

## Economics Guidebook

### Chapter 3

# Cost Allocation Methodology

A basic principle of cost allocation is that derived cost savings through the use of combined facilities for several purposes should be impartially shared among all of the purposes. The assignment of costs reflecting those savings to each purpose is the focus of the cost allocation process.

There are a number of ways in which to allocate project costs among the project purposes. Before describing four of the suggested methods used by Reclamation, a discussion of cost allocation terminology might be useful. These terms and definitions are somewhat specific to allocations but are shared among the allocation methodologies.

### Terminology

**Specific Costs** - Costs of individual physical facilities and other costs that serve only a single purpose. An example would be the cost of a power plant which is used to generate power only and serves no other purposes.

**Incremental Costs** - Costs added to a plan to accommodate the addition of a purpose or objective, or for increasing the scale of service to one or more purposes. The addition of flood storage capacity in a reservoir by increasing the size of the structure would be an incremental cost.

**Separable Costs** - These are the costs that result by taking the difference between the cost of the multi-purpose project and the cost of the same project with the purpose omitted. A series of cost estimates should be prepared representing the multi-purpose project without each purpose. A purpose's separable costs would not only include its specific costs but also the costs of multipurpose facilities which were needed for the addition of that purpose. As an example, irrigation distribution facilities would serve only irrigation and represent a specific cost, whereas the cost for increased size of a structure to provide storage capacity for irrigation deliveries above storage capacity needed for all other purposes would be a separable joint cost.

Separable costs for any component may be zero, specific costs only, or specific costs plus some portion of the joint costs. The minimum cost allocated to a purpose is its separable cost.



**Dual-separable Costs** - Costs which are exclusively identifiable to the joint service of two purposes in a project that serves more than those two purposes.

**Joint Costs** - Costs which serve more than one, and often several, purposes or objectives. Usually a dam which provides storage capacity for multiple purposes; irrigation, flood control, recreation, etc.

**Remaining Joint Costs** - Costs of joint use facilities that remain after all separable costs have been deducted from total project costs. Basically the cost of facilities shared by all purposes.

**Single Purpose Alternative (SPA) Costs** - Costs of the most economical alternative which would likely be built as a Federal project to provide equivalent benefits for a single purpose. Its economic cost would include interest during construction and annual operation, maintenance, and replacement costs. A SPA may be located at the selected project site, or at other sites, and several alternatives, in turn, may occupy the same site. It may be of different size or may be an entirely different physical plan. It should be capable; however, of producing essentially the same benefit in the same geographic area. A Federal-type SPA for M&I water or hydropower will normally be a dam and reservoir at the same site, or nearby, scaled in size to provide benefits only to the single purpose of M&I.

The SPA is used in a cost allocation as a limit to the justifiable expenditure or maximum allocation to each purpose. It is, thus, different from the costs of alternatives used for the derivation of benefits. (See chapter II of the P&G for discussion of SPA's benefit estimates.) SPA's used in cost allocation of Reclamation projects should reflect a likely Federal-type alternative. Using the same Federal requirements as a basis for calculating benefits and costs permits comparable treatment of all purposes for determination of the controlling factor in the allocation process.

With respect to unemployed and underemployed resources components, the assumption is made that the SPA would be equal to the benefits from these components.

**Justifiable Expenditure** - This represents the maximum amount of costs that can be allocated to a purpose and is determined by the lesser of a purposes benefits or SPA costs.

**NED Plan** - The NED plan is the plan which reasonably maximizes net national economic development benefits. It must be a realistic, practical alternative which satisfies the plan formulation tests of viability as covered in P&G 1.6.2 and which could be implemented.

## Cost Allocation

Basic data used in the cost allocation should be summarized in a table following the "Costs to be Allocated" table as a means of documentation. The table should include single-purpose project costs and separable costs for each component. Both the capitalized costs and the annual equivalent values should be shown.

All project costs of NED plans are allocated among NED components except highway improvement, postauthorization archeological preservation, and deferred costs. The usual procedure for allocating costs among NED components is the separable costs remaining benefits (SCRB) method. Other methods may be used under certain circumstances, as subsequently discussed.

