Using a Benefit-Cost Analysis Tool for Smart Infrastructure Investments

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WHY SMARTER INFRASTRUCTURE DECISIONS ARE NEEDED

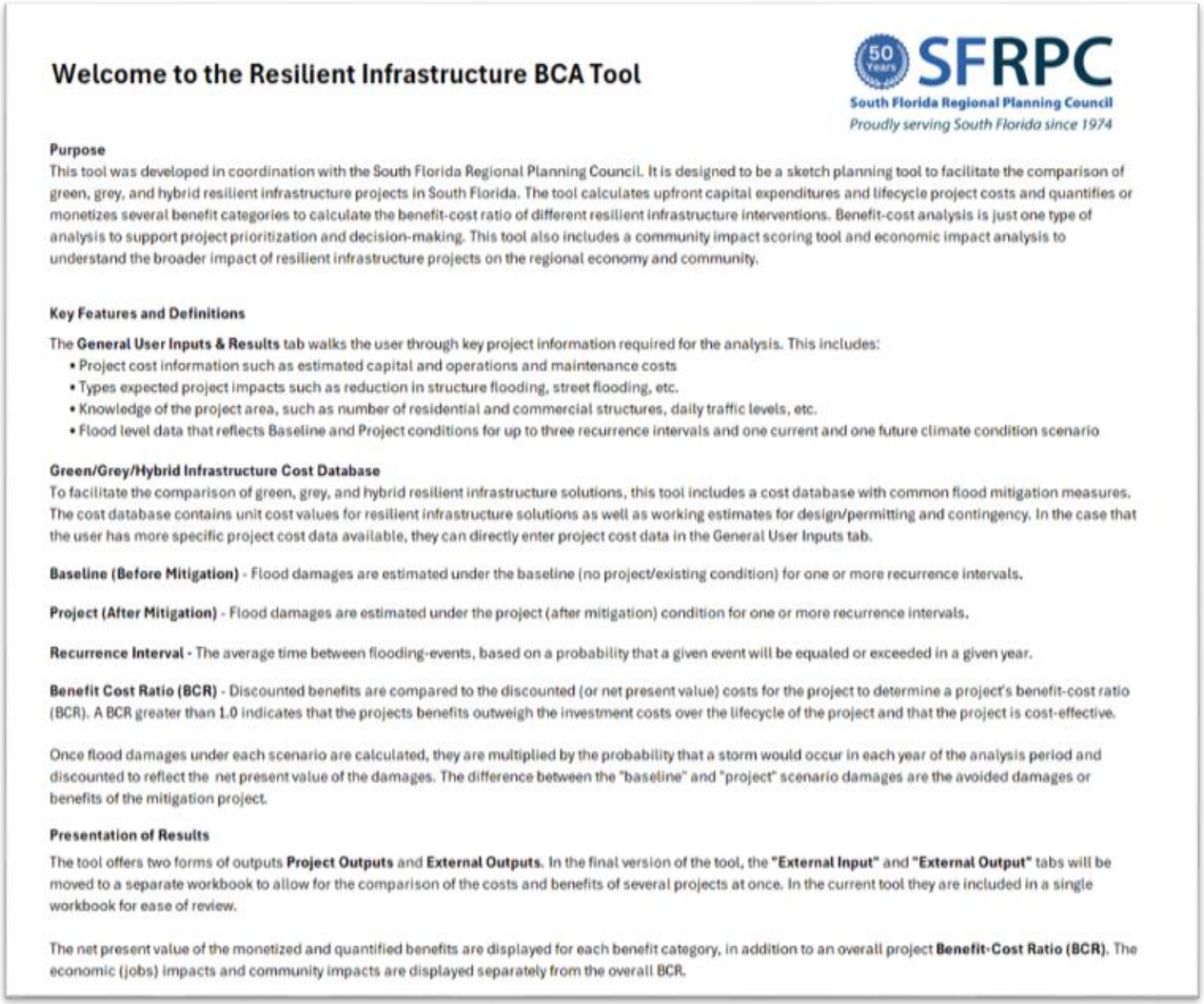
- South Florida communities face rising flood risk and sea level rise
- Infrastructure is costly — both gray and green investments require big budgets
- Local governments must make defensible, transparent decisions
- Existing tools often undervalue resilience, equity, and environmental benefits
- Communities need a standardized framework to balance multiple priorities

