Project Memorandum #4: The Relationship of Benefits and Costs to Financing Mechanisms

Workshop Discussion Version

May 19, 2016

OVERVIEW

This study will evaluate the feasibility of financing options, including an assessment district, to pay for Delta levees based on the "beneficiary-pays" principle. Simply put, this means that levee beneficiaries should pay for the share of flood protection costs that reflects their received benefits. Consequently, this study must identify and calculate the value of benefits received from levees, assign those values to various types of beneficiaries, then determine the beneficiaries' appropriate share of project costs.

The results of the study will help support the Delta Stewardship Council's Delta Plan recommendation that "the Legislature should create a flood risk management assessment district … to provide adequate flood control protection and emergency *response for the regional benefit of all beneficiaries, including landowners, infrastructure owners, and other entities that benefit from the maintenance and improvement of Delta levees, such as water users who rely on the levees to protect water quality*." (Delta Plan Chapter 7, Recommendation RR R2, emphasis added). In addition, the Department of Water Resources, which funded the Study, has had a long interest in a beneficiary pays system for Delta levee improvement and maintenance.

In this feasibility study, we will evaluate options for future State funding of levees, incorporating equity and economic efficiency as principles for allocating the cost of flood control projects. As described in Project Memorandum #1, the State and federal governments use various funding sources and cost-share requirements to pay for flood protection.[1] In Project Memorandum #2, we reviewed the legal constraints on the available financing mechanisms and concluded that no single financing mechanism could capture all Delta beneficiaries and satisfy all of the legal and economic requirements.

Our general approach for identifying and screening finance options consists of six steps, as follows:

1. Determine project funding requirements (i.e., what cost needs to be covered for levee construction);
2. Identify benefits and beneficiaries (i.e., what risks are avoided or value created by levees);

[1] See http://www.delta.ca.gov/Flood_Risk_Assessment.htm for Project Memoranda on Historic Investments and Legal Context for paying for Delta levees.

3. Allocate cost responsibility (i.e. who pays and how much based on the benefits accrued); and
4. Identify candidate financing mechanisms;
5. Match candidate mechanisms with beneficiaries
6. Evaluate candidate financing mechanisms and associated financing structure (i.e., how will a levee investment program be paid for over time) based on multiple attribute criteria (to be detailed in a later memorandum).

To trace the relationship between benefits and costs in Steps 1, 2, and 3 above, the study team has developed a three-part economic analysis:

- Estimate costs for flood protection projects in "archetypes," which are examples of Delta conditions used in this study to screen feasible financing mechanisms.
- Identify beneficiaries of the Delta levees in each archetype, and quantify their potential benefits from flood protection projects.
- Describe available cost allocation methods, pros, cons, and constraints of using them, and identify the most appropriate to be used in the archetypes.

Our screening process for financing mechanisms (Steps 4 to 6 above) will use the results from this economic analysis to evaluate the suitability of a suite of mechanisms.[2]

This memorandum summarizes the three-part analysis that traces the relationship between levee project benefits and costs. We describe the first two steps in more detail in Project Memorandum #5, Beneficiaries Analysis, and Project Memorandum #6, Approach to Estimating the Cost of Levee Upgrade Strategies. The third step, cost allocation, will be described in the next set of project memoranda and discussed at the next workshop, along with the results of the financial mechanism screening process.

ESTABLISHING THE RELATIONSHIP BETWEEN BENEFITS AND COST RESPONSIBILITY

According to the beneficiaries-pay principle, beneficiaries should bear responsibility for project costs in some proportionate manner to the benefit they receive from it.[3] This study defines beneficiaries as people or organizations who own, use or control assets for specific purposes (i.e., activities) that benefit from flood control measures in the Delta. For example, growers on Delta islands benefit from the levees that protect farming activities from flooding. Some purposes consist of individual or private transactions from which economic value can be readily estimated (e.g., sale of agricultural products from protected lands); others create broad public benefits for which a price is not easily determined (e.g., protection of ecosystems or the existence of the Delta as a unique place).

