


# Benefit-Cost Analysis Basics

## Building Resilient Infrastructure and Communities (BRIC)



# FEMA

Jane Rockhold, FEMA Region 10 Hazard Mitigation Assistance Specialist

Mark Stewart, FEMA Region 10 Hazard Mitigation Assistance Specialist

1

## BRIC Tribal Webinar Schedule

Topic	Date	Time (Pacific)
<b>Introduction to BRIC</b>	September 16	10:00 a.m. - 11:30 a.m.
<b>Capability and Capacity Building: Planning Application Development</b>	September 23	10:00 a.m. - 11:30 a.m.
<b>Capability and Capacity Building: Project Scoping Application Development</b>	September 30	10:00 a.m. - 11:30 a.m.
<b>Project Application Development</b>	October 7	10:00 a.m. - 12:00 p.m.
<b>Benefit Cost Analysis (BCA) Basics for Projects</b>	October 14	10:00 a.m. - 12:00 p.m.
<b>FEMA GO Introduction and Basics</b>	October 21	10:00 a.m. - 11:30 a.m.
<b>FEMA Grants Management</b>	October 28	10:00 a.m. - 12:00 p.m.



# FEMA

<http://j.mp/starronlinetraining>

Federal Emergency Management Agency

2

## House Keeping

---

- **Questions**
  - Everyone will be on mute but welcome questions!
  - Please ask questions in chat box
- **Interactive Knowledge Checks**
  - Anonymous
- **Technical Issues**
  - Please send a direct chat to the host
- **Participant Panel**



3

## Agenda

---

- BRIC Overview
- Benefit-Cost Analysis (BCA) Basics
- FEMA's BCA Toolkit
- Other BCA Inputs
- BCA Cost Effectiveness and Data Documentation
- Resources
- Final Q&A



4

# BRIC Overview

5

## BRIC Fundamentals

---

### ▪ Nationally Competitive Grant program

- Notice of Funding Opportunity (NOFO) releases to grants.gov; outlines funding, deadlines, etc.
- New program authorized under the Disaster Reform Recovery Act of 2018, Section 1234
- Replaces the Pre-Disaster Mitigation (PDM) program
- BRIC is a pass-through and reimbursement-based grant program

### ▪ Eligibility

- **A federally recognized tribe can apply directly to FEMA as the grant applicant or as a subapplicant to the State**
  - Tribe/Village (or the state located in) must have received a major disaster declaration in the past seven years. Can be fully or partially located in state that has had one in past seven years.
  - As of Spring 2020, all states, federally-recognized tribes, and territories satisfy this criteria.



Federal Emergency Management Agency

6

6

## Key Information

- **A FEMA approved hazard mitigation plan (HMP)**
  - Is required to apply for projects (*not needed for a planning subgrant and management costs application*)
  - If your tribe does not have one, you can apply for funding to develop a hazard mitigation plan through BRIC
  - Check out the recent Planning Application webinar, available online
  
- **Application and subapplication submittal in the FEMA Grant Outcomes (FEMA GO) system**
  - Submit application by the deadline listed in the Notice of Funding Opportunity to <https://go.fema.gov/>