PURPOSE OF THE RESILIENT BCA TOOL

- Develop a standardized BCA framework to guide data-driven infrastructure decisions
- Integrate resilience + mitigation strategies for gray & green projects
- Provide consensus-driven cost schedules tailored to South Florida
- Built through technical expertise + stakeholder collaboration
- **Goal: Help communities reduce flood risk, adapt to sea level rise, and invest cost-effectively**

KEY FEATURES OF THE TOOL

- User-friendly inputs (costs, project area, flood data)
- Built-in Cost Database for gray, green, and hybrid solutions
- Calculates Benefit-Cost Ratio (BCR), Net Present Value (NPV), and avoided damages
- Results presented in Project Outputs & External Outputs tabs



Welcome to the Resilient Infrastructure BCA Tool

SFRPC
South Florida Regional Planning Council
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Purpose
This tool was developed in coordination with the South Florida Regional Planning Council. It is designed to be a sketch planning tool to facilitate the comparison of green, grey, and hybrid resilient infrastructure projects in South Florida. The tool calculates upfront capital expenditures and lifecycle project costs and quantifies or monetizes several benefit categories to calculate the benefit-cost ratio of different resilient infrastructure interventions. Benefit-cost analysis is just one type of analysis to support project prioritization and decision-making. This tool also includes a community impact scoring tool and economic impact analysis to understand the broader impact of resilient infrastructure projects on the regional economy and community.

Key Features and Definitions

The **General User Inputs & Results** tab walks the user through key project information required for the analysis. This includes:

- Project cost information such as estimated capital and operations and maintenance costs
- Types expected project impacts such as reduction in structure flooding, street flooding, etc.
- Knowledge of the project area, such as number of residential and commercial structures, daily traffic levels, etc.
- Flood level data that reflects Baseline and Project conditions for up to three recurrence intervals and one current and one future climate condition scenario

Green/Grey/Hybrid Infrastructure Cost Database
To facilitate the comparison of green, grey, and hybrid resilient infrastructure solutions, this tool includes a cost database with common flood mitigation measures. The cost database contains unit cost values for resilient infrastructure solutions as well as working estimates for design/permitting and contingency. In the case that the user has more specific project cost data available, they can directly enter project cost data in the General User Inputs tab.

Baseline (Before Mitigation) - Flood damages are estimated under the baseline (no project/existing condition) for one or more recurrence intervals.

Project (After Mitigation) - Flood damages are estimated under the project (after mitigation) condition for one or more recurrence intervals.

Recurrence Interval - The average time between flooding-events, based on a probability that a given event will be equaled or exceeded in a given year.

Benefit Cost Ratio (BCR) - Discounted benefits are compared to the discounted (or net present value) costs for the project to determine a project's benefit-cost ratio (BCR). A BCR greater than 1.0 indicates that the projects benefits outweigh the investment costs over the lifecycle of the project and that the project is cost-effective.

Once flood damages under each scenario are calculated, they are multiplied by the probability that a storm would occur in each year of the analysis period and discounted to reflect the net present value of the damages. The difference between the "baseline" and "project" scenario damages are the avoided damages or benefits of the mitigation project.

Presentation of Results

The tool offers two forms of outputs **Project Outputs** and **External Outputs**. In the final version of the tool, the **"External Input"** and **"External Output"** tabs will be moved to a separate workbook to allow for the comparison of the costs and benefits of several projects at once. In the current tool they are included in a single workbook for ease of review.

