

USACE Inland Navigation Economics Cost-Benefit Analysis 101

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Cost-Benefit Analysis

- Why is it Used?

- ▶ Required for analysis of navigation projects by Flood Control Act of 1939.
- ▶ Accounts for time value of benefits and of costs (50 year).

- What is it?

- ▶ Technique to evaluate in monetary terms what is achieved (**benefits**) in comparison to what is invested (**costs**).
- ▶ Systematic process for comparing costs and benefits over time between no investment (**Without-Project Condition**) and investment (**With-Project Condition**).

- What are the Metrics?

- ▶ Net Benefits = Benefits minus Costs
- ▶ Benefits Cost Ratio (BCR) = Benefits divided by Costs



Costs

- Without-Project Condition
 - ▶ Normal operation & maintenance costs
 - ▶ Cyclical maintenance & unexpected repair / replacement costs
 - ▶ Non-structural (i.e. helper-boats, mooring cells)
- With-Project Condition
 - ▶ Normal operation & maintenance costs
 - ▶ Cyclical maintenance & unexpected repair / replacement costs
 - ▶ Construction/Major Rehabilitation costs



Benefits

- Without Project Condition
 - ▶ National Economic Development (NED) benefits
 - ▶ Regional Economic Development (RED) benefits
 - ▶ Other Social Effects (OSE) benefits
 - ▶ Environmental Quality (EQ) benefits
- With Project Condition
 - ▶ NED benefits – e.g. **Transportation Rate Savings**
 - ▶ RED benefits – e.g. Jobs, Income
 - ▶ OSE benefits – e.g. Cultural considerations
 - ▶ EQ benefits – e.g. Environmental impacts



Cost Benefit – Incremental Analysis

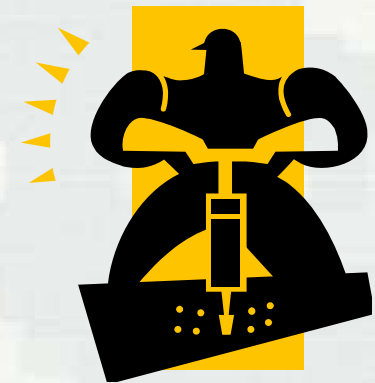
METRIC	WITHOUT PROJECT CONDITION	WITH PROJECT CONDITION		
		Alt A	Alt B	Alt C
Costs	\$50,000	\$175,000	\$550,000	\$550,000
Benefits	\$3,000,000	\$3,500,000	\$3,750,000	\$4,000,000
Incremental Costs		\$125,000	\$500,000	\$500,000
Incremental Benefits		\$500,000	\$750,000	\$1,000,000
Incremental Net Benefits		\$375,000	\$250,000	\$500,000
BCR		4.0	1.5	2.0

NED plan maximizes net benefits –
Alternative C is NED plan.



With-Project Costs - NED

- Investment First Cost (Construction Costs)
 - ▶ Walla Walla certified estimate (risk-based contingency)
- Interest During Construction (Construction Duration)
- Maintenance Costs (Scheduled)
- Costs from Risk Exposure (Repair & Replacement Costs)



With-Project Benefits – NED

- Inland Navigation Transportation
 - ▶ Cost Reduction → Project transit time reduction (Processing + Queuing Delay)
 - ▶ Others (Shift-in-mode, shift-in-market)
- Without-Project Repair & Replacement Costs Avoided
- Other Benefits*
 - ▶ Recreation
 - ▶ Water supply
 - ▶ Hydropower
 - ▶ Highway Impacts (\$)

* *Other benefits are only considered when selecting between projects if (NED) BCR > 1.0.*



Benefits – NED Drivers

- Inland Navigation Transportation
 - ▶ Capacity (LPMS)
 - ▶ Forecasts (WCSC, Industry reports, etc.)
 - ▶ Transportation Rate Savings (Surveys, STB Waybill, Informa Vessel Operating Costs)
 - ▶ Engineering Reliability Industry Impacts
- Repair & Replacement Costs Avoided
 - ▶ Engineering Reliability (OCA/ORR, RMC, OPs, ED)



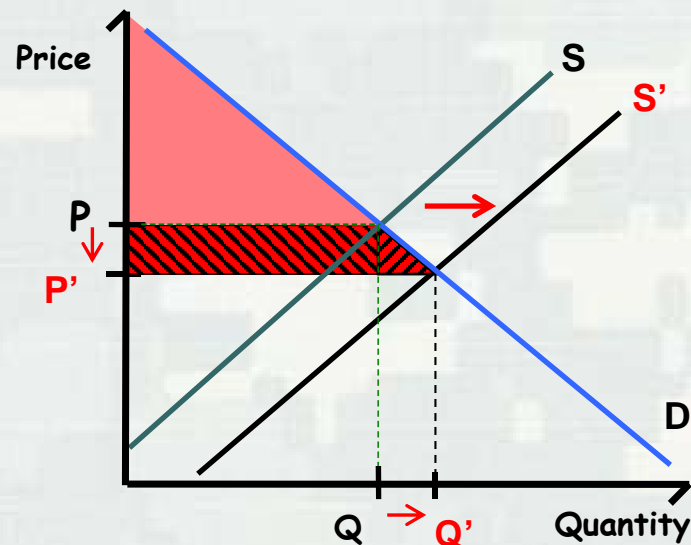
Questions?

Extra Slides follow...



Cost-Benefit Analysis

- Conceptually – the IMTS accommodates Q traffic at cost P . Benefit is represented by red triangle as consumer surplus for Q that is willing to pay more for water transportation but doesn't in the current market
- A navigation improvement/investment increases waterway transportation supply to Q' and reduces cost to P' . Existing Q traffic moves at lower cost and additional traffic ($Q \rightarrow Q'$) is induced or shifts to the waterway
- BCR is calculated by dividing total economic benefits by total economic costs



Inland Navigation Economics

BCR Updates

Project Name	Last Approved Report		Last Economic Update			
	Year	Report type	Level	Year	BCR - App Rate	BCR - 7%
Olmsted	2012	PACR	4 - PACR	2012	2.8	3.3
Kentucky Lock Addition	1994	LRR	3- LRR	2011	1.7	1.7
Chickamauga Lock	2001	Feasibility	3-LRR	2015	n.a.	0.5-0.8
Lower Monongahela 2, 3 & 4	1992	Feasibility	1.5 - Update	2014	1.3	1.4