A simple example of the SCRБ method of allocating NED costs is shown in figure 1. In this example, all costs and benefits have been capitalized to their present worth; usually annual OM&R costs are carried parenthetically to facilitate comparison with the estimates as they normally appear in cost documents but are not shown in the simplified example. The steps in the cost allocation can be followed from the following list and also on Figure 1 as each line is numbered.

- a. List total costs to be allocated (1).
- b. List NED benefits by component served (2).
- c. List Federal SPA's for each component (3).
- d. The lesser of (2) or (3) should be listed as the justifiable expenditure (4).
- e. List separable costs (5) from the "Basic Data for Cost Allocation" table. These may be broken down into specific costs and separable joint costs, if desired.
- f. Subtract separable costs (5) from the justifiable expenditure (4) for each component to determine remaining justifiable expenditure (6).
- g. Divide the remaining justifiable expenditure for each component by the total remaining justifiable expenditure to determine the percentages for distributing remaining joint costs (7).
- h. In the total column, subtract separable costs (5) from total project costs (1) to determine remaining joint costs (8).
- i. Allocate project remaining joint costs (8) among components using the distribution percentages (7) determined in (g).
- j. Determine total allocated costs (9) to each component by adding separable costs (5) and remaining joint costs (8).
- k. Summarize the allocation results in the last series of rows in the table.

**Figure 1. Simplified Illustration Separable Cost-Remaining Benefits Method  
NED Plan - 100 Years @ 8.0 Percent Interest (\$1,000)**

	Item	Irrigation	Project Purposes		Total
			Power	Recreation	
1	<b>Costs to be Allocated</b>				\$77,000
	Construction				62,000
	IDC				7,812
	OM&R				7,188
	Annual OM&R				(546)
2	<b>Benefits</b>				
	Present worth	60,000	26,100	7,000	
	Annual value	4,802	2,089	560	
3	<b>Single Purpose Alternative Cost</b>	62,000	30,000	22,500	
	Construction	48,453	23,450	17,585	
	IDC	6,100	2,952	2,216	
	OM&R	7,447	3,598	2,699	
	Annual OM&R	(596)	(288)	(216)	
4	<b>Justifiable Expenditure (Lesser of 2 or 3)</b>	60,000	26,100	7,000	93,100
5	<b>Separable Costs</b>	24,000	6,200	5,600	35,800
	Construction	20,000	5,000	2,600	27,600
	IDC	2,526	625	326	3,477
	OM&R	1,474	575	2,674	4,723
	Annual OM&R	(118)	(46)	(214)	(378)
6	<b>Remaining Justifiable Expenditure (4-5)</b>	36,000	19,900	1,400	57,300
7	<b>Percent Distribution</b>	62.8%	34.7%	2.4%	100.0%
8	<b>Remaining Joint Cost</b>	25,885	14,309	1,007	41,200
	Construction	21,612	11,947	841	34,400
	IDC	2,724	1,506	106	4,335
	OM&R	1,549	856	60	2,465
	Annual OM&R	(106)	(58)	(4)	(168)
9	<b>Total Allocation (5+8)</b>	<b>49,885</b>	<b>20,508</b>	<b>6,607</b>	<b>77,000</b>
	Construction	41,612	16,947	3,441	62,000
	IDC	5,250	2,131	432	7,813
	OM&R	3,023	1,431	2,734	7,188
	Annual OM&R	(224)	(104)	(218)	(546)

## Suballocation of Recreation and Fish and Wildlife Component

Recreation and fish and wildlife may be considered to be a single component especially for interrelated reservoir-type activities. In such a case, separable costs are incurred for the combined recreation and fish and wildlife components and cannot be independently identified for each component. However, the amount of cost sharing and the contracting organizations are usually different between recreation and fish and wildlife. Therefore, it is necessary to suballocate the costs initially allocated to the combined component.

This two-step procedure is necessary because of the process used to identify separable costs and equitably allocate joint costs in the allocation process. The

separable cost for each purpose is defined as the difference between the cost of the multipurpose project and the cost of the same project with the purpose omitted. In this instance, the "purpose" would include (separable) costs for project facilities which are common to, or serve, two (or more) purposes. However, since the combined separable costs are subject to different cost-sharing provisions, they have to be carefully segregated in the suballocation procedure. Typically, costs specific to each component are initially identified in the suballocation, and joint costs are then proportionally allocated.