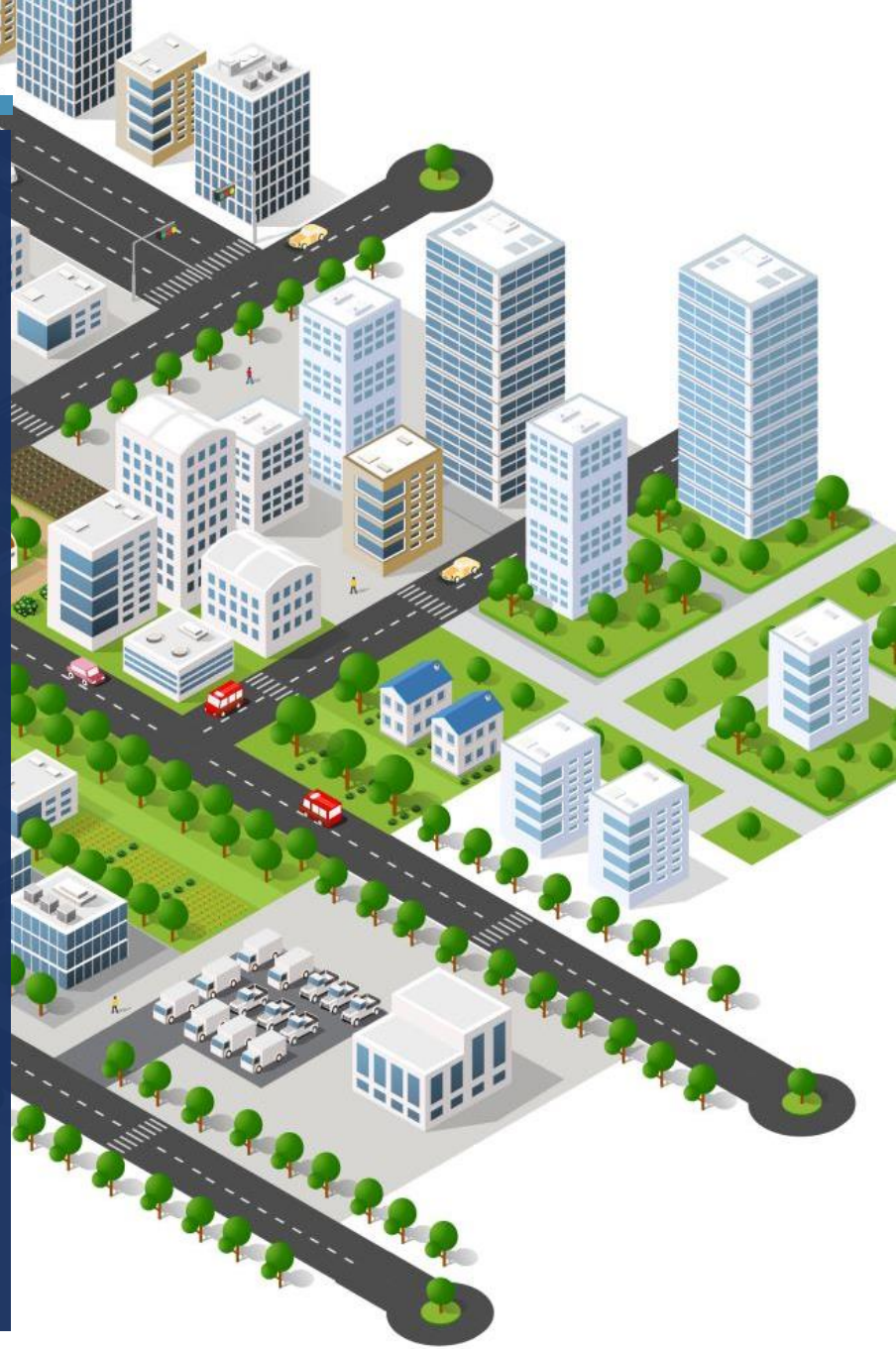
The net present value of the monetized and quantified benefits are displayed for each benefit category, in addition to an overall project **Benefit-Cost Ratio (BCR)**. The economic (jobs) impacts and community impacts are displayed separately from the overall BCR.

LIMITATIONS & OVERVIEW

- Intended as a planning/prioritization tool (not a replacement for FEMA BCA)
- Accuracy depends on the quality of user-provided data
- Incorporates guidance and inputs as of Spring 2025
- Default values can be adjusted by users
- Estimates future costs/benefits based on storm + economic scenarios

WHAT GOES INTO THE MODEL

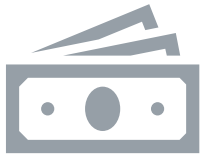
- General Assumptions & Costs
  - Discount rate, project life, capital & O&M costs, construction schedule
- Location and Asset Exposure
  - County-level selection, building types & values (residential, commercial)
  - Number of buildings, their land use and their flood depths
  - Utility outage duration, service population, traffic detour assumptions, EMS response delays
- Additional Co-Benefits
  - Green Infrastructure: acres restored by habitat type (wetlands, reefs, dunes)
  - Recreation: existing & new opportunities (visitors, access, facilities, aesthetics)



WHAT THE TOOL MEASURES

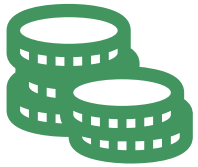
Avoided damages: structures, contents, autos, displacement

