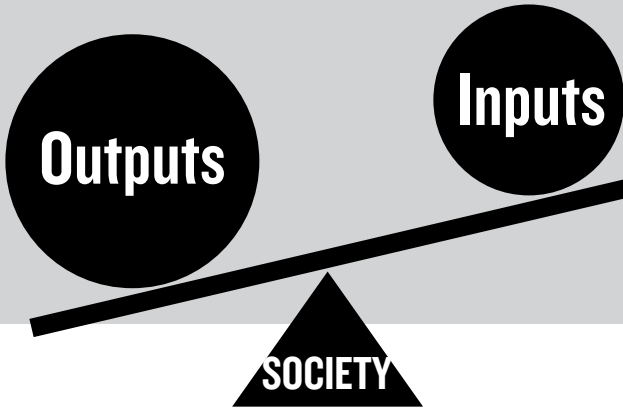


International Water Institute



#3 -
Benefit/Cost Analysis
Primer

<https://iwinst.org>

IWI

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See also:

#1 - Efficiency

#2 - Government Organizations and NGOs

#3 - Benefit/Cost Analysis Primer

#4 - Government Revenues

#5 - Inflation

#6 - Natural Resources Planning

#7 - Robert's Rules of Order

#8 - Natural Resources Economics

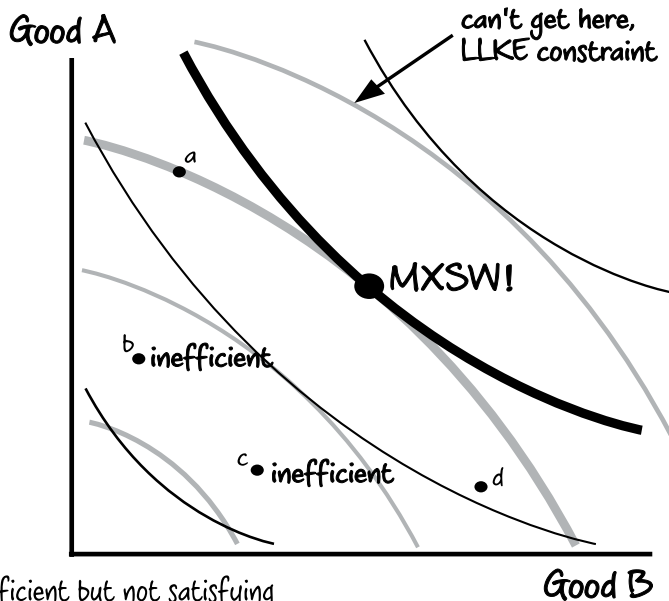
CONSERVATION IS: The prevention of wasteful use of a resource ... the efficient use of resources.

ECONOMICS IS: The study of how individuals, firms, groups, government, society ... allocate their scarce resources among competing uses to satisfy unlimited wants.

Efficiency is:

- ① Using the fewest resources to achieve a desired output
- ② Using ALL resources to achieve the MAXIMUM output
- ③ Getting the greatest output from a fixed amount of resources

Society's well being is maximized in this time period at MXSW, where $MRT_{A,B} = MRS_{A,B}$.



a: efficient but not satisfying
b, c, d: inefficient

Efficiency measures:

BCA - benefit/cost analysis (a ratio)

IRR - internal rate of return (%)

Net B - net benefits (\$ or other
common denominator)

Break-even analysis (years)

Time to payback (years to recover inputs)

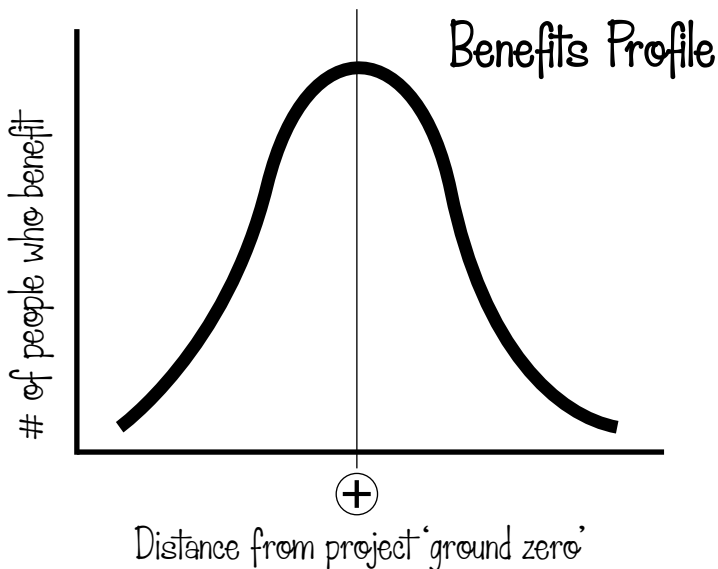
Least cost/cost efficient

Benefit/cost analysis

is a time-wise description of ALL benefits and ALL costs of a project/measure/policy/investment, to WHOMEVER, WHENEVER, or WHEREVER.

