? <input checked="" type="checkbox"/> Yes	
Expected Annual Losses due to Displacement Damages before Mitigation (\$):	7,393		
Expected Annual Losses due to Displacement Damages after Mitigation (\$):	2,956		
Expected Annual Losses - Displacement (\$):	4,437		

[View Damage Curve](#)

Standard Benefits - Loss of Function/Loss of Income



Annual Operating Budget (\$):	50,000,000	
Loss of Function (\$/day):	136,986.30	
Expected Annual Losses due to Loss of Function/Loss of Income before mitigation (\$):	1,281,019	
Expected Annual Losses due to Loss of Function/Loss of Income after mitigation (\$):	478,229	
Expected Annual Benefits - Loss of Function/Loss of Income (\$):	802,790	

[View Damage Curve](#)

Standard Benefits - Volunteer Costs



Number of Volunteers Required:	<input type="text" value="0"/>
Enter the Number of Days Lodging for Volunteers:	<input type="text" value="0"/>
Enter the Per-Person Cost of Lodging for a Volunteer (\$):	<input type="text" value="125"/>
Expected Annual Volunteer Benefits (\$):	<input type="text" value="0.00"/>

Use Default? Yes



Benefit-Cost Summary



Total Standard Mitigation Benefits (\$):	\$ 10,138,412
Total Mitigation Project Benefits (\$):	\$ 10,138,412
Total Mitigation Project Cost (\$):	\$ 5,248,181
Benefit Cost Ratio - Standard:	1.93
Benefit Cost Ratio - Standard + Social:	1.93

Analysis at 3%



FINISH



FEMA

Benefit-Cost Calculator

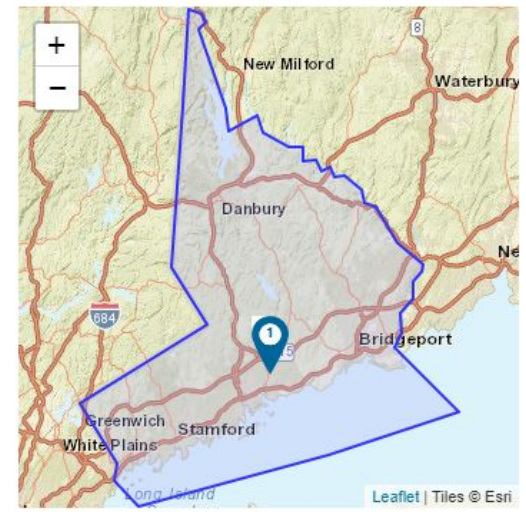
V.6.0 (Build 20230324.2039 | Release Notes)

Benefit-Cost Analysis

Project Name: Test Example RIFMA 2023

Home + Add Mitigation Action Delete Mitigation Actions View Report

Select	Map Marker	Mitigation Title	Property Type	Hazard	Using 7% Discount Rate			Using 3% Discount Rate (For FY22 BRIC and FMA only)			Copy
					Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
<input checked="" type="checkbox"/>	1	Floodproofing Measures @ 2 Post Rd E, Westport, Connecticut, 06880		Coastal A Flood	\$ 10,138,412	\$ 5,248,181	1.93	\$ 16,013,916	\$ 5,392,009	2.97	
TOTAL (SELECTED)					\$ 10,138,412	\$ 5,248,181	1.93	\$ 16,013,916	\$ 5,392,009	2.97	
TOTAL					\$ 10,138,412	\$ 5,248,181	1.93	\$ 16,013,916	\$ 5,392,009	2.97	



Reduced Annual Operating Budget to \$20M



Benefit-Cost Calculator

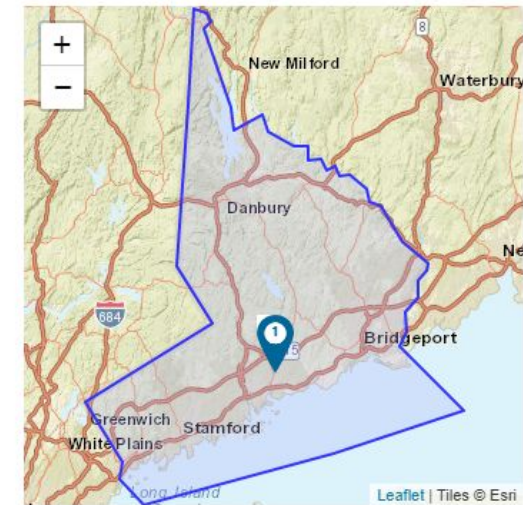
V.6.0 (Build 20230324.2039 | Release Notes)