Reduced street flooding, delays, and emergency costs

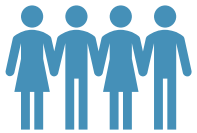


Avoided utility damages

Recreation + green infrastructure value



Jobs & regional economic impacts



Qualitative community benefits

COMMUNITY IMPACT SCORECARD

- Purpose:
  - Helps leaders make responsible, community-focused decisions
  - Evaluates how projects affect long-term safety, prosperity, and quality of life
- Categories Considered (Adapted from National Community Survey + climate category
  - **Economy:** Affordability of housing, utilities, and everyday living costs
  - **Mobility:** Reliable transportation access for residents and businesses
  - **Community Design:** Land use, zoning, and local housing options
  - **Safety & Health:** Public safety, emergency response, food security
  - **Natural Resources:** Clean water, clean air, and recreation opportunities
  - **Education & Heritage:** Opportunities for learning, culture, and civic pride
  - **Community Stewardship:** Sense of ownership, transparency in decision-making
  - Preparedness: Reducing future risks and protecting investments
- Scoring: -2 (Undesirable) → +2 (Extremely Desirable)

Enter your inputs in the highlighted blue cells below

Category	Metric	Summary Description	User Rating	Score
Economy	Cost of Living	Are basic needs like housing, food, and transport affordable?	Extremely Desirable	2
Mobility	Transportation Availability	Can all residents access reliable, affordable transportation?	Desirable	1
Community Design	Land Use & Zoning	Are development patterns sustainable and equitable?	Neutral	0
Community Design	Housing Affordability	Is affordable housing available near jobs and transit?	Undesirable	-1
Utilities	Utility Cost	Are utility services like water and power affordable?	Extremely Undesirable	-2

PROJECT UNIT COST DATABASE

- Purpose
  - Provides unit cost ranges for a wide variety of infrastructure solutions
  - Covers gray, green, and hybrid projects
  - Allows users to build project-specific cost estimates
- Examples of Solutions in Database
  - Gray Infrastructure: Seawalls ($1,000–$5,000/LF), pump stations ($1.2M–$15M), floodwalls, outfalls
  - Green Infrastructure: Bioswales ($5–$24/SF), mangrove restoration ($50K–$100K/acre), living shorelines ($775–$2,000/LF), rain gardens
  - Hybrid / Nature-Integrated: Green streets, beach dunes with plantings, constructed wetlands
  - Other Measures: Buyouts, elevation, dredging, drainage upgrades, detention/retention ponds

PROJECT TOOL OUTPUTS

Statewide Direct and Indirect Jobs (FTEs)	Construction Period Direct and Indirect Jobs (FTE)	O&M Direct and Indirect Jobs (FTE)	Community Score	Total Benefits ($M)	Total Costs ($M)	Benefit-Cost Ratio	NPV	IRR
168.0	165.0	3.0	0	$29,168,235	$27,705,176	1.05	$1,463,059	7%

Note: Job impacts are presented as jobs-per-year created/supported over the lifecycle of the project. Jobs include both direct and indirect jobs.

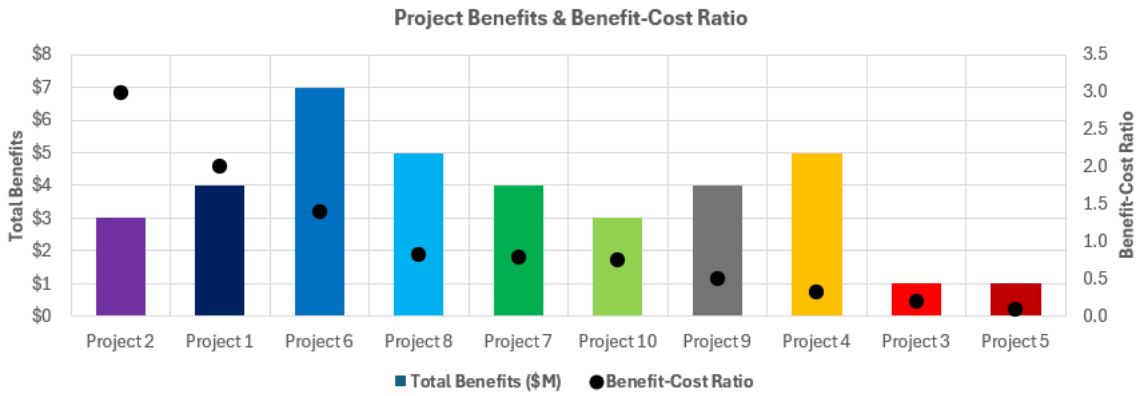
If "Construction Period Jobs (FTE)" is 10 jobs and the construction period is 3 years, this would equal 30 cumulative job-years created/supported during project construction.

