FEMA'S BENEFIT COST-ANALYSIS TOOL FOR DROUGHT PROJECTS

General Guidance

The purpose of this document is to provide potential subapplicants with general guidance on FEMA's Hazard Mitigation Assistance (HMA) benefit-cost analysis (BCA) tool. This guidance is not intended to provide complete information, but rather to outline some basic requirements and considerations as subapplicants begin the analysis process. OES is available to answer technical questions about BCAs and can be contacted by emailing HMA@caloes.ca.gov.

Benefit-Cost Analysis for Drought Mitigation Projects

Drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. Drought mitigation projects are defined as actions taken to reduce the potential depletion of water sources in a community and/or improve recharge of those water sources. For the purpose of FEMA HMA projects, such actions fall into two general categories: supply increase and demand reduction.

BCA Software and Methodology

FEMA requires the use of its BCA software (version 6 for all BCAs). Subapplicants can get the software by visiting FEMA's Benefit-Cost Analysis Guidance and Tools website: https://www.fema.gov/media-library/assets/documents/179903. BCAs for drought projects follow the specific paths in the software, which are selected via the drop list for *hazard type* and *mitigation action type*. FEMA offers guidance on one as guidance on one aspect of such BCAs – for aquifer storage and recovery (see footnote)[1]. This guidance does not address BCAs for all potential projects.

[1] *https://www.fema.gov/media-library-data/1464288989120-5439c85896bf950c82009b95dbe2c16b/15_J_0051_ASR_BCA_Methodology_508.pdf*

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Data used in the Analysis

This subsection is intended as a general summary of data requirements for the two types of BCAs, not a comprehensive explanation of how to complete an analysis.

A **Damage-Frequency Assessment (DFA) BCA** for a drought project requires the following data. Note that for drought projects, one specific "path" in the software differs from the standard DFA approach. This is incorporated when the analyst chooses utilities as the facility type, aquifer recharge as the mitigation type, and modeled damages as the basis methodology. Specific inputs for this path are noted separately below (see the guidance noted above in the footnote on page 1). The other inputs listed in this subsection are for a standard DFA approach.

1. Address and/or latitude and longitude of the proposed project site.
2. The project useful life, per FEMA guidance.
3. A series of at least two relationships between the frequency of drought events and the damages associated with them.
4. The frequencies of droughts may be established via historical records (usually through open sources of information), or by other methods such as reported increases in the need for new wells, and provisions for delivering water to communities when sources are depleted. There is a variety of potential approaches to determining drought frequencies. Consult OES for further information.
5. Damages may be "modelled", observed and documented historical damages or "expected" damages. It is outside the scope of this general document to describe every possible approach to such a determination, and droughts are particularly complex to evaluate for several related reasons. Damages may include full or partial loss of water to a community, reduced fire flows (which may contribute to increased fire risk, but is difficult to determine), and agricultural losses. Each of these requires a different approach to determine damages, all of which must be explained and documented. This is not intended as a comprehensive list of all potential drought damages.
6. For the specific path noted in the introduction above (and for this specific situation only), the software requires analysts to input the population served, water demand, pre-mitigation supply, pre-mitigation duration of water shortages due to drought, and the same information for post-mitigation (for the latter two categories).

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7. The design performance of the proposed project, i.e. drought damages are reduced by a specific degree post-mitigation. These must be related to the same event frequencies that were used in the pre-mitigation data entry table.
8. Project cost and project maintenance cost.

Benefits

Benefits of drought mitigation projects may include avoided loss of potable water to the community (or diminished supply), avoided agricultural damages, and avoided reductions in fire flows, among others.

FEMA also allows the use of *stress and anxiety* benefits that apply specific values to avoiding these forms of damage. These are based on the numbers of people in the project area, and apply only when the underlying benefit-cost ratio for the project is 0.75 or greater.

Project Useful Life and Project Effectiveness

Project useful life is simply the period over which a project is effective. FEMA's 2009 BCA guidance (Appendix D) provides specific values for useful life, and can be found by visiting FEMA's Benefit-Cost Analysis Guidance and Tools website: https://www.fema.gov/media-library/assets/documents/179903. Project effectiveness is the extent to which a mitigation activity reduces future damages. In the full flood methodology, the software requires the analyst to enter information to calculate this value.

Documentation

OES and FEMA require subapplicants to provide documentation for all data that is used in a BCA. This must be included with the materials that are submitted as part of the application package.

Best Practices

OES strongly recommends that each subapplicant BCA be supplemented by a brief technical report that summarizes the approach to the analysis, the data that was used, the sources of the data, and the results of the analysis.

Subapplicants should provide electronic copies of any data sources that are used in a BCA. Ideally, every data point entered into the software will be explained in a technical report and backed up with written documentation.

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