LEVEL TWO (Detailed) B-C Analysis

For large, high-cost projects, projects which are politically sensitive, or projects where initial screening indicates that benefit-cost ratios are close to one, more detailed analysis may be desirable. Detailed analysis is also necessary whenever the default values, used in the **LEVEL ONE (Minimum Data)** analysis, do not accurately reflect a specific project under evaluation. See **Chapter 8, Benefit-Cost Program: Level Two Analysis**, for a detailed discussion.

The Benefit-Cost Program allows the user to "override" (i.e., replace) any of the default values by entering building-specific data in the **BLUE** data entry blocks. All entries in **BLUE** blocks override default data which are always shown in **ORANGE** blocks.

Users may enter a complete building-specific analysis by entering data in all of the **BLUE** blocks, or simply enter a few building-specific data where desired.

There are several circumstances when entering building-specific data is highly recommended, including:

1. for non-residential buildings, because the FIA depth damage data (see Chapter 6) are predominantly for residential buildings,
2. whenever high water velocities, debris or ice flows are expected during flooding, because the default depth damage data are for damage resulting predominantly from water depth only,
3. for buildings which are unusually susceptible or resistant to flood damage because of construction details or contents,
4. for buildings in which loss of function impacts (displacement costs, rental and business income losses, loss of public/nonprofit services) are high, and
5. for any large, high-cost, or politically sensitive projects, especially when a preliminary **LEVEL ONE** analysis indicates a benefit-cost ratio near one.

In conducting benefit-cost analyses, the user has complete control (and responsibility) for all of the data inputs which affect the benefit-cost results. None of the data input values are imposed by the Benefit-Cost Program.

Expediting B-C Analysis

Benefit-cost analysis of most common hazard mitigation projects is easy and simple: many of the required data inputs are built into the software as default values and most of the other required data are readily obtainable.

There are data collection requirements necessary in order to conduct benefit-cost analyses. Some data, such as flood hazard information and zero flood depth elevations, are particularly important for the analysis and accurate values must be obtained. Often the necessary data are not particularly difficult to obtain.

By providing a quantitative, defensible framework, benefit-cost analysis of hazard mitigation projects may expedite the approval process for good projects by providing solid documentation of eligibility. Benefit-cost analysis may also minimize the appeal process for projects which are rejected by providing quantitative, rather than purely subjective decision-making criteria. Furthermore, if there are disputes between FEMA and applicants over the results of the benefit-cost analysis, all of the input data are clearly on the table for review and discussion.

Thus, when the whole project evaluation process is considered, benefit-cost analysis may actually reduce the effort required rather than increase it.

Furthermore, there are several ways to conduct benefit-cost analyses efficiently, including:

1. **Use common data to evaluate projects in a single neighborhood.** Many of the data may be applicable to numerous structures in a single neighborhood. For example, flood elevations of 10, 50, 100, and 500-year floods may be applicable to an entire neighborhood. Other data inputs such as replacement value per square foot, depth-damage function, etc., may be the same or very similar for many structures in a neighborhood.

2. **Evaluate projects in a single neighborhood consecutively.** To maximize the use of common data and for consistency, it may be desirable to conduct all the benefit-cost analyses required for a given neighborhood consecutively, changing only the data which differ from project to project. Changes in only a small number of input parameters (or sometimes only one, such as zero flood elevation) may suffice to conduct many analyses, once the first analysis is completed.

3. **Group similar projects.** If a large number of structures are similar (such as a housing development), then it may not be necessary to conduct individual analyses of each structure. Rather, projects with the same flood hazard risk (i.e., at the same elevation or closely similar elevations) can be grouped or averaged. A buyout or relocation of one hundred 1,000 square foot houses can be analyzed as 100,000 square feet of single family residences, or analyzed by calculating the benefits for one (average) house, multiplied by one hundred, and then compared to the total cost of the buyout.

4. **Consider projects at the same or closely similar, Zero Flood Depth Elevation with the same flood hazard risk.** Flood hazard risk will be identical for structures at the same or closely similar Zero Flood Depth Elevation in the same neighborhood. Once the flood hazard information is compiled, many single analyses can be conducted using the flood hazard information, or groups of buildings at the same Zero Flood Depth Elevation can be grouped for one analysis.

   If a large number of similar structures at varying elevations are to be evaluated for a buyout, relocation, or for a single type of flood mitigation measure (e.g., elevation or protection by a levee) then structures may be grouped in bands (contours) of elevation. One or two feet of elevation difference can markedly change flood hazard, so it is very important to group structures only of the same or closely similar elevations. If a large group of structures varies in elevation, the structures may be grouped in one-foot elevation bands: for example, consider all structures between 6.5 and 7.5 feet of elevation to be at 7 feet. Grouping structures in wide bands of elevation (e.g., covering several feet of elevation difference) will almost certainly produce substantially inaccurate results.

CAUTION: structures at different elevations cannot be grouped together because the flood hazard risk (i.e., the probability or recurrence interval of a given water depth) varies markedly with a building's Zero Flood Depth Elevation!

5. **Use your good judgement and make reasonable estimates.** Remember that exact data are generally not available. Always use judgement and reasonable estimates whenever exact data are not available. Although it may be necessary to gather additional data for large (high-cost), controversial, or high-visibility projects, or projects with Benefit-Cost ratios near one, many decisions will be clear-cut and can be made with approximate data only.

Summary

The accuracy, validity, and usefulness of any benefit-cost analysis depends on the correctness of the input data. A benefit-cost analysis in which **ANY** of the input data do not realistically reflect the particulars of the building and mitigation project under evaluation will be inaccurate and potentially misleading.

Many of the data inputs for benefit-cost analysis are not exact numbers, but rather informed estimates or judgements. Nevertheless, all of the data inputs as well as the results must be reviewed for reasonableness and defensibility.

Benefit-cost analyses are subject to review and audit. Therefore, any analyses where the input parameters are not reasonable for the specific building and mitigation project under evaluation may be challenged.

ALL data inputs for benefit-cost analysis MUST be reasonable and defensible. Otherwise, benefit-cost results will be invalid.

The analyst has control over the data inputs and thus responsibility for the results.