

## **Benefit-Cost Analysis (BCA) Data Documentation Template – Damage-Frequency Assessment**

FEMA reviews Benefit-Cost Analyses (BCAs) for all proposed mitigation projects submitted under the FEMA grant programs to determine whether the information provided in the application is:

1. Credible and well-documented
2. Prepared in accordance with accepted FEMA BCA practices
3. Able to demonstrate that the project is cost-effective

The Damage Frequency Assessment can be used for any hazard for which frequency-damage relationships can be established from historical damage data and/or engineering judgment. The following template can be used to assist in the collection and entering of information to meet these requirements within the BCA Tool. One way to use this tool is to highlight or circle the source and use the last column to record the software input and justification for values that vary from the FEMA Standard Value (Default).

<b>Obtained</b>	<b>Input</b>	<b>Documentation Summary</b>	<b>Potential Sources</b>	<b>Software Input/Justification</b>
<input type="checkbox"/>	Name, address, county, and latitude/longitude for each project structure	Include contact information and whether building is historic.	Documents available from homeowner, local building inspector, local tax assessor's office, or title documents.	
<input type="checkbox"/>	Project Information	Project Information includes: <ul style="list-style-type: none"> <li>• Project Number</li> <li>• Analyst Name and Contact Information</li> <li>• Grant Program</li> <li>• Project Point of Contact (POC)</li> </ul>	Information available from the project manager or POC.	
<input type="checkbox"/>	Scope of Work (SOW)	Should include: <ul style="list-style-type: none"> <li>• Problem Description and Proposed Solution</li> <li>• Description of Existing Conditions</li> <li>• Work Schedule</li> <li>• Cost Estimate</li> </ul>	The SOW is available from the project manager.	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/ Justification
		<ul style="list-style-type: none"> <li>Engineering schematics, detailed engineering drawings, or engineering designs</li> <li>The proposed level of protection for the project (i.e., it will mitigate up to the 50-yr event)</li> </ul>	The BCA Cost Estimation module will walk the user through costs that are valid for each project type.	
<input type="checkbox"/>	Basis for Damages	Refer to your project SOW to determine the basis for damages [historical damages or expected].	The project manager or engineer can provide this information.	
<input type="checkbox"/>	Hazard Type	Refer to your project SOW to determine the hazard type. Choose from: Flood, Hurricane Wind, Earthquake, Tornado, Wildfire, or Other. Hazard type is found in the SOW.	The project manager or engineer can provide the SOW.	
<input type="checkbox"/>	Mitigation Project Type and Description	Refer to your project SOW to determine the mitigation project type and to obtain the project description. Project types vary by hazard and can include: <ul style="list-style-type: none"> <li><b>Flood:</b> Acquisition, Elevation, Relocation, Dry Flood Proofing, Drainage Improvement, Other Flood Proofing measures</li> <li><b>Hurricane Wind:</b> Acquisition, Shutters, Roof, Load Path</li> <li><b>Earthquake:</b> Strengthen Structure or Anchor/Brace Non-Structural</li> <li><b>Tornado:</b> New Safe Room or Retrofitting Existing Structure</li> <li><b>Wildfire:</b> Defensible Space Activities, Hazardous Fuels Reduction, Ignition Resistant Construction Activities, or Other</li> </ul>	The project manager or engineer can provide the SOW. Engineering designs may provide this information.	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/ Justification
<input type="checkbox"/>	Cost Estimate	<p>All anticipated project costs, including maintenance costs, should be detailed over the useful life of the project. Avoid the use of lump-sum costs. The Cost Estimate should include:</p> <ul style="list-style-type: none"> <li>• The estimate source and an itemized list of costs</li> <li>• The base year of all cost estimates and any changes to the anticipated construction date</li> <li>• Anticipated environmental resource remediation or historic property treatment measures</li> <li>• Other related construction/demolition/relocation costs, such as survey permitting, site preparation, site maintenance, site assessment, legal costs and material disposal</li> <li>• Other acquisition costs, such as appraisals, legal recordation, displacement costs, and maintenance</li> </ul>	<p>Provide estimate from contractor or line-item cost estimate based on Standard Cost Estimating software or local similar historical costs in present day dollars. Source should be government representative or professional with relevant expertise.</p>	
<input type="checkbox"/>	Base Year of Costs	<p>The year in which the mitigation project's cost was estimated. If cost estimates are several years old, the user can use the inflation calculator in the cost estimator to account for inflation in costs between the base year and the present.</p> <p>If cost figures are adjusted provide a description of methodology used in the justification tab of the cost estimator.</p>	<p>Information available from subapplicant.</p> <p>Analyst can escalate costs in the cost estimating portion of the BCA Tool.</p>	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/ Justification
