Calculating Economics: What Kind of Science?
SWG Summer Stakeholder Partnering Forum

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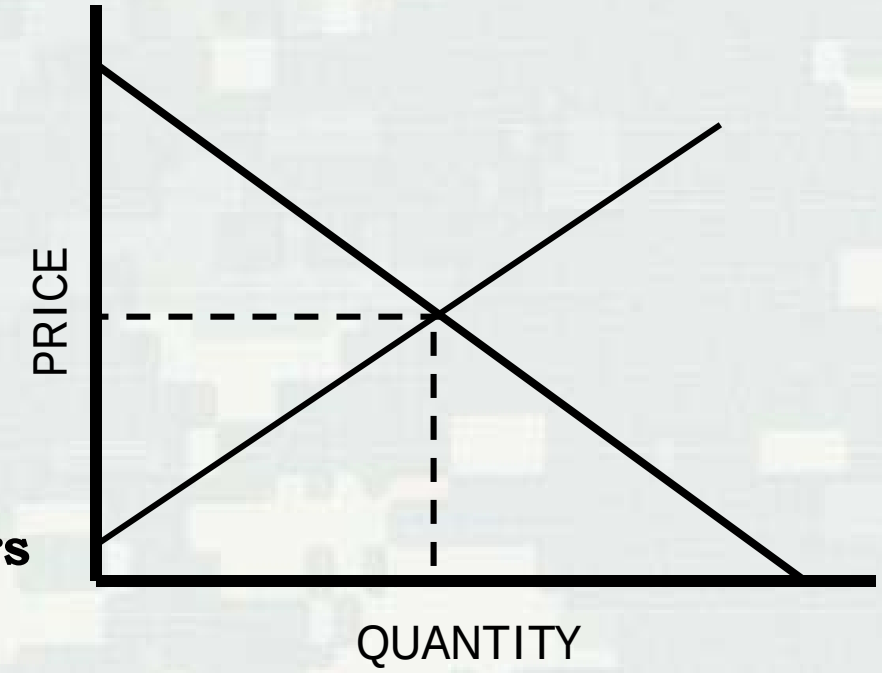


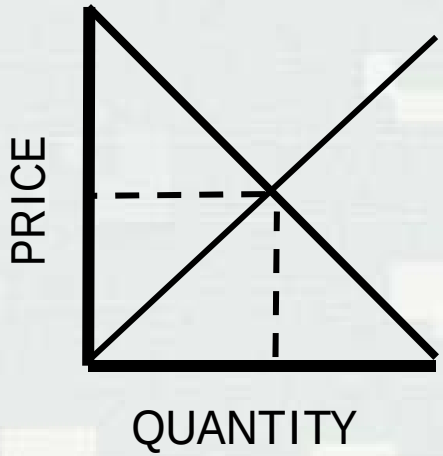
Objective

To demystify how Corps economists calculate economic benefits for projects related to Coastal Storm Risk Management, Flood Risk Management, and Navigation.

It's a science, not magic…

Economics 101

- Scarcity: The Fundamental Economic Problem
- Equilibrium: Supply=Demand
- Measured by Willingness-to-Pay



Corps Economics 101

- The Federal Objective is to contribute to National Economic Development (NED) consistent with protecting the environment…
  - Communicates value
  - Informs decision making
  - Plan that maximizes net NED benefits, BUT doesn't mean the highest Benefit-to-Cost Ratio (BCR)

Corps Economists

- Conduct economic analysis using empirical evidence.
- Key team members during the planning process.
- Use models and consider risk and uncertainty.

Models

- Corps requires use of approved models for economic analysis, examples include HarborSym and Beach-fx.
- Typically models use Monte Carlo simulations.
- Incorporates uncertainty.

