FEMA Benefit-Cost Analysis (BCA)
WIFI
ODAPM: HM
password: odampnzmzmit
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?

- **YES**: 9
- **NO**: 15
Have you heard the term ‘BCA’?

- Yes: 27
- No: 5
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

![Diagram of a balance scale with Project Benefits on the left and Project Costs on the right.]
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?

- Yes: 7
- No: 23
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 (E0270), 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?

- sea level rise
- tropical cyclone
- coastal flooding
- cyclone
- hurricane
- landslides
- erosion
- tsunami
- flooding
- earthquake
- storm
- island sinking
- strong winds
- torrential rain
- man-made
- heavy rains
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

\[
\text{Benefits} = \frac{\text{Costs}}{\text{Costs}} = \text{BCR}
\]

- **Benefits** = Costs Before Mitigation - 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
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

<table>
<thead>
<tr>
<th>Loss of Service Type</th>
<th>FEMA Standard Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical power</td>
<td>$174/person/day</td>
</tr>
<tr>
<td>Potable water</td>
<td>$114/person/day</td>
</tr>
<tr>
<td>Wastewater</td>
<td>$58/person/day</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Social Benefit</th>
<th>FEMA Standard Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental stress &amp; anxiety</td>
<td>$2,443/person</td>
</tr>
<tr>
<td>Lost productivity</td>
<td>$8,736/person</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Type of space</th>
<th>FEMA Standard Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Open Space</td>
<td>$8,308/acre/year</td>
</tr>
<tr>
<td>Riparian</td>
<td>$39,545/acre/year</td>
</tr>
<tr>
<td>Wetlands</td>
<td>$6,010/acre/year</td>
</tr>
<tr>
<td>Forest</td>
<td>$554/acre/year</td>
</tr>
<tr>
<td>Marine &amp; Estuary</td>
<td>$1,799/acre/year</td>
</tr>
</tbody>
</table>
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
<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Kinda</th>
<th>Yes</th>
<th>not sure</th>
<th>hopefully</th>
</tr>
</thead>
<tbody>
<tr>
<td>taking photos</td>
<td></td>
<td></td>
<td>Much better now, than previous years.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How are disaster damages documented?

- yes
- Yes but inconsistent insufficient
- picture
- disaster report
- Reports
- yes
- Yes
- Through Detailed Damage Inspectors Reports (DDIR)
<table>
<thead>
<tr>
<th>Photos</th>
<th>Yes No Maybe So</th>
<th>pics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Do you think documentation could be better?

Yes: 29
No: 1
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?

- Yes: 25
- No: 8
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.
Do you know where to find your FEMA flood map data?

27 Yes
1 No
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*)
Project Effectiveness

Project effectiveness measures how well the project will reduce future damages

› Is the level of protection being increased?
  o Yes > move forward with project BCA
  o No > back to drawing board

› After Mitigation Damages:
  o Only structure acquisition/demolition projects are 100% effective – i.e., they have $0 costs after mitigation
  o 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.

**Garbage in = garbage out**

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?

Yes: 19
No: 11
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

1. Document all data, numbers, information, anything submitted in and with the BCA.

2. Organize like telling a story of the damage: what, where, why, how.

3. 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
<table>
<thead>
<tr>
<th>SELECT</th>
<th>RECURRENCE INTERVAL (YEARS)</th>
<th>IMPACT (DAYS)</th>
<th>Road Damages</th>
<th>Building Damages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>15,405</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Documentation Summary**

1-year Recurrence Interval Damage

- Road Damage amount: $15,405
- 24-hour work turnaround
- Road clean-up
- Repaving
- Cement stabilization sand
- Stabilization of road infrastructure for safety

**Potential Sources**

- Erosion Rate Calculations.xlsx
- Matagorda County Structure Damage_Revision.xlsx
- Residential Structure Info.xlsx
- Matagorda County Data Documentation_RFI.pdf (Pages 3-20)

**Software Input/Justification**

Loss of Road:

- 1 day: duration of when the road will be receiving repair
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: Wright, Stacy F
Sent: Kendro, Hilary A
To: Lakeland Village - Av
Cc: Stacy
Subject: 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

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:

Lima Fiatoa
American Samoa
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