A similar suballocation may be required where there are both reservoir and instream flow requirement segments of a component such as fish and wildlife. Further, in those instances in which there are fish and wildlife and recreation components in both reservoir and instream flow requirement categories, a dual suballocation may be needed: an initial suballocation to segregate recreation and fish and wildlife segments and a second suballocation to isolate reservoir and instream flow segments.

The alternative justifiable expenditure (AJE) method (subsequently described) or other appropriate techniques may be used for these purposes to avoid the complexities of estimating separable costs of each subcomponent. An example of an AJE suballocation is shown in Figure 2. In this example, the suballocated cost is reflected in Figure 1, total allocation to Recreation. The steps to follow are the same as previously listed for the SCRB method except specific costs are used instead of separable costs.

**Figure 2. Simplified Illustration Suballocation of Costs - Alternative Justifiable Expenditure Method Initially Allocated to a Combined Recreation and Fish and Wildlife Component 100 Years @ 8.0 Percent Interest (\$1,000)**

	Item	Purposes to Suballocation		Total
		Recreation	Fish & Wildlife	
1	<b>Costs to be Suballocated</b>			\$6,607
	Construction			3,441
	IDC			432
	OM&R			2,714
	Annual OM&R			(218)
2	<b>Benefits</b>			
	Present worth	5,000	2,000	
	Annual value	400	160	
3	<b>Single Purpose Alternative Cost</b>	20,000	18,000	
	Construction	15,000	14,000	
	IDC	1,964	1,764	
	OM&R	3,036	2,236	
	Annual OM&R	(243)	(179)	
4	<b>Justifiable Expenditure (Lesser of 2 or 3)</b>	5,000	2,000	7,000
5	<b>Specific Costs</b>	3,249	972	4,222
	Construction	1,500	600	2,100
	IDC	150	60	210
	OM&R	1,599	312	1,912
	Annual OM&R	(128)	(25)	(153)
6	<b>Remaining Justifiable Expenditure (4-5)</b>	1,751	1,028	2,779
7	<b>Percent Distribution</b>	63%	37.0%	100.0%
8	<b>Remaining Cost to be Suballocated</b>	1,503	882	2,385
	Construction	845	496	1,341
	IDC	140	82	222
	OM&R	505	297	802
	Annual OM&R	(41)	(24)	(65)
9	<b>Total Allocations (5+8)</b>	<b>4,752</b>	<b>1,854</b>	<b>6,607</b>
	Construction	2,345	1,096	3,441
	IDC	290	142	432
	OM&R	2,104	609	2,714
	Annual OM&R	(169)	(49)	(218)

## Exceptions

Although SCRB is usually the preferred method of cost allocation, circumstances may arise which justify using another method. Some of these situations are as follows:

**Overriding Legislation or Departmental Directives** - Legislation specific to a project such as the authorizing act will sometimes include specific cost allocation or cost-sharing rules which override the general procedures. Also, specific direction may be provided by Department of the Interior mandate or directive.

**Suballocation and Insufficient Information** - Sometimes there are insufficient data on benefits and/or separable costs to use the SCRB method of allocation. The allocation problem may be relatively minor resulting in the lack of justification for the time and expense of preparing further economic and engineering estimates. An example of such a situation is when unforeseen M&I use develops on an existing project, and it is necessary to suballocate a particular structure or conveyance facility in order to establish M&I water charges. In such situations, an alternative method may be used (with approval of the Commissioner's Office) such as the benefits method or the use of facilities method wherein the allocation is made on the basis of proportionate share of benefits, or yield, or the capacity of the facility.

**Other Lead Agency** - Reclamation may agree to an alternative method of allocation chosen by another Federal agency which has primary responsibility for a plan or multipurpose facility. An example of this situation is when irrigation is subsequently added as a component to a storage project previously constructed by the Corps of Engineers. In such instances, the lead Federal agency has final authority over the method of cost allocation.

**Authorization of Commissioner** - The Commissioner may designate a particular cost allocation or repayment methodology for a project in order to address policy, environmental, or cost equity considerations.

