

Cost Effectiveness, Affordability, Project Planning And YOU!

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David Dunn P.E.
WA Dept. of Ecology

As decision makers for a utility you have two responsibilities

- Protect public health, safety, and the environment
- Keep utility rates low

- These two are in inherent conflict
- That's why you're "decision makers"

How do you choose your infrastructure?

- A. Do what Ecology says?
- B. Do what your consultant says?
- C. Avoid making any choice?
- D. Do you lead your utility forward through smart choices?

Life Cycle Cost Analysis

- A Life Cycle Cost Analysis (LCCA) is a powerful tool.
- LCCA can help you make good decisions
- If you know the assumptions that go into the analysis.

Life Cycle Costs (LCC)

Life Cycle Costs include both:

- Construction costs (including design, construction management, change order / high bid risk)

AND

- Operations costs (Operations, Maintenance, Asset management, financing costs)

AND

- Replacement costs (Replacing the infrastructure system at the end of it's useful life)

The "Goldilocks" Curve

Life Cycle Cost Analysis

- LCC is a tool to find which alternative is superior
 - Required for Ecology funding
- Thinking about total ownership costs
 - Comparing future costs to today's costs
 - Comparing a string of costs to a lump sum cost
- Includes the Time Value of Money
 - Today's money is worth more in the future
 - (Future costs are less expensive today)

Net Present Worth

- Discounting future costs - Time Value of Money
 - Imagine investing today to provide for future payments.
 - Use the "Real" (inflation adjusted) Discount Rate
 - 1.6% for 20 year bonds as of 7/9/14
- Examples Net Present Worth (2014 dollars)
 - \$36,400 invested today equals \$50,000 (inflation adjusted) in 2034.
 - 20 annual payments of \$50,000 have a Net Present Worth of \$850,000

Decision Matrices

- Commonly used tool
- List of criteria with scores for each alternative
- Beware of decision matrices
 - Unclear criteria
 - Subjective scores
 - An easy way to fool yourself

A Bad Example

Criteria	MBR	Lagoons
Construction Cost	1	3
Community Acceptance	4	1
Sustainability	3	5
Quality of Effluent	4	1
Meets "Class A" reclaimed water standards	5	1
	17	11

Another Bad Example

Criteria	MBR	Lagoons
Construction Cost	1	3
O&M Cost	1	5
Sustainability	3	5
Meets permit requirements	5	3
	10	16

A Bad Example

Criteria	MBR	Lagoons
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- ### If you have to use decision matrices
- Understand how the rating criteria supports the goal of the project
 - Understand how scores are assigned across the range
 - Use as tie breakers after doing LCCA

An Example of LCCA

- ### Welcome to Anywhere, WA!
- Sewer Customers: 1,000
 - Median Household Income: \$40,000
 - Anywhere needs a new sewage treatment plant

- ### Anywhere has two options
- A: Expensive upfront, cheaper to operate
 - B: Cheap upfront, more expensive to operate

Up front Expenses (Anywhere, WA)

- Construction Cost (Estimates)
- Design
- Planning
- Construction Management

	A	B
Capital Cost	\$10,000,000	\$6,000,000

Recurring Expenses (Anywhere, WA)

- Staff
- Overhead
- Supplies / Tools
- Power
- Chemical
- Asset Replacement
- Lab expenses

	A	B
Annual O&M	\$500,000	\$800,000

Life Cycle Costs (cash)

	A	B
Capital Cost	\$10,000,000	\$6,000,000
Annual O&M	\$500,000	\$800,000
O&M NPW*	\$8,500,000	\$13,600,000
TOTAL	\$18,500,000	\$19,600,000
<i>Savings</i>	\$1,100,000	

* NPW = Net Present Worth

Life Cycle Costs (loan)

	A	B
Capital Cost	\$10,000,000	\$6,000,000
Annual Debt*	\$630,000	\$378,000
Annual O&M	\$500,000	\$800,000
Debt NPW	\$10,710,366	\$6,426,219
O&M NPW	\$8,500,290	\$13,600,464
TOTAL	\$19,210,656	\$20,026,684
<i>Savings</i>	\$816,028	