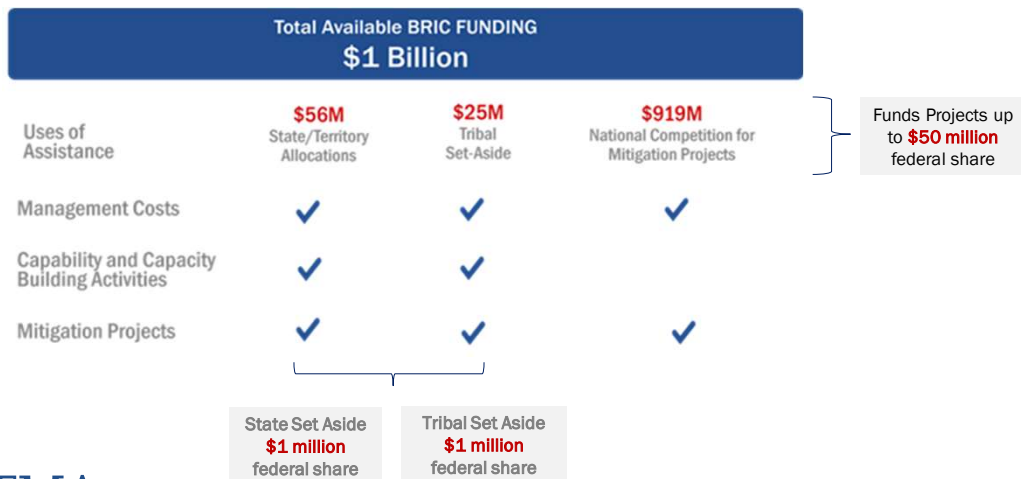


Federal Emergency Management Agency

7

7

## Building Resilient Infrastructure and Communities (BRIC) FY21



Federal Emergency Management Agency

8

8

## Cost Share

---

### Standard Cost Share

**75% Federal / 25% Local**

Fed Share cannot exceed 75% of the total

### Economically Disadvantaged Rural Communities Cost Share

**90% Federal / 10% Local**

Must be requested in application and meet criteria.

#### EDRC Criteria

- Be a community of 3,000 or fewer individuals
- Be economically disadvantaged, (i.e. <https://www.census.gov/tribal/> or [www.bea.gov](http://www.bea.gov)).

*Best Available Data!*



Federal Emergency Management Agency

9

9

## Life Cycle of a BRIC Application

---

- Notice of Funding Opportunity was released: **August 2021**
- Application period opens: **September 30, 2021**
- Submission deadline for applications: **January 28, 2022**
- Selections / Pre-Award Selection Notice: **Summer 2022**
- Grant Award: **December 2022 and After**
  - *This could take longer if lengthy Environmental and Historic Preservation (EHP) review is required*
- Period of Performance:
  - **Start Date:** When the recipient accepts the Award
  - **End Date:** All projects are 36 months from the date of the Award
  - **Closeout:** Due 90 days after Period of Performance ends



Federal Emergency Management Agency

10

10

## Benefit-Cost Analysis (BCA) Basics

12

### Benefit-Cost Analysis

#### ▪ Why is it required?

- The Stafford Act requires cost-effectiveness for HMGP and BRIC.
- 44 CFR states that cost-effectiveness is required to receive grant funds.
- OMB Circular A-94 states that a project must demonstrate cost effective using a “benefit-cost analysis.”



#### Why is it a good idea?

- To help your community set priorities.
- To help determine if a project is a good investment.
- To help get support from your community for the project.

13

13

## What is a Benefits-Cost Analysis (BCA)?

---

- A process that quantifies future benefits of a mitigation project compared to its cost. The result is a Benefit-Cost Ratio (BCR).

$$\frac{\text{Benefits}}{\text{Costs}} = \text{Benefit Cost Ratio}$$

- *We think about benefits vs cost everyday...just a little less complex.*
- *For example: Is the gym membership worth it? Should I fix the leaking sink in my house? What are my benefits and what are my costs to help me decide?*



14

## BCA Costs

---

**Costs:** Mitigation project costs can include:

- Construction costs
- Any other project-related costs such as title searches, permits, etc.
- Future maintenance costs
- Engineering and Design Cost
- Project Management/Staff Time



15

## BCA Benefits

---

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

- Benefits = Costs before Mitigation – Costs After Mitigation
- Future costs should be counted regardless of who pays for them, whether federal, state/local, or property owner.
- These avoided future costs/losses can include:
  - Physical damage
  - Loss of service/function
  - Injury or death
  - Displacement costs
  - Can include social or environmental benefits



Federal Emergency Management Agency

16

16

## What types of projects require a BCA?

---

- A BCA is required for almost all project applications; exceptions include project scoping and precalculated benefits.
- Some project types that meet certain criteria qualify for “pre-calculated benefits” and don’t require a standalone BCA. There are precalculated benefits for the following:
  - Acquisitions and Elevations in the Special Flood Hazard Area (SFHA) - Updated
  - Residential Hurricane Wind Retrofits
  - Non-Residential Hurricane Wind Retrofits
  - Residential Tornado Safe Rooms
  - Some Post-Wildfire Mitigation
  - Hospital Emergency Generators – New