Benefit-Cost Analysis

Project Name: Test Example RIFMA 2023

[Home](#)
[+ Add Mitigation Action](#)
[Delete Mitigation Actions](#)
[View Report](#)

Select	Map Marker	Mitigation Title	Property Type	Hazard	Using 7% Discount Rate			Using 3% Discount Rate (For FY22 BRIC and FMA only)			Copy
					Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
<input checked="" type="checkbox"/>	1	Floodproofing Measures @ 2 Post Rd E, Westport, Connecticut, 06880		Coastal A Flood	\$ 4,161,299	\$ 5,248,181	0.79	\$ 6,572,892	\$ 5,392,009	1.22	
TOTAL (SELECTED)					\$ 4,161,299	\$ 5,248,181	0.79	\$ 6,572,892	\$ 5,392,009	1.22	
TOTAL					\$ 4,161,299	\$ 5,248,181	0.79	\$ 6,572,892	\$ 5,392,009	1.22	



Standard Benefits - Displacement



Current Federal Lodging Per Diem (\$/night):
Current Federal Meals Per Diem (\$/day):
Enter the Number of Building Residents:
Total Displacement Cost (\$):
Expected Annual Losses due to Displacement Damages before Mitigation (\$):
Expected Annual Losses due to Displacement Damages after Mitigation (\$):
Expected Annual Losses - Displacement (\$):

125
69
12
869
88
81
7

Use Default? Yes
Use Default? Yes



View Damage Curve

Standard Benefits - Volunteer Costs



Number of Volunteers Required:
Enter the Number of Days Lodging for Volunteers:
Enter the Per-Person Cost of Lodging for a Volunteer (\$):
Expected Annual Volunteer Benefits (\$):

10
5
125
8,225.2

Use Default? Yes



Additional Benefits - Social

Note: Available only if a Residential property and Standard Benefits are greater than zero.



How many of the 12 Resident(s) work?
Expected Annual Social Benefits (\$):

12
134,148





Benefit-Cost Calculator

V.6.0 (Build 20230324.2039 | [Release Notes](#))

- [+ Add Project](#)
- [← Import Projects](#)
- [→ Export Projects](#)
- [📄 Batch Processing](#)
- [🗑 Delete Projects](#)

Select <input checked="" type="checkbox"/>	Project Title ▼	County, State	Using 7% Discount Rate			Using 3% Discount Rate (For FY22 BRIC and FMA only)			Copy
			Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)	
<input checked="" type="checkbox"/>	Test Example RIFMA 2023	Fairfield, CT	\$ 4,161,299	\$ 5,248,181	0.79	\$ 6,572,892	\$ 5,392,009	1.22	
<input checked="" type="checkbox"/>	Test Example RIFMA 2023 [Copied on 5/22/2023 @ 17:17:46]	Fairfield, CT	\$ 2,540,120	\$ 5,248,181	0.48	\$ 3,934,452	\$ 5,392,009	0.73	
TOTAL (SELECTED)			\$ 6,701,419	\$ 10,496,362	0.64	\$ 10,507,344	\$ 10,784,018	0.97	
TOTAL			\$ 6,701,419	\$ 10,496,362	0.64	\$ 10,507,344	\$ 10,784,018	0.97	

Key Takeaways:



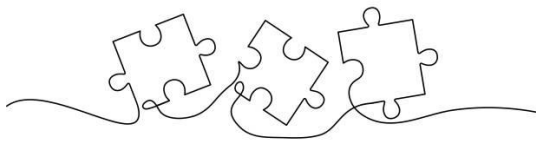
BCA important for applying grants

Fill data gaps / check input data

Make reasonable assumptions

Perform sensitivity analysis

Look out for FEMA trainings and webinars



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