<input type="checkbox"/>	Project Useful Life (PUL)	<p>The estimated amount of time (in years) that the mitigation action will be effective.</p> <p>The PUL is based on the type of mitigation.</p>	<p>Sources include the PUL table provided in the BCA Tool dynamic help; which provide the FEMA Standard Values. If the FEMA standard values are not used, additional documentation is required from the project manager, or the project engineer to justify the PUL.</p>	
<input type="checkbox"/>	Facility Type	<p>Choose one or more facility types for loss of function: utilities, roads/bridges, non-residential buildings, or not applicable. Provide photocopies of tax records, hard copy or electronic photos, appraisals, or maps.</p>	<p>Data is available from assessor, owner, local tax appraiser or surveyor office, or title documents.</p>	
<input type="checkbox"/>	Value of Services: Utilities	<p>Enter the facility description, type of service, number of customers served and value per unit of service (\$/person/day).</p> <p>Select electrical, water, wastewater, or other from the drop-down. If user chooses other, enter the description of the service.</p> <p>If a utility, enter the number of customers served by the utility. If other, enter the portion of the population that will be affected by the mitigation. Provide letters or technical studies from utilities that include engineering estimates or historic evidence of impact on service due to an event.</p> <p>FEMA Standard Values for Loss of Service for utilities:</p> <ul style="list-style-type: none"> <li>• Loss of electric power: \$126/person/day</li> <li>• Loss of potable water: \$93/person/day</li> </ul>	<p>Documentation is available from the agency providing the service. Local utility company data should indicate the number of affected customers. Determine the number of customer connections and then use census data to determine that average number of people at each location.</p>	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/Justification
		<ul style="list-style-type: none"> <li>Loss of wastewater: \$41/person/day</li> </ul> <p>Any number outside of the FEMA Standard Values must be documented with a letter from the utility that would be affected.</p>		
<input type="checkbox"/>	Value of Services: Roads/Bridges	<p>Enter the facility description, estimated number of one-way traffic trips per day, additional time per one-way trip due to the detour, number of additional miles, and the Federal mileage reimbursement rate for a private vehicle (\$/mile). FEMA Standard Values for Loss of Service for roads:</p> <ul style="list-style-type: none"> <li>Loss of road/bridge service: \$38.15/vehicle/hour</li> </ul> <p>Mileage: Use current Federal Mileage Rate (<a href="http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentId=17943&amp;contentType=GSA_BASIC&amp;queryYear=2008">http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentId=17943&amp;contentType=GSA_BASIC&amp;queryYear=2008</a>)</p> <p>Any number outside of the FEMA Standard Values must be documented with Department of Transportation (DOT) traffic studies or letter from utility or traffic departments.</p> <p>Maps indicating the location of road closure and the proposed detour route should be included.</p>	<p>This information is available from a professional engineer, planner, or county DOT manager with signature authority.</p>	
<input type="checkbox"/>	Non-Residential Buildings	<p>Choose a facility type: fire station, hospital, police station, or other.</p> <p>For “other” buildings, enter the annual budget of public agencies, limited to the budget associated</p>	<p>Documentation is available from the agency providing the service or an agency’s published annual report.</p>	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/ Justification
		with building(s), and select the appropriate service name to provide the budget for that service.		
<input type="checkbox"/>	Analysis Duration	<p>Input the current analysis year and the year the utility, building, road, or bridge was built. This will provide a period of history for the historical losses. Provide documentation such as an appraisal or title.</p> <p>For structures less than 10 years old, input the minimum analysis duration of 10 years.</p> <p>For older structures for which flood damage/loss data or construction activities indicate a significant change in local flow conditions, the analysis can be assumed to begin on the date when the change first occurred. Therefore, the user would manually input the analysis duration in years.</p> <p>In this instance, required documentation includes a Flood Insurance Study or Hydrology and Hydraulics Study that accounts for the change in local flow conditions.</p>	<p>Documents available from homeowner, local building inspector, local tax assessor's office, or title documents.</p> <p>Documentation of changes in local flow conditions is available from a hydrologist or engineer.</p>	
<input type="checkbox"/>	Damages Before Mitigation	<p>Enter the year of occurrence and number of days of a loss of function <b>before</b> the mitigation project is completed (i.e., a bridge was unusable for 5 days after a flood).</p> <p>If based on historical occurrence, provide written documentation from a credible source. If number of days of loss of function is derived or estimated, provide written explanation of the method used, including all assumptions.</p>	<p>Documentation may be obtained from:</p> <ul style="list-style-type: none"> <li>• An official from a public utility, public works, or transportation department, technical report, or study.</li> <li>• The information may also be in mitigation project specifications or technical documents related to project</li> </ul>	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/ Justification