## **Other Allocation Methods**

The two methods most commonly used in special situations where the SCRB method cannot be reasonably applied are the AJE method and the use of facilities (UOF) method. A slightly modified SCRB procedure can be used in those instances in which a project purpose is evaluated on a cost-effective basis rather than on a benefit basis. In addition, allocation of costs to some threatened and endangered species objectives may require other allocation approaches.

**AJE Method** - This method is the same as the previously described SCRB method, except that only specific costs rather than separable costs are allocated to each purpose prior to the allocation of joint costs. This method may give similar results to the separable cost-remaining benefits method. This would be particularly true if the majority of separable costs were specific for each purpose. It may be used in lieu of that method when there are technical problems in determining separable costs such as a transbasin diversion or when the expense of preparing separable cost estimates is not warranted by the relative importance of the allocation problem.

**Use of Facilities Method (UOF)** - In this method, each purpose is assigned its specific cost or its separable cost, plus a share of joint costs proportionate to the use of joint facilities by each purpose in terms of comparable measures such as annual water deliveries, capacities of physical features, and annual requirements for power and energy. There are many variations of this method because there are

many ways in which the UOF may be measured; however, few will provide equitable results. Such measures are complicated by variability of use over time, fluctuations of head, peak periods of use, conflicting demands, and inapplicability of a common measure to all project purposes. Physical measures of use may be convenient in very early stages of investigations before benefits have been evaluated. However, disregard of the relative value of water for various purposes and omission of alternative cost as an element in the allocation prevent determination of the maximum justifiable allocation for each purpose, leading to inequitable results. For the same reason, the UOF method is inconsistent with economic principles for project formulation.

This method will be limited, generally, to use in suballocating costs assigned to a NED component by another method among groups of beneficiaries sharing in a common purpose. Advance approval of the Commissioner's Office is necessary before the UOF method may be used on the initial allocation among components of a plan.

## **Allocations Based on Other Measures**

In some instances, costs may be allocated to functions based on other methods or measures, in the absence of currently available methods of identifying quantifiable benefits and/or SPA costs.

For instance, the CRWQIP salinity control purposes are currently evaluated on a costeffectiveness basis. This requires a slight modification of the SCRB procedure. In the formulation of multipurpose salinity control projects, the justifiable expenditure is based on the SPA, which is used as a measure of NED benefits. The amount allocated to salinity control becomes an estimate of salinity control cost effectiveness, and allocations to other (reimbursable) water supply purposes are estimates of beneficiaries' willingness to pay. Instances might arise in which allocated costs to the other beneficiaries are greater than the repayment capability of those beneficiaries resulting in the need to reallocate costs. Such adjustments require careful review and oversight. However, in no case should Federal expenditures for salinity control exceed the single-purpose costs.

Costs may be allocated to purposes based on cost effectiveness using other measures of beneficial use. If authorized either by policy or legislation, costs may be allocated to the purpose based on either: (1) the assumption that benefits for the purpose are at least equal to costs, or (2) the assumption that the use of water for the purpose is at least equal to the value of the water in its next best alternative use; i.e., equal to the opportunity costs of the water.

Note that in the case of some threatened and endangered species, current methodologies do not lend themselves well to measurement of quantifiable benefits. Although declining populations would innately entail an increase in the value of remaining species members, current technology does not lend itself to the monetary measurement of such increasing values due to scarcity. In these

instances, costs may be allocated based on other measures, such as cost effectiveness, biological accomplishment, or opportunity costs, which better reflect desirable values.

## **O&M Costs**

The procedure of first choice for allocating Federal O&M costs should utilize the final project cost allocation. However, in the event the nature of the project has changed substantially, alternative allocation procedures can be considered. If the decision is made to allocate O&M costs by a method other than the final cost allocation, the modified methodology should be based on a determination of benefits for uses currently being served. Generally, a detailed study of benefits, similar to the level of detail required for a planning study, will not be required. For instance, farm enterprise budgets may be used to determine irrigation benefits, or unit-day values may be used to estimate recreation benefits.

## **Other Allocation Problems**

The preceding discussion covers the principles of cost allocation and the major methods to use in preparing planning reports. Certain other special allocation problems may arise which require different treatment. These problems are classified as reallocations or revisions, suballocation, and problems in final cost allocations.