Federal Emergency Management Agency

17



## Pre-Calculated Benefits

Project Type	Maximum Project Costs	Notes
<b>Acquisitions in SFHA</b>	\$323,000 / property	See 9/29/21 memo for details.
<b>Elevations in SFHA</b>	\$205,000 / property	See 9/29/21 memo for details.
Residential hurricane wind retrofits	Ranges from \$13,153 - \$52,018 / property	Only certain states, counties eligible
Non-residential hurricane wind retrofits	10% of Building Replacement Value (BRV)	See memo for details.
Residential tornado safe rooms	Ranges from \$3,936 - \$20,067 / property	Maximum cost depends on state
Post-wildfire mitigation	\$5,250 / acre rehabilitated	See Policy Clarification for details.
<b>Hospital Generators</b>	\$6.95 / gross sq ft – Urban hospital \$12.62 / gross sq ft – Rural hospital	See 9/29/21 memo for details; must be stand-alone project



Federal Emergency Management Agency

18

## Inflating Pre-Calculated Benefits for High-Cost Areas

What	How Much?	Supporting Documentation
Pre-Calculated Benefits - Elevation	\$205,000	
Anchorage inflater	19.10%	From RS Means, 2016
Anchorage benefits	\$244,155	
Fort Yukon inflater	41.80%	From Program Demand-Cost Model for Schools, AK Dept Education, 2016
Fort Yukon benefits	\$346,212	



Federal Emergency Management Agency

19

19

## Knowledge Check



FEMA

20

### Avoided physical damages

---

- One of the primary benefits of a hazard mitigation project is avoided physical damages.
- Physical damages can include:
  - Structural damage to buildings or infrastructure
  - Building contents damage
  - Damage to historic/cultural resources
  - Site contamination



FEMA

Federal Emergency Management Agency

21

## Avoided physical damages

- How do we quantify – that is, express in dollar terms – avoided physical damages?
  - We use one of the following to estimate the amount of damage expected in the future.
    - (1) Hazard-specific information (modeled damages)
    - (2) Past (historic) damages or
    - (3) Expected (future) damage



Federal Emergency Management Agency

22

## Avoided loss of service/function

- Another major benefit of a hazard mitigation project can be **avoided loss of service or function of the facility**.
- This benefit is only applicable to public facilities, such as utilities, emergency operations facilities (i.e., police, fire), and infrastructure such as roads and bridges.
  - For example, a generator project for a fire station can ensure the fire station remains operational even during a storm event.
  - Likewise, a bridge retrofit project can ensure the bridge remains functional during/after a hazard event.



Federal Emergency Management Agency

23

## Avoided loss of service/function

---

- How do we quantify this benefit?
  - For most **public/nonprofit sector buildings**, the value of services lost when the building becomes unusable due to a hazard event is calculated by assuming that services are worth what the public pays to provide the services.
  - For **critical facilities**, (i.e., fire/police stations, hospitals), the value of services is estimated based on the service population and the societal benefits of maintaining that facility in the aftermath of a disaster.
  - For **roads and bridges**, the value of services is based on the number of one-way trips, additional time/miles required for detour, the GSA mileage rate, and FEMA standard values.
  - For **utilities**, the value of service is based on the service population and FEMA standard values.



Federal Emergency Management Agency

24

## Avoided displacement costs

---

- Displacement costs occur when occupants (of residential, commercial, or public buildings) are displaced to temporary quarters while damage is repaired.
- These costs include rent and other monthly costs, such as furniture rental and utilities, and one-time costs, such as moving and utility hook-up fees.
- They can also include loss of business income for commercial buildings.



