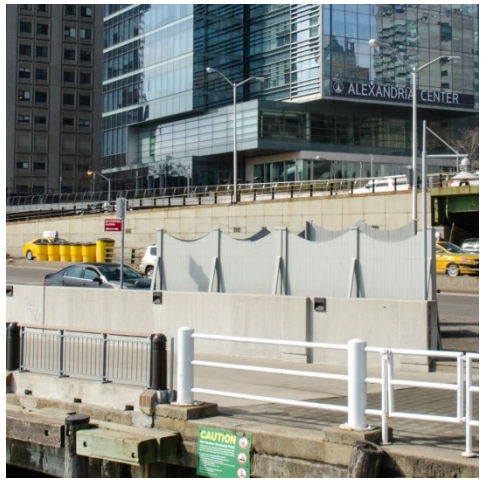
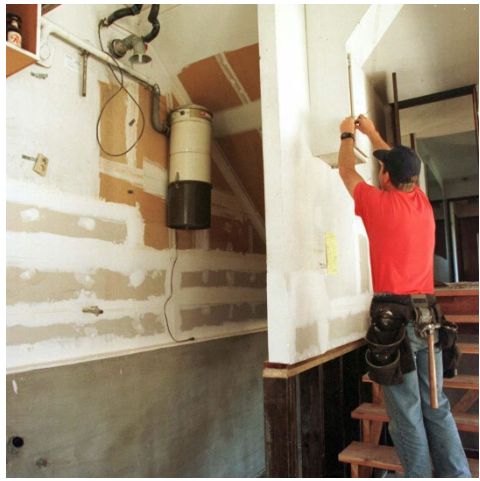






Unit 1: Basic Concepts in Benefit-Cost Analysis (BCA)

Unit 1 Overview

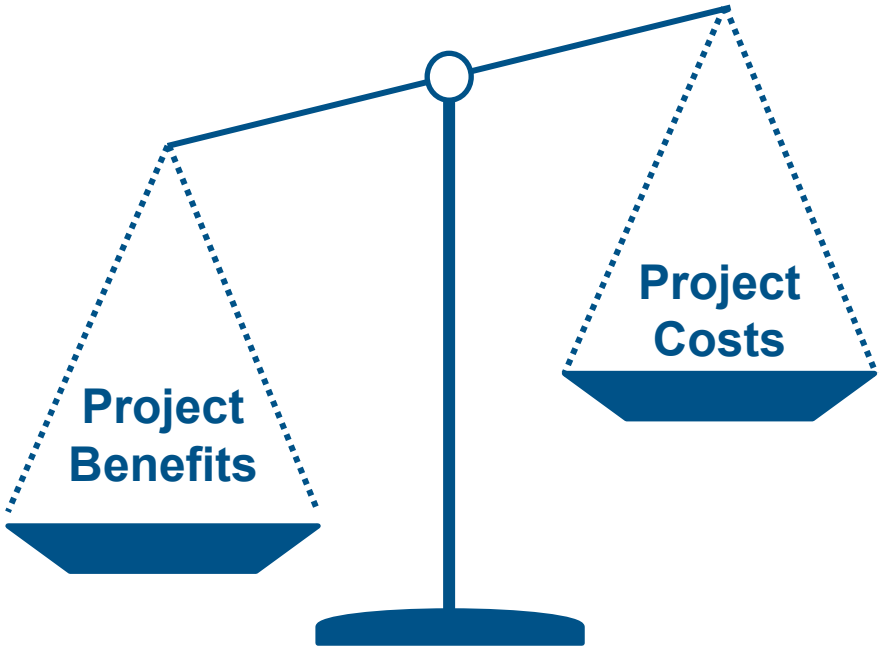
- Introduce students to the basic concepts behind Benefit-Cost Analysis (BCA).
- Introduce students to the role of the BCA in Hazard Mitigation Assistance (HMA) grants.
- Introduce students to the basic terms used when discussing BCA.

Unit 1 Objectives

- Students should be able to describe the basic terms used in Benefit-Cost Analysis (BCA).
- Students should be able to explain how to determine when to do a BCA and when it will be cost effective.