Costs are: direct, indirect, externalities

Benefits are: direct, indirect, externalities



$$BCR = \frac{\Sigma PV B}{\Sigma PVC} = \frac{B_0}{C_0} + \frac{B_1}{(1+i)^1} + \frac{B_2}{(1+i)^2} + \frac{B_2}{(1+i)^3} + \dots + \frac{B_n}{(1+i)^n} - \frac{C_1}{(1+i)^1} - \frac{C_2}{(1+i)^2} - \frac{C_2}{(1+i)^3} - \frac{C_n}{(1+i)^n}$$

PV = present value

B_n = benefit in year n

i = discount rate

C_n = cost in year n

OR:

Just use the Tables

BCR Considerations

- discount rate
- project life
- SCRB
- sunk costs
- adaptive management
- double counting
- without project condition
- indentifying, measuring, monitoring benefits and costs (doesn't need to be done in \$) ... requires a common denominator
- perspective
- not easy to grasp the complete BCA framework

Discount rate

- the value of a dollar today isn't the same as a dollar in 1966 or a dollar in 2032.

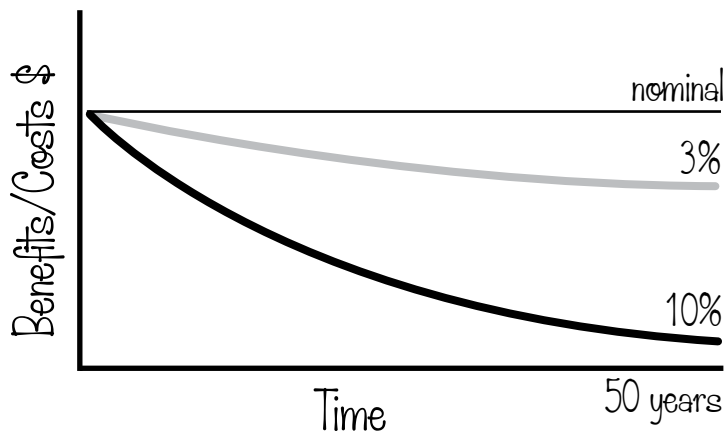
Real dollars are dollars adjusted for inflation to a specific year. All dollars are in relation to one year.

Nominal dollars are contemporary prices.

We ignore inflation with BCR.

Selected discount rates

Year	Each Year		All Years	
	3%	10%	3%	10%
0	1	1	1	1
5	0.8626	0.6209	4.5797	3.7908
10	0.7441	0.3855	8.5302	6.1446
20	0.5537	0.1486	14.8775	8.5136
50	0.2281	0.0085	25.7298	9.9148



Project life

- the useful life of a project with reasonable O + M.

Big water projects \leq 50 years

SCRB

- You can't lump projects together if they don't rely on each other, just to use the surplus benefits from Component A to bring along Component B which couldn't stand alone.

Sunk Costs

- A BCA done today ignores all previous expenditures and just looks ahead to remaining $C + B$. At the same time, don't include B that already exist or that might exist without the project.

Adaptive Management

- A BC analyst can't assume the *status quo*. For example, if a township road washes out every 2 or 3 years, eventually the township will abandon or harden the road in the absence of a higher-end government funded project.

Double Counting

- Be careful not to count the same benefit twice. For example, increases in cropland value are the same as increased production as a result of the project.

Without Project Condition

- What would the future be without a project compared to with a project.

Identifying B + C

- Brainstorm all that might exist to whomever, wherever, whenever.
No ∞ or priceless B!

Perspective

- A project's sponsor's perspective is important to consider (local, regional, state, multi-state, or national).
- But perspective doesn't change the overall social efficiency analysis of all B and all C.

Measuring B + C

The planning team will say how many of what will result from the projects

- acres protected
- recreation days provided
- nitrogen levels reduced
- wildlife populations increased
- sediment levels reduced

Monetizing B + C

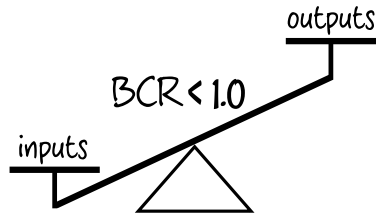
Primary data - analyst collects numbers

Secondary data - analyst uses numbers from available sources

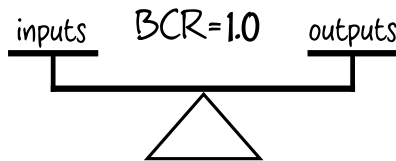
- Benefits transfer: use numbers from somewhere else
- Meta-analysis: use numbers from a bunch of other studies
- SWAG: come up with a best estimate that is defensible
- Just saying "reducing N levels is a benefit" stops short of a social efficiency analysis

$$\frac{PVB}{PVC} = BCR$$

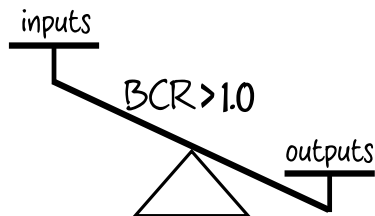
Resources
are wasted



No net gain
for society



Society is
better off*



*In general!

How does BCR compare to the other measures?

BCR is society's method of investment analysis.

Can BCR be compared across projects?

Does BCR consider equity?

Conclusion

BCR helps society get the most from its finite supply of resources, now and in the future.

BCR does not consider equity.

Qualitative arguments about “priceless” social goods do not make it into the BCR and likely will not make it into the 1-page ‘project scoring’ document that policy makers use to make decisions.