Federal Emergency Management Agency

25

## What are NOT considered benefits?

---

- **Anything that is subjective or non-quantifiable** cannot be counted as a benefit in FEMA BCAs. For example:
  - Ease of project
  - Aesthetic value of project
- **Anything not impacted by the proposed project.** A direct connection must be made between the project and claimed benefits.
- Additionally, OMB Circular A-94 dictates that **indirect benefits must not be considered** in a BCA. For example:
  - Changes in gross regional economic product, incomes, or employment
  - Avoided criminal justice system costs for disaster-related crime



Federal Emergency Management Agency

26

## Duplication of benefits and programs

---

- It is important to include all possible quantifiable benefits when developing the project, but you must also be sure that you are not double-counting your benefits or duplicating programs.
- **Duplication of benefits** occurs when:
  - You are counting the same benefits in two different projects or counting the same benefits on multiple structures in your project.
  - An example of duplication of benefits would be elevating a home in one project but then using the original elevation of that home in a separate drainage project.
- **Duplication of programs** occurs when:
  - Project falls mainly under another federal program (e.g., certain levee projects are the domain of the U.S. Army Corps of Engineers).



Federal Emergency Management Agency

27

## Knowledge Check



**FEMA**

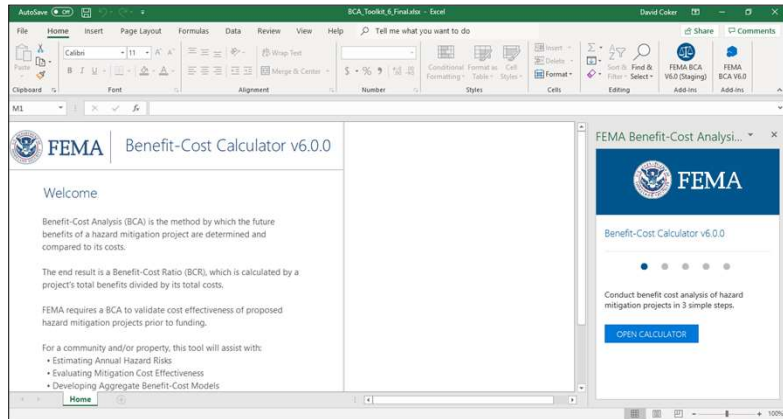
28

## FEMA's Benefit Cost Analysis (BCA) Toolkit

29

## FEMA's BCA Toolkit

- FEMA BCA Tool Kit Version 6.0 is required to be used.
  - This new version of the toolkit has a more user-friendly interface than previous versions (i.e. BCA Version 5.3).
- The BCA Toolkit is an Excel-based tool designed to collect data about a project and calculate a BCR based on data inputs.

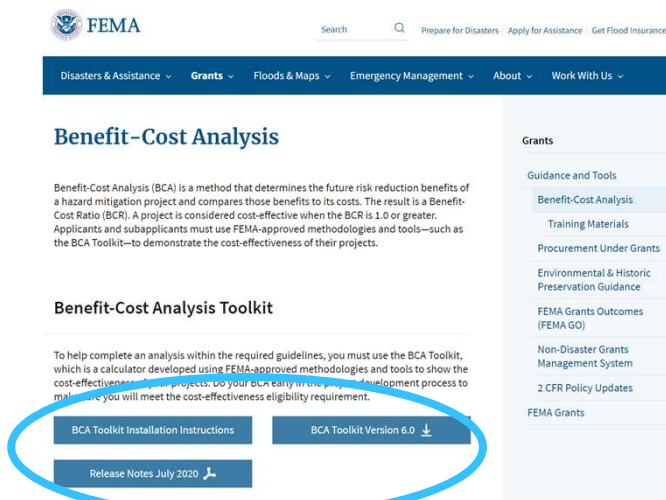


Federal Emergency Management Agency

30

## BCA Toolkit Version 6.0

Download the toolkit from FEMA's BCA website.



Federal Emergency Management Agency

31

31

## Available technical assistance & training

---

- FEMA offers technical assistance with BCAs through the **BCA Helpline**.
  - Phone: 1-855-540-6744, 9 am-5 pm (EST) M-F
  - Email: [bchelpine@fema.dhs.gov](mailto:bchelpine@fema.dhs.gov)
  - BC Helpline staff can answer questions and provide guidance but cannot perform or review BCAs.
- BCA training is offered as a classroom course, and the materials are posted at [www.fema.gov/benefit-cost-analysis](http://www.fema.gov/benefit-cost-analysis).



Federal Emergency Management Agency

32

## Other BCA Inputs

33



## The Benefit-Cost Model

- Beyond the benefits and costs, what are the other variables that factor into the Benefit Cost Ratio (BCR) calculation?
  - Data needs vary by hazard and project type.
  - Key pieces of information needed for all projects.