Operations and maintenance (O&M) jobs are also presented in jobs-per-year. For example, if O&M Jobs (FTE) is 1 and the project lifecycle is 45 years, this represents one job-per-year created/supported throughout the lifecycle of the project. Jobs impacts are presented as full-time equivalent (FTE) positions.

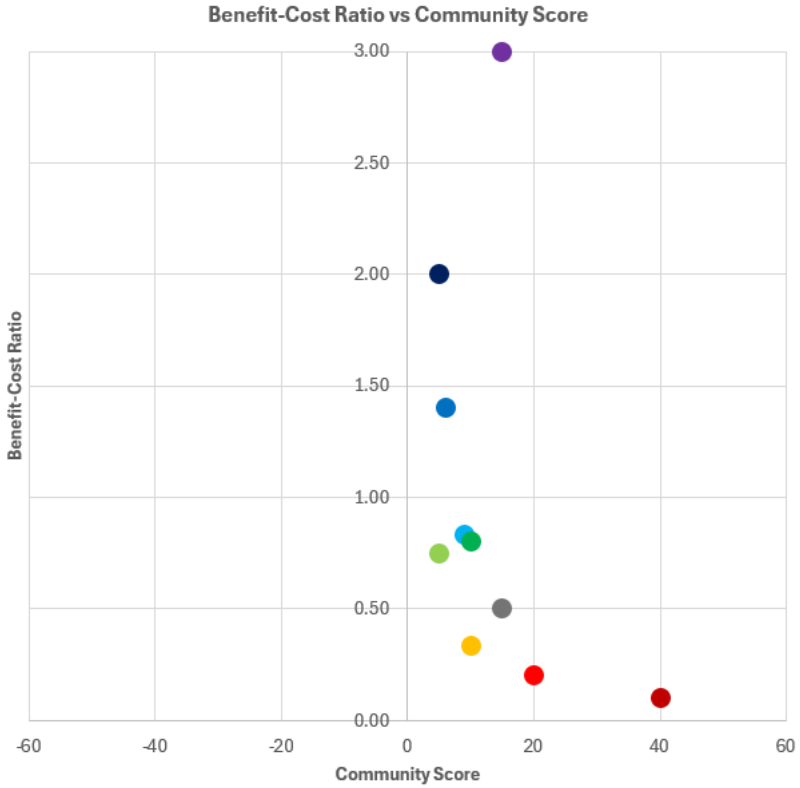
Disaggregated Benefits and Costs (Present Value)	
Project Benefits	
Avoided Structure Damages	$10,099,553
Avoided Contents Damages	$4,831,602
Avoided Displacement/Business Interru	$4,735,488
Avoided Auto Loss Damages	$1,043,226
Avoided Street Flooding Damages	$378,155
Emergency Response Damages	$3,792
Avoided Utility Damages	$0
Recreation Value	$1,712,286
Green Infrastructure Value	$6,364,133
Total Benefits	**$29,168,235**
Project Costs	
Construction	$25,897,060
O&M	$1,808,116
Total Costs	**$27,705,176**

COMPARE PROJECT ALTERNATIVES

Sort Function	Benefit-Cost Ratio
Projects Displayed	10



Project	Color	Total Benefits	Project Costs	Benefit-Cost Ratio	Community Score	Statewide Direct/ Indirect Jobs (FTEs)	Project Type
Project 2		$3.0	$1.0	3.0	0	0	0
Project 1		$4.0	$2.0	2.0	0	0	0
Project 6		$7.0	$5.0	1.4	0	0	0
Project 8		$5.0	$6.0	0.8	0	0	0
Project 7		$4.0	$5.0	0.8	0	0	0
Project 10		$3.0	$4.0	0.8	0	0	0
Project 9		$4.0	$8.0	0.5	0	0	0
Project 4		$5.0	$15.0	0.3	0	0	0
Project 3		$1.0	$5.0	0.2	0	0	0
Project 5		$1.0	$10.0	0.1	0	0	0



THANK YOU!

- Questions?