6 Step Planning Process

- Step 1: Specify Problems and Opportunities
- Step 2: Inventory and Forecast Conditions
- Step 3: Formulate Alternative Plans
- Step 4: Evaluate Effects of Alternative Plans
- Step 5: Compare Alternative Plans
- Step 6: Select Recommended Plan

Step 1: Specify Problems and Opportunities

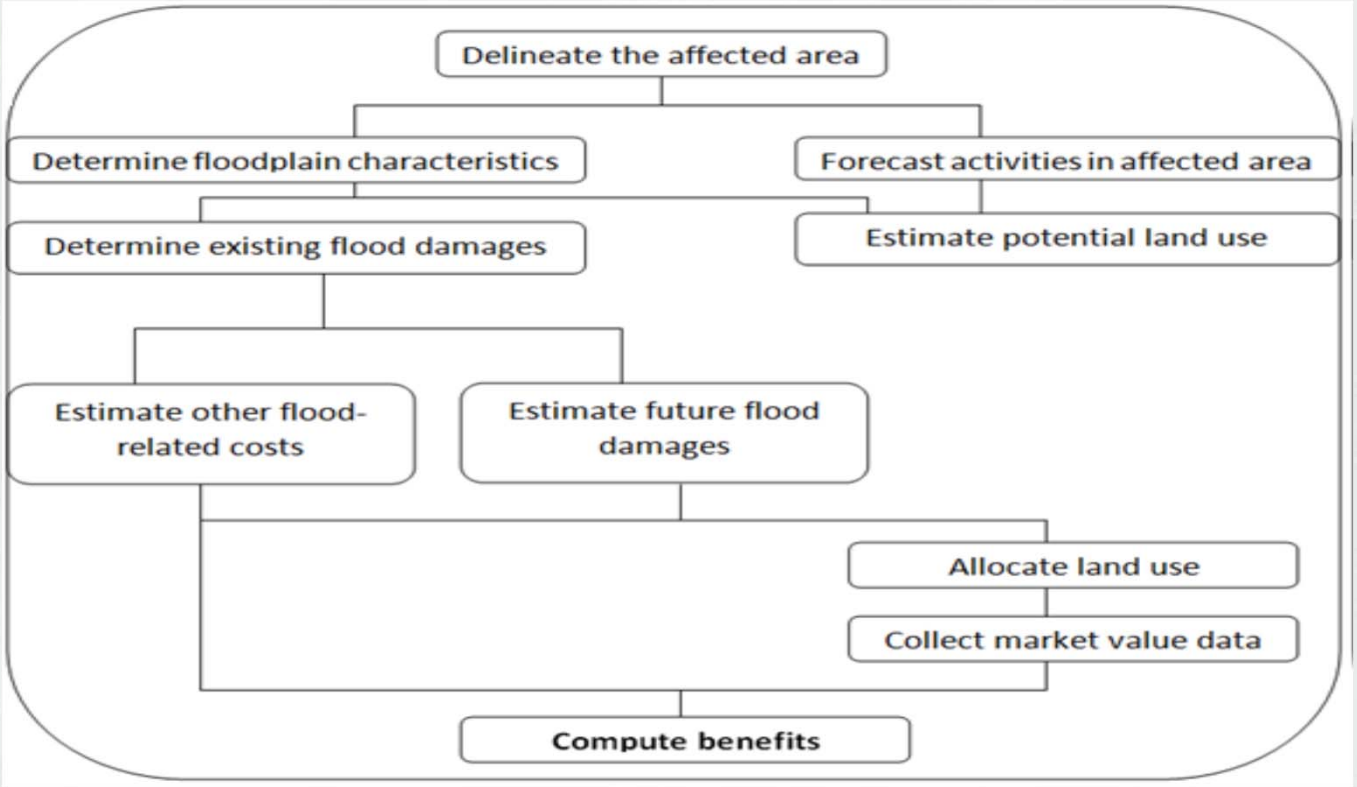
- Involved in defining study area, to include socioeconomic characteristics.
- While doing analysis for project area, must consider a systems analysis and the inter-relationship of changes.
  - Navigation: Improving one project may increase traffic and reduce delays at that project. But increased traffic may increase delays at other projects.
  - CSRM: Structural changes to a coastal area will change the movement of sediment, which can impact recreation, environmental quality, and navigation. This must be considered for the reaches adjacent to the project in costs and benefits.