 <b>Project title</b>	 <b>Hazard data, damage history, or expected damages estimated by a qualified professional</b>
 <b>Property location</b>	
 <b>Property structure type</b>	 <b>Project cost estimate</b>
 <b>Hazard type</b>	 <b>Project useful life</b>
 <b>Mitigation action type</b>	



## Frequency and Damage Relationship

- This is the type of data you have available for your BCA. The BCA software will provide a drop down to select one of the following options:



## Project Useful Life (PUL)

---

- Project Useful Life (PUL) is the **estimated amount of time (in years) that the mitigation action will be effective.**
- The PUL is important in the calculation of the BCR because it establishes the timeframe to calculate benefits.
- Higher PUL values extend the duration over which benefits are calculated, thus raising the final BCR.
- Many project types use a standard value. If you want to use a higher number than the standard, you must document. Source(s) for non-standard value: Project engineer, Manufacturer.



Federal Emergency Management Agency

36

## Recurrence interval (RI)

---

- A recurrence interval (RI) is **how often a hazard event of specific severity is likely to occur in a particular location.**
- A 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. (The actual depth of the 1% chance annual flood varies by location.)
  - The percent annual chance is calculated by dividing 1 by X. Here, 1/100.
- **Projects that mitigate more frequent events are more likely to be cost-effective.**



Federal Emergency Management Agency

37

## Example: Emergency Generator for Critical Facilities

**Hazard Risk:** Recurring ice storms impacted powerlines and cut power to two fire stations in Eugene, OR,, limiting their ability to respond to fires and medical aid calls.

**Mitigation:** Install emergency power generators and fuel tanks at each station to keep them operational during power outages.

**Project Needs:** Study to determine sizing of generators, public notice (FS #11 in floodplain), permits, construction

**Project cost:** \$136,355

**Annual Maintenance cost:** \$1,500

**Sub-Applicant submitted aggregated BCR:** 3.31

**Post-review aggregated BCR:** 2.63



Federal Emergency Management Agency

38

38

## FEMA BCA 6.0 Toolkit Example



39

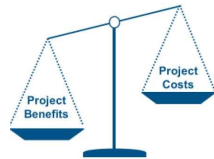
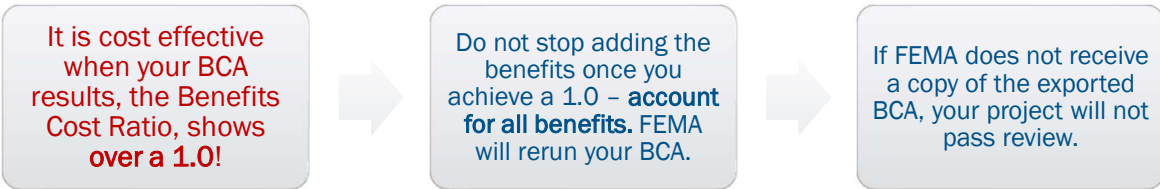
39

# Cost Effectiveness and Data Documentation

40

40

## How do I know if a project is Cost Effective?



41

## Helpful Tips for Cost Effectiveness

---

- If the BCA Toolkit is generating a BCR that is much lower than you expected or below 1.0, there are some things you can try to increase it.
  - Check to make sure you have entered or selected all required inputs correctly.
  - Confirm basic project and structure data: basement type, number of residents, project cost, NFIP status, etc.
  - Run the BCA using a different Frequency and Damage Relationship option.
  - Use a different combination of structures.
  - Combine benefits from multiple hazards, if applicable.
  - Add environmental and/or social benefits, if applicable.
  - Look for better data sources!



42

## Data Documentation

---

- Include/attach all source documentation and document any changes.
  - If you change any of the automatic values in the tool (the Standard FEMA Values), you **must make a comment** in the tool kit and refer to your documentation in the application of why you changed it.
  - Example: Documentation supporting Project Useful Life if FEMA standard value not used.
- All data used should be from **credible and reliable sources**.
  - Required for BCA inputs that do not utilize FEMA standard or default values.
  - Examples: Engineering documents & designs, professional studies, flood maps, utility companies.