**Reallocations or Revisions** - When a project is placed in service, and a final cost allocation has been prepared, revisions or a reallocation may become necessary as a result of changes in operating criteria, changes in project beneficial effects, or changes in project costs. Such a change would typically be activated by authorizing legislation. A prime example of the legislative requirement is provided by Title III of the Department of Energy (DOE) Organization Act (Public Law 95-91), which addresses transfer of project functions to DOE. That legislation stated that no changes in cost allocation or project evaluation standards shall be deemed to authorize the reallocation of joint costs of multipurpose facilities of a project unless the change is approved by Congress.

The basic guideline to follow in updating cost allocations is to use the same method of allocation as was used in the project authorization report. However, if authorizing legislation provides other direction, then it would take precedence. Note that the AJE method may be preferable for many reallocations, where costs have been expended and there is no opportunity for redesign. Depending on the problem, this will sometimes necessitate updating benefits, Federal costs, and separable costs for some, or all, of the purposes to place them on an equivalent basis. Appraisal-level estimates through the use of appropriate cost indexes will usually be sufficient for this purpose. Relatively minor changes in use, such as shifting a small amount of irrigation supply to M&I use after the project is in operation, may be handled by a pro rata adjustment to each component.

**Suballocation** - A further breakdown of costs within a NED component may sometimes be necessary for the purpose of cost sharing among different contracting units. An example of such a suballocation for the recreation and fish and wildlife component by the AJE method was discussed previously.

Other examples of suballocation problems can be found in the allocation of costs between project use and commercial power, among irrigation blocks, and among M&I contractors. Suballocation on components where there is a common denominator such as units of physical output diverted or consumed, can be performed by the UOF method on the basis of proportionate use. Consideration must be given to both the capacity and energy components when the UOF method is used to suballocate power costs between commercial power and project pumping power.

The UOF allocation procedure is frequently used in SRPA projects to suballocate combined irrigation and M&I water supply costs among interest- and noninterest-bearing subpurposes. When the UOF allocation procedure is applied for this purpose on an annual basis, it is referred to as a "rolling allocation."

## **Problems in Final Cost Allocations**

Some unique problems may arise in an instance in which a final cost allocation is made following construction over an extended period of time with project functions coming on line at widely varying junctures. As noted earlier, a prime objective of the final allocation is the equitable distribution of joint costs. To accomplish that, it is requisite not only that benefits, SPA costs, and expended costs for a particular purpose be on a comparable timeframe (cost level) but, also, that the timeframe for each purpose be equitable relative to that for other project purposes.

Difficulties may arise in how to present SPA costs, benefits, and project costs with disparate time periods on a comparable (equitable) basis. Experience has shown that the presentation of SPA costs for a purpose is not a problem when those costs are based on a similar or reduced-in-size version of essentially the same facility because the SPA costs and actual construction costs essentially use the same cost base.

However, a complication occurs in those instances in which the SPA is an altogether different facility such as the case in which a thermal plant is the SPA for a hydropower plant. In these instances, current costs of the SPA must be indexed to coincide with the cost level (timeframe) of actual construction costs for the function. Similarly, if cost allocation to a project purpose is limited by benefits, rather than SPA costs, it is important that the price level (timeframe) of those benefits be indexed to coincide with that of the actual construction costs of the function.

A problem that has often occurred in final allocations and reallocations is the condition wherein project costs to be allocated exceed total benefits, either due to an increase in project costs, a decline in benefits, the elimination of a function, project downsizing, or a combination of reasons. In this situation, remaining project beneficiaries would generally be responsible for allocated costs up to the limit of residual project purpose benefits, subject to a minimum of allocated separable costs. However, such situations would require case-by-case scrutiny, and the review and approval of the Commissioner's Office.

Another problem that has occurred in the final allocation is the situation in which benefits for a particular function are less than allocated separable costs due to an extended project construction period resulting in a considerable shift in water requirements or demand for a particular purpose. In this situation, original purpose beneficiaries would normally be responsible for, at least, the separable costs, unless the costs could be shifted to a function(s) whose demand for water (benefits) have increased since plan formulation estimates and the separable facilities are adaptable to another function. Such complications are relatively rare and are dealt with on a case-by-case basis.

## **Results of Cost Allocations**

The results of the cost allocations are used in accounting for project expenditures, for budget preparation, and to determine the amount of reimbursable costs to be repaid by project beneficiaries.