What is Benefit-Cost Analysis (BCA)?

- **Benefit-Cost Analysis (BCA)** is the process of quantifying the advantages (benefits) of an action and comparing it to its drawbacks (costs).



What is Benefit-Cost Analysis (BCA)? (cont.)

Although BCA may seem like a difficult concept, you probably already practice it almost every day.

- Examples:
  - Is a warehouse club membership worth it?
  - Should I fix that leaky toilet in my house?
  - Should I buy or rent a house?
- What factors go into your decision?

Benefits and costs

We'll discuss benefits and costs in relation to hazard mitigation projects more in Unit 3, but for now let's consider the example of the leaky toilet.

- What are the **benefits** of replacing it? How would I quantify these benefits?
- What are the **costs** of replacing it?

Benefits and costs (cont.)

- Benefits:
  - Lower water bills
  - Reduced damage to floor
  - Less worry about damage?
  - Reduced time spent fixing leak or cleaning up mess?
- Costs:
  - Cost of new toilet + materials
  - Pay someone to install toilet
  - Take time off work to supervise installation of toilet
  - Maintenance?

How do we know if something is “worth it”? (1 of 3)

- If an action’s benefits are greater than its costs, then it is considered **cost-effective**.
- Once we add up the benefits for an action, we divide that value by the costs, which gives us the **Benefit-Cost Ratio (BCR)**.

$$\frac{\text{Benefits}}{\text{Costs}} = \text{BCR}$$

If the BCR is greater than or equal to 1.0, then the action is cost-effective.

How do we know if something is “worth it”? (2 of 3)

- Is it worth $1 million to:

1. Protect one vacation home?
2. Protect one government building that floods infrequently?
3. Protect a flood-prone hospital or wastewater treatment plant?
4. Protect 150 flood-prone houses?

Probably	Probably Not

How do we know if something is “worth it”? (3 of 3)

- Is it worth $1 million to:

	Probably	Probably Not
1. Protect one vacation home?		☑
2. Protect one government building that floods infrequently?		☑
3. Protect a flood-prone hospital or wastewater treatment plant?	☑	
4. Protect 150 flood-prone houses?	☑	

Applications of BCA

- BCA can be used to determine if a single action is cost-effective in comparison to the status quo:
  - Should I replace that leaky toilet, or leave it as-is?
- Or it can be used to determine the most cost-effective option out of several:
  - Should I (1) replace the leaky toilet, (2) try to repair it, or (3) remodel my entire bathroom?
- For hazard mitigation projects, we are usually doing the first way, since we do not require applicants to show that they are choosing the most cost-effective option.

Why should I do a BCA?

- Required component for HMA projects
- Required for some 406 (Public Assistance) mitigation projects
- Helps communities and subapplicants make informed decisions about their risks and money and prioritize projects

Other common BCA terms

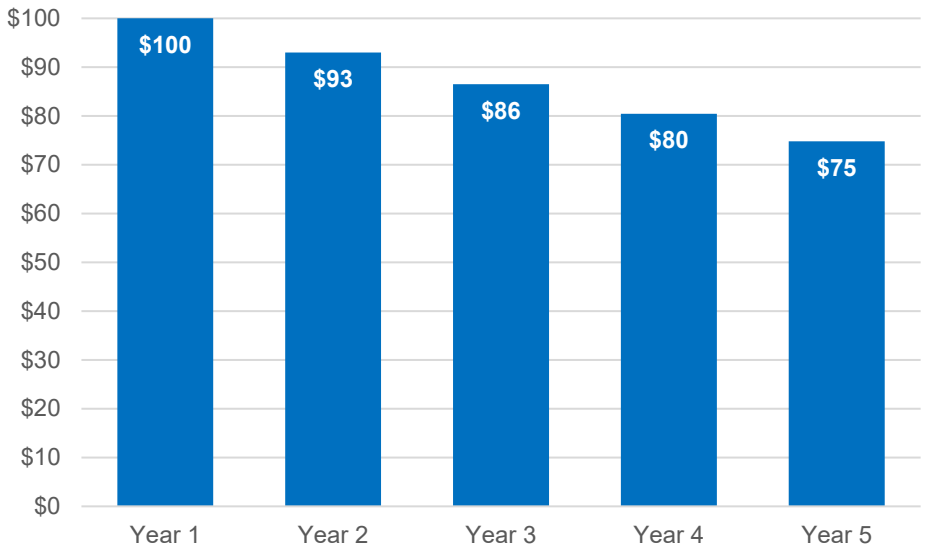
- **Discount rate**
- **Net present value**

