Chapter 8
Display and Comparison

8-1. Overview

Displays should be prepared (1) to facilitate comparison of the effectiveness of alternative plans in terms of solving the problem and of taking advantage of the opportunities identified, (2) to identify the monetary and non-monetary costs of the alternatives, and (3) to identify differences among the alternatives (ER 1105-2-100). This chapter provides guidance for such displays for flood-damage reduction plans. It includes templates that complement those included in ER 1105-2-100, with additions and modifications to describe property uncertainty and to display additional performance indices described in this manual.

8-2. Display of Uncertainty Description

Institute for Water Resources (IWR) Report 92-R-1 (USACE 1992b) notes that "Risk and uncertainty analysis in the current context does not require the analyst to do extra work. It does require the preservation of more of the information that is generated in an analysis." For example, a discharge-probability function may be included with plotted confidence intervals to illustrate the lack of knowledge about less frequent, higher discharge values. Such technical details of discharge-probability function uncertainty may truly be of little interest to the decision makers and public reviewers of the documents. However, the impact as this uncertainty propagates through computation of economic and engineering performance indices is important and, in some cases, can best be understood through reference to the source.

8-3. Display of Economic Benefits and Costs

a. The impact of uncertainty in evaluation of project benefits can be displayed as shown in Table 8-1. Such a table can be included for each alternative plan, and depending on the scale of the study, for each stream in the basin or for each damage reach of a stream. Table 8-1 also identifies various categories of benefits and costs. Entries in the inundation-reduction benefit category should include, as a minimum, subclassifications of residential property, commercial property, and industrial property. The annualized expected values of benefits and costs are shown. These values are computed with procedures described in Chapter 2 of this document. The difference in the expected value of total project benefit and the expected value of project costs is the expected net benefit. Uncertainty in various benefits and costs is presented, thus representing the net impact of all model and parameter uncertainties. Values shown for inundation-reduction benefits are computed via simple probability analysis of results of sampling procedures described earlier. For example, if 95 of 100 estimates of damages reduced for category 1 exceed $10,000, this implies that the probability is 0.95 that the inundation reduction benefit for category 1 exceeds $10,000. That benefit value is also entered. Similarly, when project costs are subtracted to compute net benefits, the net benefit estimate that is exceeded 95 percent of the time is computed and entered in the table.

b. Table 8-2 shows the time distribution of expected annual damage values computed, accounting for uncertainty. The values included here reflect changes in future conditions within the basin. For example, as land use changes, the discharge-probability function will change, and consequently, the expected annual damage will change. This table demonstrates that.

8-4. Display of Engineering Performance

a. Table 8-3 displays measures of engineering performance of proposed plans. The median estimate of annual exceedance probability is shown; this value is determined by inspection of the function derived without uncertainty analysis. The estimate with uncertainty analysis might be developed with the event sampling procedure illustrated in Chapter 2. Long-term risk is computed as described in Chapter 2. Again, depending on the scale of the study, this table may be repeated for each stream in the basin or for each damage reach of a stream.

b. Table 8-4 describes the performance of each plan for various flood events. It shows the probability that the target stage associated with each plan will not be exceeded, given the occurrence of an event of specified annual exceedance probability.

c. Table 8-5 describes, in quantitative terms, the impact of capacity exceedance. It shows (for a range of stages that exceed the capacity of the project) the damage that would be incurred, along with the probability that the stage will be exceeded.

Table 8-1
Summary of Annualized NED Benefits and Costs for Plan __ , Stream __ , Reach __

Project Benefit and Cost Categories		Expected Value	Probability That Benefit or Cost > Value Shown				
			0.95	0.75	0.50	0.25	0.05
Inundation-reduction benefit	Category 1						
	Category 2						
	Category 3						
	Category n						
Intensification benefit							
Location benefit	Floodplain						
	Off floodplain						
Benefits from other purposes							
Total project benefit							
Total project cost							
Net benefit							
Benefit/cost ratio							

Table 8-2
Expected Annual Damage by Decade

Plan	Time Period			
	Year 0	Year 10	Year 20	Year n
1				
2				
3				

Table 8-3
Annual Exceedance Probability and Long-term Risk

Plan	Median Estimate of Annual Exceedance Probability	Annual Exceedance Probability with Uncertainty Analysis	Long-term Risk		
			10 yr	25 yr	50 yr
1					
2					
3					

Table 8-4
Conditional Non-Exceedance Probability

Plan	Probability of Annual Event		
	0.02	0.01	0.004
1			
2			
n			

Table 8-5
Summary of Residual Damage for Plan __ , Stream __ , Reach __

Stage	Annual Exceedance Probability	Damage with Project	Population Affected	Number of Structures Flooded