Cost-benefit analysis

Topics

- Political background
- Context question
- Federal *Principles, Requirements & Guidelines*
- Measuring benefits of an increased water supply
- *Alternative* costs as a benefit measure

1

Political gravity

- Major projects have been the Public sector's domain. Why?
  - $$$ & multipurpose
  - Major opportunities for relying on taxpayers instead of ratepayers
  - Myths prevail (need, econ. development)

2

"A" CBA question

Mindful of the full range of available supply enhancement and demand management options:

- Is this project part of the best package?

3

U.S. *Principles & Requirements*

Political and water agency forces prefer projects, so U.S. law acted to require CBA, beginning in 1936.

But the agencies themselves do the analyses, and they have internal biases.

Yet, we want consistent (across agencies) and well done CBAs.

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U.S. *Principles, Requirements, and Guidelines*

- 2013 & old Principles & Guidelines (1983)
  - downloadable at websites.
  - quite readable; doesn't develop allowed methods
- Required for national projects only.
  - Past: Corps of Eng., BuRec, TVA, NRCS (USDA)
  - added (2013): EPA, NOAA, FEMA, OMB
- for any water-related infrastructural planning

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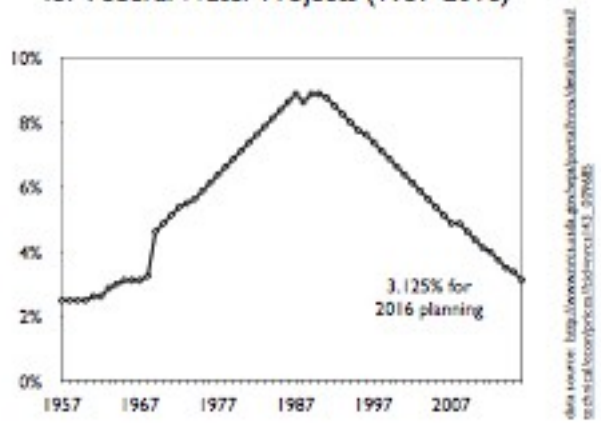
Historical Discount Rates

for Federal Water Projects (1957-2016)



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1983 U.S. *Principles & Guidelines*

- Water projects are multipurpose – difficult to analyze.
- 4 "accounts": NED, RED, EQ, OSE
  - RED includes secondary economic effects.
  - EQ, OSE include incommensurables and intangibles.
- NED: are annualized benefits > annualized costs?
  - If "yes", it can be built according to 1983 P&Gs.
  - "Variances" commonly given (in writing).
  - Still needs appropriations (funding).

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2013 U.S. *PR&G*

- 4 accounts are gone, at least in name.

"In consideration of the many competing demands for limited Federal resources, it is intended that Federal investments in water resources as a whole should strive to maximize public benefits, with appropriate consideration of costs. Public benefits encompass environmental, economic, and social goals, include monetary and nonmonetary effects and allow for the consideration of both quantified and unquantified measures." (p. 3, emphasis added).

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U.S. *PR&G*

"Addressing the complex and often conflicting water resource needs of today and the future requires the formulation of a diverse range of solutions that need to be fully considered in the decision making process. Such solutions may produce varying degrees of effects relative to environmental, economic, and social goals. No hierarchal relationship exists among these three goals and as a result, tradeoffs among potential solutions will need to be assessed and communicated during the decision making process" (p. 3, emphasis added).

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U.S. *PR&G*

"The ecosystems services approach is a way to organize all the potential effects of an action (economic, environmental and social) within a framework that explicitly recognizes their interconnected nature" (p. 7).

"A narrow focus on monetized or monetizable effects is no longer reflective of our national needs, and from this point forward, both quantified and unquantified information will form the basis for evaluating and comparing potential Federal investments in water resources" (p. 7).

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U.S. *PR&G*

"Nonstructural approaches can often be the most cost effective and environmentally protective alternative to implement" (p. 11).

"Nonstructural measures include, but are not limited to, modifications to public policy, regulatory policy and pricing policy, as well as management practices, including green infrastructure" (p. 7).

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That is, CBA is necessarily more than NPV (or similar measures), because all project impacts are not *commensurable*.