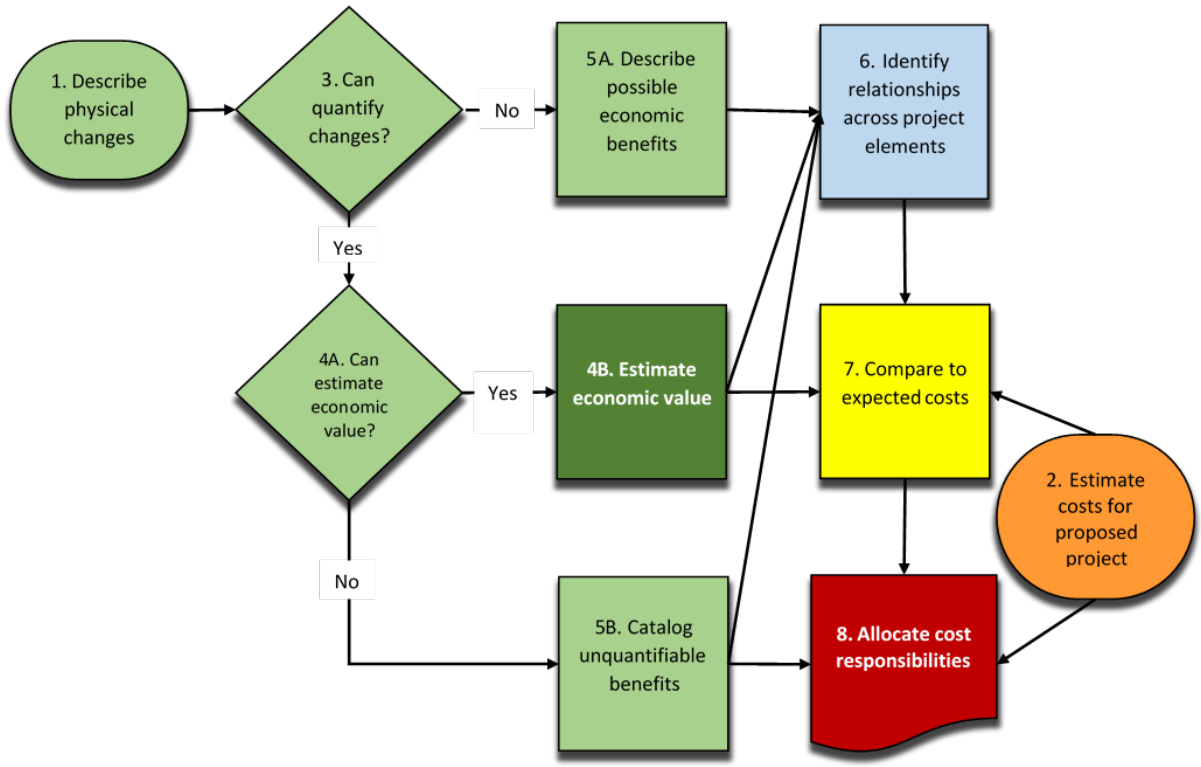
[2] Steps 3 to 6 will be addressed in Workshop #3.

[3] The proportion of benefits that accrues to beneficiaries varies with context and legal constraints. These issues will be addressed in a forthcoming project memorandum on cost allocation.

In general, the benefits of flood control measures are the reduced risk to beneficiaries. Although we can calculate the value of reduced risk, that value is uncertain, as it depends on predicting the likelihood of flooding. In contrast, other types of levee benefits are more tangible and readily measured and valued, such as improved habitat or water supply. Regardless, the basic process for moving from benefits to cost responsibility is similar across types of benefits.

Figure 1 shows how our team will determine the basis for allocating cost responsibility for flood control measures based on the beneficiary-pays principle.

Figure 1. Process for Estimating Benefits and Allocating Cost Responsibility



Steps in Using the Beneficiary-Pays Principle to Allocate Cost Responsibility

Figure 1 illustrates the steps to describe and estimate the benefits of flood control measures, then use those benefit estimates to allocate cost responsibility. The results then feed into the evaluation of candidate financing mechanisms to collect the needed revenues. The steps are described below.

1. **Describe expected physical changes.** List and describe all physical changes that are expected to occur because of a particular flood control measure or project (e.g., decreased flood risk, increased fish population, decreased salinity, increased water supply, etc.) A physical change may benefit all or some beneficiary groups, or it may benefit some but impose costs on others.
2. **Estimate costs for proposed project.** Estimate costs and put them in a comparable timeframe as the expected benefits. For example, if the costs are terms of an upfront

investment in new levees, the benefits will be aggregated over the expected lifetime of the levee.

3. **Quantify expected physical change.** Where data is available, provide quantitative estimates of the physical change (e.g., reduced flood risk per 100 years, salinity reduction at Banks pumping plant of 15 mg/l in July, an increase of 250 acre-feet of water supply deliveries to Delta Export Agriculture).

4. **Estimate the economic value of the benefit.** Where sufficient data exists, include an estimate of the net economic value of the physical changes described and quantified in steps 1 and 3. For example, raising a levee could improve flood control, but could also reduce available fishery habitat. The analysis should consider both values and compute the net benefit. If the improved flood risk exceeds the value of the lost fish habitat, then the net benefit would be positive.

5. **Describe unquantifiable economic benefits.** We expect that there will be insufficient data to quantify all of the expected benefits, either because a physical change is not readily identifiable (e.g., a species count does not change) or the economic benefits are not easily measured (e.g., determining the value of the Delta as a unique place). For such benefits, we can describe their possible timing, distribution, magnitude, and certainty. For example, the continued existence of legacy communities in the Delta produces societal value that is not easily expressed in monetary terms. Benefits such as the creation and protection of habitat are also difficult to quantify, although there are methods for estimating their value. (For more detail on estimating the value of benefits, please see Project Memorandum # 5 on Beneficiaries).

6. **Identify interrelationships between project elements that jointly produce a range of benefits.** Levees may provide multiple benefits from multiple purposes, some from purposes that do not readily yield measurable economic benefits. Maintaining channel integrity to improve aquatic habitat, which is a benefit for which there is no private transaction information, and to facilitate water conveyance, which is priced through utility rates, is one possible example. These interrelationships, or "joint products," enter into the cost allocation step below.

7. **Compare quantified economic benefits to expected costs.** Summarize how the economic benefits that can be quantified compare to the estimated costs. We will note where non-quantified benefits exist that could improve the benefit-cost ratio to justify these expenditures. However, because these are only examples, we will proceed to evaluate financing mechanisms despite an unfavorable benefit-cost ratio for a levee project.

8. **Allocate cost responsibilities.** As we will describe in a project memo for the next workshop, there are several options for cost allocation. We may use different methods as we step through the different levels of funding authority, from federal to state to local, due to differences in practices and legal authorities. We will present the selected options with the rationale and expected key challenges.