* SRF loan; 20 year term; 2.3% interest

Life Cycle Costs (bond)

	A	B
Capital Cost	\$10,000,000	\$6,000,000
Annual Debt*	\$735,000	\$441,000
Annual O&M	\$500,000	\$800,000
Debt NPW	\$12,495,426	\$7,497,256
O&M NPW	\$8,500,290	\$13,600,464
TOTAL	\$20,995,717	\$21,097,720
<i>Savings</i>	\$102,003	

* Municipal Bonds; 20 year term; 4% interest

- ### Limitations of the Life Cycle Cost Analysis
- Depends on the options considered.
 - Highly sensitive to how accurate the assumptions are.
 - Construction cost estimates
 - Estimates of annual O&M cost

Anywhere decides on Option A

- It's the least cost option (LCC)
- Maximizes Grant / subsidy options



Three Cheers for Anywhere, WA!

- ▲ You are a very wise leader.
- ▲ You have chosen the least cost option.

Can you afford the least cost option?

Life Cycle Cost Analysis can't tell you if you can afford a project.

What is affordable?

- Every community has a different sense of what is affordable to them
- EPA defines a utility bill that less than 2% of the median household income is "affordable".
- For a community with a Median Household Income (MHI) of \$40,000 (like Anywhere, WA) a \$67/month sewer bill is "affordable".
- For ratepayers facing "unaffordable" utility bills Ecology, Health, and CDBG offer grant funding.

Affordability Analysis

- Evaluate the annual utility budget
 - Debt for new project
 - Any old debt
 - All O&M costs
- Calculate a per sewer account cost
- Compare to the Median Household Income

Anywhere, WA

Annual Budget	
Construction Debt*:	\$630,000
Treatment O&M:	\$500,000
Collections O&M:	\$200,000
Outstanding Debt:	\$200,000
Annual Expenses:	\$1,530,000

* SRF loan; 20 year term; 2.3% interest

Affordability Analysis

Construction Debt*:	\$630,000
Treatment O&M:	\$500,000
Collections O&M:	\$200,000
Outstanding Debt:	\$200,000
Annual Expenses:	\$1,530,000
Sewer Accounts:	1,000
Annual per customer:	\$1,530
Monthly Sewer Bill:	\$128
MHI:	\$40,000
Affordability Index:	3.825%

* SRF loan; 20 year term; 2.3% interest

This is just an estimate

- Other things to consider:
 - Large or industrial users
 - Reserve amounts
 - Utility tax
 - Conservation rates
 - Individual rate structure

What can we do?

- State Grant Funding

Affordability Analysis (w/ grant)

Annual Budget	
Construction Debt*:	\$315,000
Treatment O&M:	\$500,000
Collections O&M:	\$200,000
Outstanding Debt:	\$200,000
Annual Expenses:	\$1,215,000
Sewer Accounts:	1,000
Annual per customer:	\$1,215
Monthly Sewer Bill:	\$101
MHI:	\$40,000
Affordability Index:	3.038%

* SRF loan; 20 year term; 2.3% interest plus \$5,000,000 in state grant

What can we do?

- State Grant Funding
- Lower Interest Rates

Affordability Analysis (w grant and refi)

Annual Budget	
Construction Debt*:	\$277,000
Treatment O&M:	\$500,000
Collections O&M:	\$200,000
Outstanding Debt*:	\$87,719
Annual Expenses:	\$1,064,719
Sewer Accounts:	1,000
Annual per customer:	\$1,065
Monthly Sewer Bill:	\$89
MHI:	\$40,000
Affordability Index:	2.662%

* SRF loan; 20 year term; 1.0% interest plus \$5,000,000 in state grants

What can we do?

- State Grant Funding
- Lower Interest Rates
- Rearrange rates
- Remove stuff from the construction project
- Start cutting back on O&M

The O&M Iceberg



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What can we do?

- △ State Grant Funding
- △ Lower Interest Rates

- Rearrange rates
- Remove stuff from the construction project
- Start cutting back on O&M

- Go back to the drawing board?