43

## Example : Culvert Upsizing

**Hazard Risk:** A critically undersized 24" dia culvert in Jefferson County is repeatedly blocked with debris at the inlet, threatening to wash out the road and damage a private residence located at the outflow end of the culvert.

**Mitigation:** Replace 24" dia culvert with 96" dia culvert to meet WSDOT design standards, properly compact and reinforce embankments on both sides of culvert crossing.

**Project Needs:** Permitting, easement procurement, engineering and geotechnical services, construction, inspection fees.

**Project cost:** \$1,330,000

**Annual Maintenance cost:** \$5,000

**Sub-Applicant submitted BCR:** 1.56

**Post-review BCR:** .59

**Reason:** Missing Documentation!



Federal Emergency Management Agency

44



44

## FEMA's BCA Toolkit – Key Reminders!

- 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**
- Double-check your entries for accuracy and reasonableness.
- Properly sourced and documented data sources are **always** required as part of your project application!



Federal Emergency Management Agency

46

# Resources

47

47

## FEMA GO Resources

---

- **FEMA GO Resources:** <https://www.fema.gov/grants/guidance-tools/fema-go/hazard-mitigation-assistance-grants>
  - If you need assistance in registering, please contact [femago@fema.dhs.gov](mailto:femago@fema.dhs.gov) or call 1-877-611-4700



Federal Emergency Management Agency

48

48

## Additional Resources

- **BRIC NOFO and Program Support Materials:**
  - [Building Resilient Infrastructure and Communities | FEMA.gov](#)
  - [Before You Apply for Building Resilient Infrastructure and Communities \(BRIC\) Funds | FEMA.gov](#)
  - [Resources for the Building Resilient Infrastructure Communities Program \(BRIC\) | FEMA.gov](#)
- **BRIC Webinars:**
  - [2021 Building Resilient Infrastructure and Communities and Flood Mitigation Assistance Webinar Series | FEMA.gov](#)
- **HMA Guidance and Resources:**
  - [Hazard Mitigation Assistance Guidance | FEMA.gov](#)
  - [BCA Website for resources](#)
- **Region 10 Webinars and Resources:**
  - [Natural Hazards Community Planning - BRIC \(starr-team.com\)](#)



## BRIC Tribal Webinar Schedule

Topic	Date	Time (Pacific)
Introduction to BRIC	September 16	10:00 a.m. - 11:30 a.m.
<i>Capability and Capacity Building: Planning Application Development</i>	September 23	10:00 a.m. - 11:30 a.m.
<i>Capability and Capacity Building: Project Scoping Application Development</i>	September 30	10:00 a.m. - 11:30 a.m.
Project Application Development	October 7	10:00 a.m. - 12:00 p.m.
Benefit Cost Analysis (BCA) Basics for Projects	October 14	10:00 a.m. - 12:00 p.m.
<b>FEMA GO Introduction and Basics</b>	<b>October 21</b>	<b>10:00 a.m. - 11:30 a.m.</b>
FEMA Grants Management	October 28	10:00 a.m. - 12:00 p.m.





### FEMA Region 10 Non-Disaster Grant Team

[FEMA-R10-HMA@fema.dhs.gov](mailto:FEMA-R10-HMA@fema.dhs.gov)



Rob McCulloch



Cynthia Palmer



Brenna Meneghini



Kayla Keelan



Ravi Dutta



# FEMA

51

### FEMA Region 10 Tribal Affairs Team

FEMA Region 10 Tribal Liaisons are also ready to help with any other questions!



**Jay LaPlante**  
[Jay.LaPlante@fema.dhs.gov](mailto:Jay.LaPlante@fema.dhs.gov)



**Aurora Lehr**  
[Aurora.Lehr@fema.dhs.gov](mailto:Aurora.Lehr@fema.dhs.gov)



**Erin Ward**  
[Erin.Ward@fema.dhs.gov](mailto:Erin.Ward@fema.dhs.gov)



**Ramona Van Cleve-Alaska**  
[Ramona.VanCleve@fema.dhs.gov](mailto:Ramona.VanCleve@fema.dhs.gov)



# FEMA

52