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Costs?

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Table 3-2 NDDDB Initial Project Cost Estimate

Facilities	Size	Costs ($ million)
Sites Dam (MAF)	1.80 MAF	70
Golder Gate Dam (MAF)	1.80 MAF	180
Seville Dams (MAF)	1.80 MAF	137
Pumping Plant at Golder Gate Dam (cfs)	6,000 cfs	364
Sacramento River Pumping-Generating Plant (cfs) [1]	2,000 cfs	477
Sacramento River Pump Plant Fish Screen (cfs)	2,000 cfs	72
Funks Reservoir Modification (cfs) [2]	6,000 cfs	47
Long Tunnel w/ multi- level outlet (fixed cost)		534
South Road Alternative (fixed cost)		148
Recreation (fixed cost)		30
CCID Conveyance and TRR (fixed cost)	1,800 cfs	37
Pipeline and Pumps from TRR to Funks (fixed cost) [3]	1,800 cfs	140
TCC Conveyance (fixed cost)	2,500 cfs	83
Land Acquisition (ac) [4]	14,000 ac	19
Total Field Costs		**1,941**
Engineering, Inspection, Admin, Legal Costs (25%) [5]		485
Total Construction Costs		**2,426**
Foregone Investment Value (Interest) during construction [6]		426
Total Capital Costs [7]		**2,852**
Annual Costs		
Operation & Maintenance		4
Power		17
Total Annual Costs		**21**

[1] Includes Pipeline, Reverse Flow Facilities and Inlet/Outlet Structures to Funks.
[2] Includes TC Bypass.
[3] Includes pumping-generating plant.
[4] Land Acquisition includes easement and right-of-way for Sites Reservoir and Conveyances.
[5] Engineering costs include construction management and design.
[6] Environmental Mitigation and Permits are not reduced in the total costs.
[7] Interest during construction is the federal terminology.

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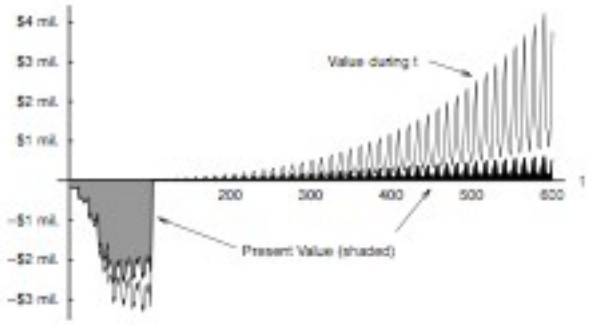
San Antonio's Applewhite Reservoir



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Alternative Costs

- Let's say we wish to measure the added benefits of $+\Delta w$ for some project.
- Instead of using  , could we use the *alternative cost* procedure?
  - What other costs will be avoided if this project is built? Can they be claimed to be the benefits?

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Alternative Costs *(cont.)*

Presented as a fill-in-the-blank application:

> "By increasing the water supply with project A, the region will avoid paying option B's $X million, so the benefits of project A are at least $X million."

Alternative Costs *(cont.)*

> "By increasing the water supply with project A, the region will avoid paying option B's $X million, so the benefits of project A are at least $X million."

Proj. A	Alternative B	Okay?
Hott Dam	Losing $X m. in regional economic activity	no, the alternative costs are secondary econ. effects
Hott Dam	Paying $X m. for an interbasin transfer	maybe, but only if B would occur & is efficient
Hott Dam	Paying $X m. for a desalinization plant	maybe, but only if B would occur & is efficient

The *PR&G*'s dictates (fyi only)

"Alternative plans, strategies, or actions are to be formulated in a systematic manner to ensure that a range of reasonable alternatives are evaluated." (p. 12)
"In some cases, plans, strategies, or actions may be formulated which require changes in existing statutes, implementation authority, administrative regulations, and/or established law and policies" (p. 12)
"Alternative plans, strategies, or actions that can effectively address a problem through the use of nonstructural approaches, if they exist, must be fully considered and carried forward to the final array of solutions." (p. 12)
"An alternative plan, strategy, or action that is preferred by a local interest with oversight or implementation responsibilities must be included in the final analysis." (p. 12)