Step 2: Inventory and Forecast Conditions

- While data collection is a study-long process, most information is collected during this step.
- Used for defining the with- and without-project conditions.
- Forecasts: not done with a crystal ball, but with empirical data.

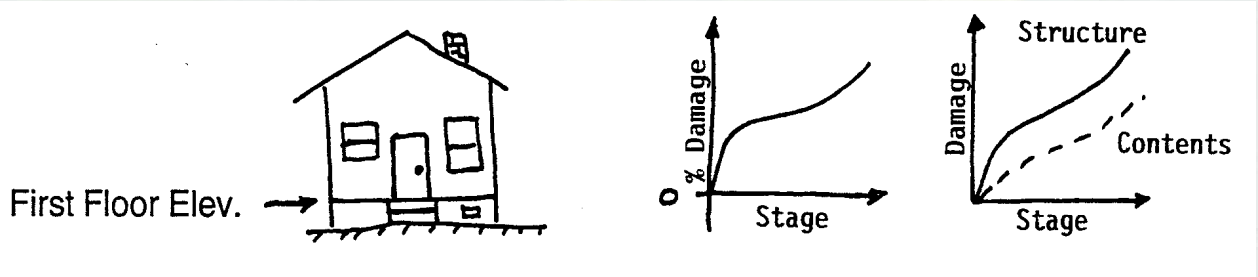
Step 2: Inventory and Forecast Conditions

Flood and Coastal Risk Management



Step 2: Inventory and Forecast Conditions

Flood and Coastal Storm Risk Management



Structure Inventory Data

- Structure ID
- Location/address
- Structure value
- Content ratio
- Damage category
- Depth-Damage Function
- First Floor elevation
- Ground elevation
- Coordinates
- Stream Station

