Interpreting Benefit-Cost Results

Benefit-Cost Ratios, like all of the results of benefit-cost analysis, depend directly on the input data. Varying any of the input data which affect numerical results (i.e., changing any of the entries in **GREEN**, **BLUE**, or **RED Data Entry Blocks**) will change the benefit-cost ratio.

The sensitivity of calculated benefits and/or benefit-cost ratios to changes in the values entered in the model may be explored by varying input parameters one at a time (**within credible or justifiable limits**) and noting the impact on the resulting calculated benefits. Some of the input parameters have little impact on the benefit-cost ratio because they only govern a tiny portion of the benefits. Other input parameters have a major impact on benefit-cost results. The relative importance of each input parameter will vary from project to project depending on the specifics of each individual project.

Because of the inherent uncertainties, benefit-cost results, like any calculation, should not be interpreted blindly or in disregard of the uncertainties. For example, three prospective flood hazard mitigation projects with benefit-cost ratios of 0.2, 1.2, and 2.2 are almost certainly distinguishable. Three prospective projects with benefit-cost ratios of 0.95, 1.00, and 1.05 are probably not significantly different. Three projects with ratios of 0.8, 1.0, and 1.2 may or may not be significantly different, depending on the validity of the input data.

Benefit-cost ratios near one will always be in a gray area of interpretation. Depending on the accuracy of the input data, benefit-cost ratios near one (e.g., 0.9 or 1.1) may not be significantly different from 1. That is, with reasonable and defensible variations in estimates made in the input parameters, the benefit-cost results can come out either somewhat above or somewhat below one.

The real power of benefit-cost analysis is to separate projects with benefit-cost ratios substantially below one from projects with benefit-cost ratios substantially above one. There will always be projects on the borderline, subject to results indicating benefit-cost ratios greater than or less than one, depending on variations in input data assumptions.

In this context, the relative rankings of benefit-cost results may be more significant than the absolute benefit-cost ratios. Thus, if similar assumptions are made about roughly similar projects, the ranking of benefit-cost ratios accurately reflects relative differences between the projects, while the absolute numerical values of benefit-cost ratios reflect the general assumptions made in conducting the analyses.

In comparing a range of projects with varying costs, benefits, and benefit-cost ratios, it is essential to consider the scale of the projects as well as the simple benefit-cost ratio. For example, a $5,000 project with a benefit-cost ratio of 2.0 (i.e., benefits of $10,000, present value criterion of $5,000) is not intrinsically a "better" project than a $500,000

project with a benefit-cost ratio of 1.5 (i.e., benefits of $750,000 and a present value criterion of $250,000). Thus, in comparing projects it is necessary to consider both the benefit-cost ratios and the present value criterion (or the total amount of dollar benefits). Simple comparisons of projects using only the benefit-cost ratios are valid if and only if the projects are of closely similar size (cost).

As discussed in **Chapter 5, Benefit-Cost Model: Guidance**, 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.

As discussed in Chapter 5, 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 full control over the data inputs and thus full responsibility for the benefit-cost results.

SUMMARY

The **Summary** page is in three parts: the first part contains all of the single-valued data entries, the second part contains a table of all data entries which vary by flood depth, and the third section contains a summary of the benefit-cost results.

The three sections of the **Summary Table** are shown below:

Single-Valued Data Entries

Building Replacement Value ($/sf)	$75.00
Total Floor Area (square feet):	1,000
Total Building Replacement Value:	$75,000
Demolition Threshold Damge Percentage:	50%
Total Contents Value	$22,500
Total Displacement Costs ($/month):	$2,000
Cost of Providing Services from this Building ($/day)	$534
Post-Disaster Continuity Premium ($/day)	$500
Total Value of Lost Services ($/day)	$1,034
Total Monthly Rent from All Tenants ($/month)	$500
Estimated Net Income of Commercial Businesses ($/month)	$1,500
Total Mitigation Project Costs	$50,297
Discount Rate	7.0%
Project Useful Life (years)	20

Data that Vary by Flood Depth

Flood Depth	Building DDF (%)	Modified DDF (%)	Contents DDF (%)	Displacement Time (days)	Functional Downtime (days)	Building Mit. Effectiveness (%)	Contents Mit. Effectiveness (%)	Annual # of Floods
-2	0	0	0	0	0	100	100	5.378E-01
-1	0	0	0	0	0	100	100	3.064E-01
0	5	5	8	0	5	100	100	1.033E-01
1	9	9	14	0	9	100	100	3.482E-02
2	13	13	20	54	13	100	100	1.174E-02
3	18	18	27	94	18	100	100	3.956E-03
4	20	20	30	110	20	100	100	1.334E-03
5	22	22	33	126	22	77	77	4.496E-04

Summary of Benefits and Costs

PROJECT BENEFITS	$26,176
PROJECT COSTS	$50,297
PROJECT BENEFITS MINUS PROJECT COSTS :	($24,121)
BENEFIT-COST RATIO:	0.52