		<p>Click on the Icon to the left of “Damage Year” to see the field chooser. Update the fields to reflect information needed for documentation.</p> <p>Enter the year of occurrence and a minimum of two hazard events of known frequency or three hazard damage events of unknown frequency that occur within the analysis period. The historical loss must have been a loss that the mitigation project would have mitigated.</p> <p>When there are multiple events occurring in the same year, add the total dollars and enter it as one single event.</p> <p>Columns can be added to reflect any damage category: avoided physical damages to structures and contents, infrastructure (bridges, roads, culverts, etc.), loss of function (displacement, loss of rental or business income), casualties, and avoided emergency management costs.</p> <p>Recommended documentation varies depending on how the data was obtained. Documentation should cite the date of the data, the source, and the author.</p> <p>Recommended documentation:</p> <ul style="list-style-type: none"> <li>• Frequencies or Reoccurrence Intervals (RIs) linked to documented Flood Insurance Study (FIS) data</li> <li>• U.S. Geological Survey (USGS) stream gauge data or National Oceanic and Atmospheric Administration (NOAA) tide gauge data</li> </ul>	<p>development or in historical data from past events, i.e., insurance or repair records or photographs of damaged facilities, or FEMA Public Assistance documents for declared events</p> <p>Historical occurrences can be documented by a letter from a local official, a copy of a newspaper account, or a copy of a technical study.</p> <p>Information may be obtained from:</p> <ul style="list-style-type: none"> <li>• National Weather Service; USGS; NOAA; or National Climactic Data Center</li> <li>• FEMA Project Worksheets/Damage Survey Reports</li> <li>• Insurance claims, BureauNet/Simple and Quick Assessment (SQA) Net information, damage repair records, or data from the State/local agency, local government</li> </ul> <p>Newspaper accounts citing credible sources (other than homeowner accounts)</p>	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/Justification
		<ul style="list-style-type: none"> <li>• Insurance records (if used to assess how often events occurred)</li> <li>• Newspaper accounts citing credible sources, such as a public agency</li> <li>• Copies of engineering/technical expert reports</li> <li>• For peak ground acceleration and other seismic issues use refer to the recurrence intervals for Earthquake mitigation projects where “expected damages” are determined.</li> <li>• Use Hurricane Wind module to determine Hurricane Wind reoccurrence intervals and plug that number in to the chart.</li> </ul> <p>Letter from subject matter expert who has independently calculated frequencies</p>		
<input type="checkbox"/>	Unknown Frequency Calculator	<p>To use the unknown frequency calculator, provide documentation of:</p> <ol style="list-style-type: none"> <li>1. A minimum of three hazard events that occur in different years where either:               <ul style="list-style-type: none"> <li>• Frequencies/RIs of all events are unknown, or</li> <li>• Frequencies/RIs of up to two events are known and have total inflated damage values that exceed the total inflated values of all the other unknown frequency/RI events.</li> </ul> </li> <li>2. Date of construction (needed for period of record).</li> </ol>	<p>Information may be obtained from:</p> <ul style="list-style-type: none"> <li>• National Weather Service, USGS, NOAA, or National Climactic Data Center</li> <li>• FEMA Project Worksheets/Damage Survey Reports</li> <li>• Insurance claims, BureauNet/SQA Net information, damage repair records, or data from the State/local agency, local government</li> <li>• Newspaper accounts citing credible sources (other than homeowner accounts)</li> </ul>	

Obtained	Input	Documentation Summary	Potential Sources	Software Input/ Justification
<input type="checkbox"/>	After Mitigation: Loss of Function	<p>Enter the calculated number of days of a loss of function <b>after</b> the mitigation project is completed (i.e., a bridge was unusable for 5 days after a flood).</p> <p>Except where a function (utility, road/bridge, and building) is completely eliminated, a post-project loss of function time should be entered in this part of the analysis.</p> <p>Documentation includes a letter from an official or a copy of a written technical study. If the number of days is derived or estimated provide a written explanation of the method used, including all assumptions.</p>	<p>Documentation may be obtained from:</p> <ul style="list-style-type: none"> <li>• An official from a public utility, public works, or transportation department</li> <li>• Technical report or study</li> <li>• Mitigation project specifications or technical documents related to project development.</li> </ul>	
<input type="checkbox"/>	Damages After Mitigation	<p>Nearly all mitigation projects have some residual damages. Most projects will not completely eliminate damages after mitigation, but will reduce damages by a certain percentage or up to a certain design level event/RI (the level of protection).</p>	<p>This information is available in the SOW or from the project manager.</p> <p>Provide a written explanation of the method used, including all assumptions.</p>	