Step 2: Inventory and Forecast Conditions

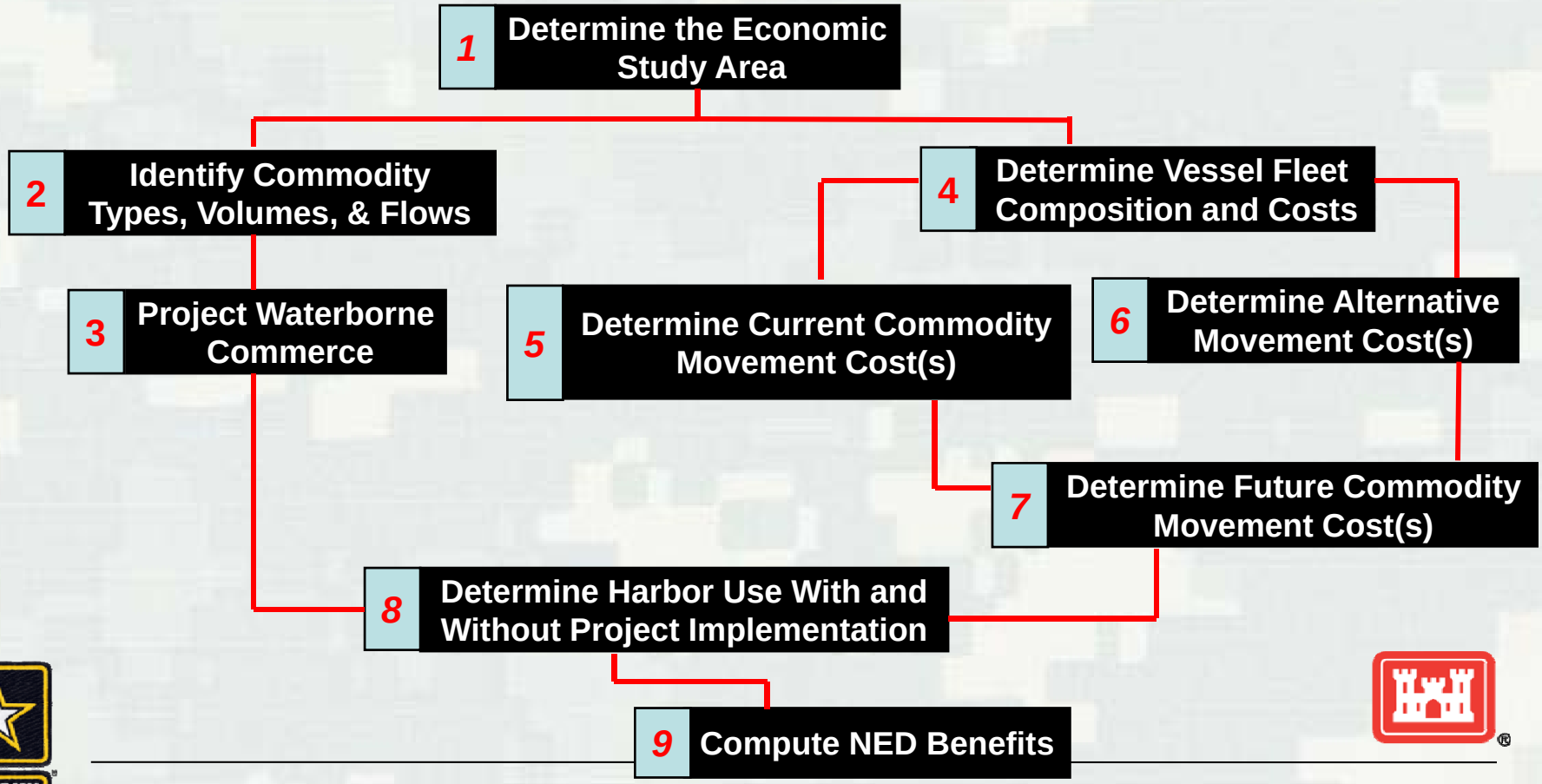
Management Measures

Structural vs. Non-Structural

1. Natural Resource Protection
2. Preventative Measures
3. Property Protection
4. Structural Projects
5. Public Information
6. Flood Fighting and Emergency Services Measures