Discount rate

- If I offered you $100 today, or $100 one year from now, which would you choose? Why?
  - $100 invested today might result in $106 one year from now.
  - $100 one year from now might only buy $97 worth of goods.
- Because benefits are worth more if they are experienced sooner, future benefits must be discounted. The rate at which benefits decline in value each year is the **discount rate**.
  - Federally-funded mitigation projects must use a discount rate of 7%, which is set by the U.S. Office of Management and Budget (OMB). We'll discuss this more in Unit 3.

Discount rate (cont.)

- Example: Let's say I have a mitigation project with $100 in benefits in Year 1. With a discount rate of 7%, my annual benefits would be as follows:



Net present value, 1 of 6

- **Net present value (NPV)** is the value today of benefits that you will receive in the future, minus the value today of costs that you will incur in the future.
- A positive NPV indicates that something is a good investment.

Future benefits (in today's dollars)	-	Costs (in today's dollars)	=	Net Present Value (NPV)

Net present value, 2 of 6

- Example: Let's say I would like to rent out my basement. In order to make the space rentable, I will have to spend $25,000 to renovate it and get a certificate of occupancy. The basement will rent for $1,000 per month, and I plan to rent it out over a period of 3 years.
- Is this a good investment? How can I figure this out?

Net present value, 3 of 6

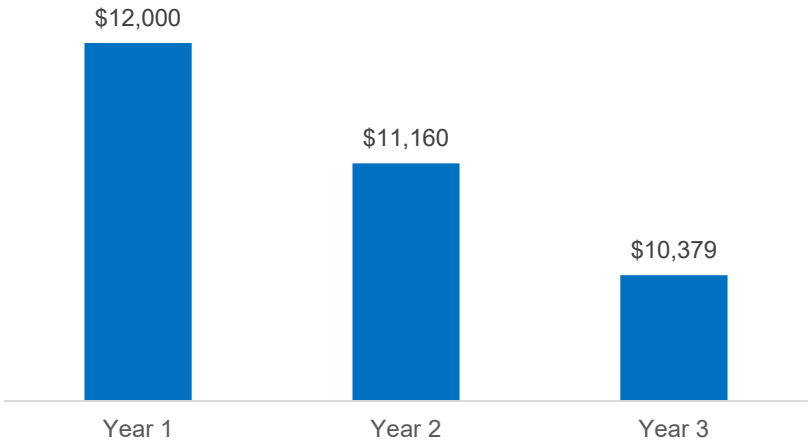
Future benefits (in today's dollars) - **Costs (in today's dollars)** = **Net Present Value (NPV)**

- In Year 1, my benefits from renting out my basement are $1,000 x 12 = $12,000.
- What are my benefits in Year 2 if I assume a 7% discount rate? (Hint: The answer is not $12,000.)

Net present value, 4 of 6

Future benefits (in today's dollars) - **Costs (in today's dollars)** = **Net Present Value (NPV)**

Benefits are reduced by 7% each year over the 3-year period:



Sum = $33,539

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Net present value, 5 of 6

Future benefits (in today's dollars) - **Costs (in today's dollars)** = **Net Present Value (NPV)**

- In this very simplified example, my costs are my original investment:

$25,000

Net present value, 6 of 6

Future benefits (in today's dollars) - **Costs (in today's dollars)** = **Net Present Value (NPV)**

- For this example:

$33,539 - **$25,000** = **$8,539**

- Did I make a good investment?

Unit 1 Review

- Key terms:
  - **Benefit-Cost Analysis (BCA)**
  - **Benefit**
  - **Cost**
  - **Benefit-Cost Ratio (BCR)**
  - **Cost-effectiveness**
  - **Discount rate**
  - **Net present value (NPV)**