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Back to the drawing board

- Why is Anyone building a new treatment plant?
 - Permit compliance?
 - Growth pressures?
 - Existing infrastructure is failing?
- Anywhere only looked at two Options. Why?
- LCCA proved that "Option A" was less expensive than "Option B", not that "Option A" the best way to solve the problem.

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Why are you building your project?

- All projects should solve problems
- Do you know what problem your project is supposed to solve?
- Is your project addressing symptoms? Or root causes? Or something else entirely?

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Project Planning requires you Ask yourself "WHY?"

- WHY?
- WHY?
- WHY?
- WHY?
- Keep asking till you identify your real problem

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Identify Your Real Problem / Need

- Use the "five why's"
- Be honest with yourself
- Look for root causes, not symptoms
 - You may have more than one problem
- Get Clarity: Write it down
 - Two sentences, no more than 20 words, plain English
- Review with utility staff, engineers, elected officials
- Get them to buy into the problem statement
- Fully define your Need before you start working on a solution
- Develops a team to tackle the problem

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On second thought, don't be like Goldilocks

- Goldilocks is great at optimizing
- Goldilocks is bad at deciding what to optimize
- Was her real problem cold porridge? Or breaking and entering? Or maybe not getting eaten by bears?
- A clear understating of the problem leads to solutions for that problem.

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How do you solve your problem?

- Facility Planning / Alternative Analysis / Value Analysis / Cost Effectiveness Analysis
 - 0 Identify the REAL PROBLEM / NEED
 1. Brainstorm. Get a big list of possible solutions
 2. Evaluate their ability to solve the problem
 3. Look at the lifecycle costs and benefits of the solutions
 4. Pick the Best/ Least Cost/ Highest Value alternative
 5. Plan the path forward to implement that project

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Many projects suffer premature "HOW"

- Is your project a pre-chosen solution looking for a problem?
- Solving the wrong problem isn't going to move you forward.
- Remember, not every problem is a nail.
 - Even if you have the most amazing hammer in the world.

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Brainstorming when you're stuck in a rut



Not every problem is a nail...



Even if you have the most amazing Hammer in the world

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Really brainstorm: Go get more alternatives

- Think "outside the box"
 - Or hire somebody who can
- Think about scale
- Reconsider your assumptions
- Think about levels of technology
- Consider political and regulatory approaches
- Keep the "nobody will do that" ideas

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Reconsider your assumptions

- Growth projections
 - Planning for growth vs. building capacity for tomorrow's growth today.
- Per capita sewer volumes
- Capacity of existing treatment plant
- Permit Limits

Reconsider your technology options

- Individual Septic Tanks
- Large Onsite Sewage Systems (LOSS)
- Lagoons
- Sand filter / RGF
- Mechanical Treatment
- Advanced Treatment
- Membrane Separation

Explore Other Options

- Regional Alternatives
- I/I reduction
- Conservation
- Pollution Trading
- Plant capacity re-rating

This is Infrastructure Planning

- The report might be called a "Facility Plan" or an "Engineering Report", or a "Water System Plan"
- The report documents your process for decision making.
 - 0 Identifies the REAL PROBLEM / NEED
 1. Develops a list of possible solutions (alternatives)
 2. Evaluates their ability to meet the need
 3. Calculates the Life Cycle Costs for each solution
 4. Pick the Best/ Least Cost/ Highest Value alternative
 5. Plans the path forward to implement that project

*Plan your work
Then work your plan*

*Everyone has a plan,
until you get punched in
the face
– Mike Tyson*

*Plans are worthless,
but planning is everything.
– Dwight D. Eisenhower.*

- ### No Plan Survives Contact With The Engineer
- Don't be a slave to your plan
 - Be prepared to be flexible during design and construction
 - Undiscovered site conditions, new technology, and changing regulations are all "opportunities"
 - Consider how any changes or opportunities will affect the real need underlying your project

Thank You!

- ### Additional information
- David.Dunn@ecy.wa.gov 360/407-6503
 - Ecology funding program site:
<http://www.ecy.wa.gov/programs/wq/funding/funding.html>
 - Grant and Loan listserv:
<http://www.ecy.wa.gov/maillist.html>