Step 2: Inventory and Forecast Conditions

Navigation

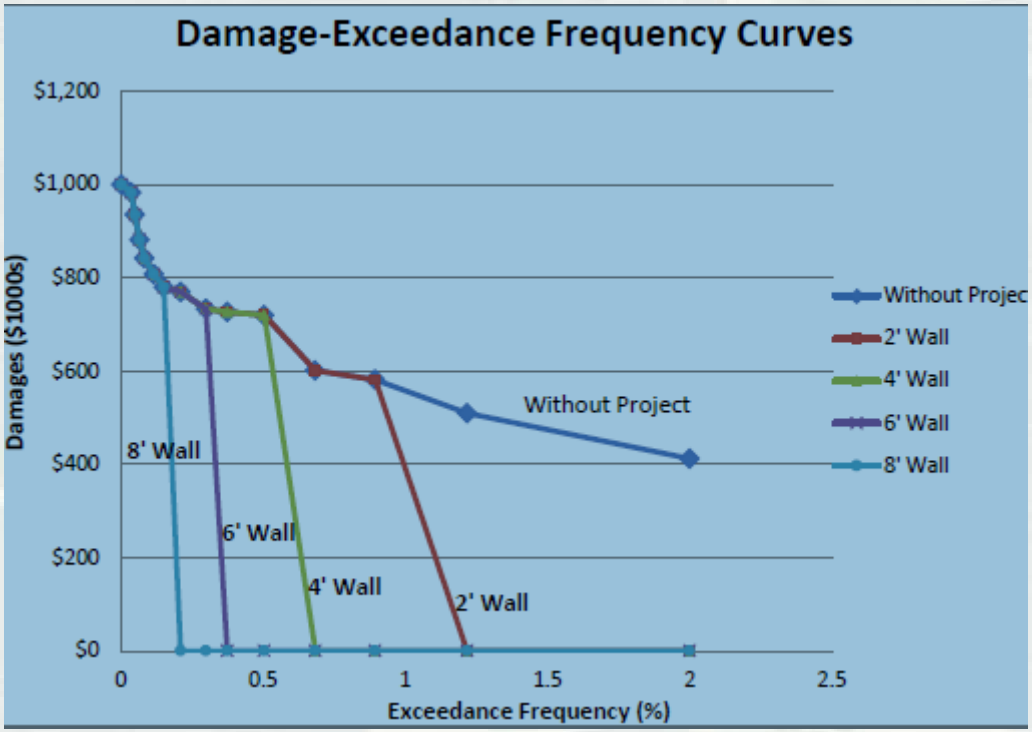


Steps 3 and 4: Alternative Plans

Risk Categories for Evaluating Damages, Losses, or Other Opportunities

- Flood
  - Physical Damage
  - Non-Physical Losses
- Wave Damages
- Erosion Damages
- Other Damages or Areas of Opportunities

Steps 3 and 4: Alternative Plans



Steps 3 and 4: Alternative Plans

Without-Project

Interest Rate 6%

Reach	Home	Storm	Year (Base 2010)	Depreciated Home 2010 Value	Flood Height	Depth-Damage Curve (3 ft.) for combined Erosion, Flood, and Waves	Total Damage	Present Value = Future Value / [(1 + r)^(t-s)]	Average Annual Equivalent Damage
1	Home 1	Storm 1	2012	$ 100,000	3 feet above floor	20% damage	$ 20,000	$18,326	$1,163
1	Home 1	Storm 2	2020	$ 100,000	2 feet above floor	10% damage	$ 10,000	$3,210	$204
Without-Project: Reach 1 Total Damage								**$ 21,536**	**$1,366**
2	Home 45	Storm 1	2012	$ 200,000	5 feet above floor	40% damage	$ 80,000	$73,305	$4,651
2	Home 45	Storm 1	2020	$ 200,000	5 feet above floor	40% damage	$ 80,000	$25,682	$1,629
2	Home 50	Storm 1	2012	$ 150,000	1 foot above floor	5% damage	$ 7,500.00	$6,872	$436
Without-Project: Reach 2 Total Damage								**$ 105,859**	**$6,716**
Without-Project Condition Total Damages								**$ 127,395**	**$8,082**

With-Project

Interest Rate 6%

Reach	Home	Storm	Year (Base 2010)	Depreciated Home 2010 Value	Flood Height	Depth-Damage Curve (3 ft.) for combined Erosion, Flood, and Waves	Total Damage	Present Value = Future Value / [(1 + r)^(t-s)]	Average Annual Equivalent Damage
1	Home 1	Storm 1	2012	$ 100,000	1 feet above floor	5% damage	$ 5,000	$4,582	$291
1	Home 1	Storm 2	2020	$ 100,000	0 feet above floor	no damage	$ -	$0	$0
With-Project: Reach 1 Total Damage								**$ 4,582**	**$291**
2	Home 45	Storm 1	2012	$ 200,000	3 feet above floor	20% damage	$ 40,000	$36,652	$2,325
2	Home 45	Storm 1	2020	$ 200,000	3 feet above floor	20% damage	$ 40,000	$12,841	$815
2	Home 50	Storm 1	2012	$ 150,000	0 feet above floor	no damage	$ -	$0	$0
With-Project: Reach 2 Total Damage								**$ 49,493**	**$3,140**
With-Project Condition Total Damages								**$ 54,075**	**$3,431**

Step 5: Compare Alternative Plans

NED Costs

- Project Costs (construction, mitigation, etc.)
- Associated Costs
- Operation, Maintenance, Repair, Replacement, and Rehabilitation Costs (OMRR&R)
- Interest During Construction (IDC)

Step 5: Compare Alternative Plans

NED Benefits

- Discounting for all alternatives to a single base year present value
- Determine the Average Annual Equivalent (AAE)
- AAE Benefits-AAE Costs=Net Excess Benefits
- AAE Benefits/AAE Costs=BCR

Step 6: Select Recommended Plan

The NED Plan is the one that maximizes net excess NED benefits, not the highest BCR!

Conclusion

Voila!
That's economics folks!
A science, not magic done in a black box!