How Triple Bottom Line Economic Analysis Supports Best Value Procurement, Project Selection, and Stakeholder Outreach

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Impact Infrastructure

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Building resilience requires not just integrating the changing climate into planning, but also adjusting how we invest using resilience principles.

How can local governments require meaningful climate-smart criteria and deliverables for all infrastructure-related capital projects and capital improvement plans, contracts and other procurement vehicles, grants and bond funding, and asset management plans?

What evaluation methodologies are available to help capture the broader range of climate impacts in the project design and bids evaluation process that include the cost of externalities?

What are potential ways to track resilience investments within local governments?

Total Value = Financial + Social + Environmental

Identify best-value: measure impacts, prioritize projects, and communicate public and community benefits

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ECONOMIC ANALYSIS TO INFORM PROJECT AND POLICY DECISION MAKING

CBA is a tool to aid organizations in project design, prioritization, and outreach:

- It considers the gains and losses to all members of the society on whose behalf the CBA is being undertaken

  It values impacts in terms of a single, familiar measurement scale – money

  The money values used to weight the relative importance of the different impacts
- Determine whether the benefits of a proposed action justify its costs

Data-Driven Decision Making

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CONSIDERATIONS TOWARDS ECONOMIC ANALYSIS

- CBA is an industry standard decision-support tool used to inform and improve public policy, programmes and projects
- Increasing project competition for scarce resources
- Regulatory and legislative drivers
- Broader public and stakeholder interest in community benefits and sustainability, alongside greater project scrutiny
- Challenges incorporating sustainability and resiliency into investment and operating decisions via traditional capital planning
- Used extensively in resiliency assessment to value of both structural and non-structural investments relating to hazard mitigation or operational redundancy/reliability
- PPP market further driving importance on identifying explicit value proposition and benefits to different stakeholder groups (owner, government, community)
- Private capital, alternative funding, and bond ratings looking to quantify impacts & risks
- Compare disparate investments using a common lens
- Greater importance of quantitative decision making and project due diligence

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INTEGRATING TBL ECONOMICS – BROADER MARKET

J.P.Morgan Asset Management

"We will not invest in any infrastructure project that does not include long-term **triple-bottom-line** analysis from early planning into operations."
-CEO, JP Morgan Infrastructure Investments, 2014

PGH2O

"Evaluate … if design locations are maximizing their fullest stormwater capture. The Consultant shall provide … a benefits valuation performed by the PWSA, which will be based in Autocase software, to evaluate: [financial, social and environmental costs and benefits]."
– *Pittsburgh Water and Sewer Authority*, 2018

DGS

"The state is interested in aligning sustainable design decisions in the most cost beneficial manner, taking into account life cycle financial, social, and environmental factors…..have identified a software program called Autocase as the tool they will use in analyzing sustainable project enhancements." - DGS O Street RFP 2017

NYCEDC

"NYC Capital Planning now requires a **triple bottom line** analysis, and we need tools to do it."
-NYC Director of Capital Planning, 2015

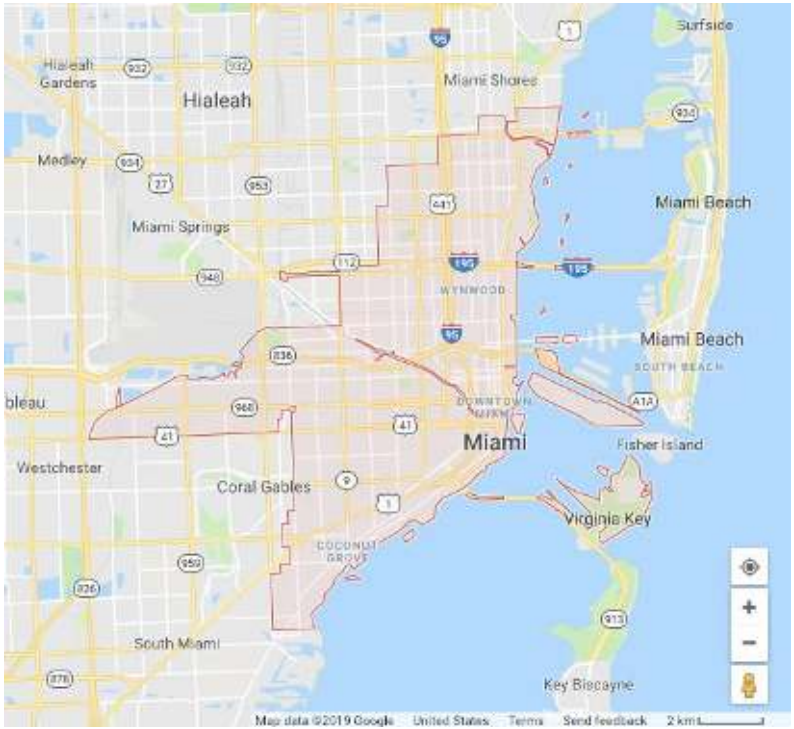
City of Phoenix

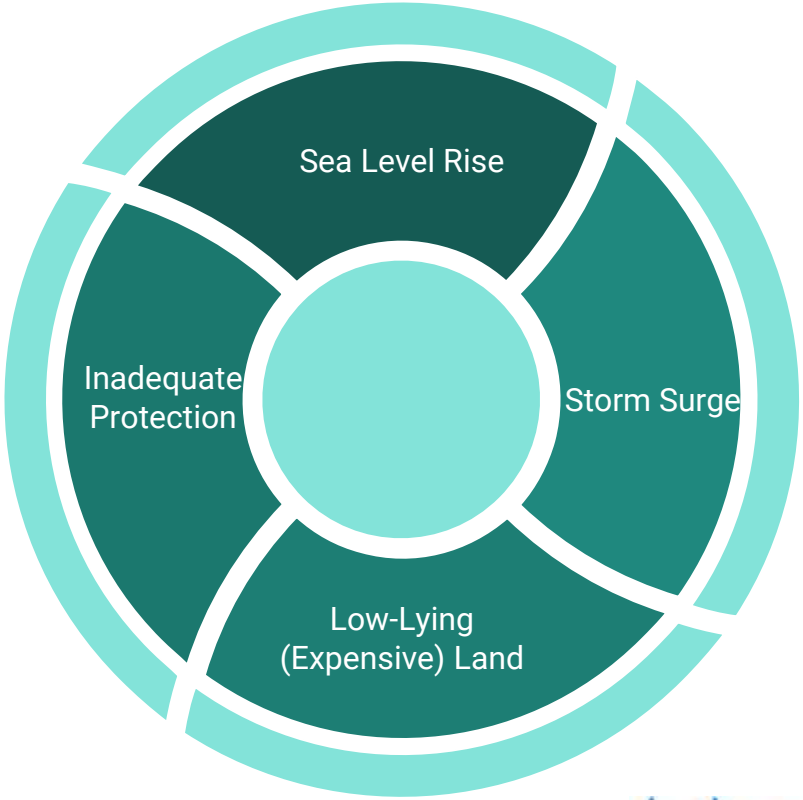
"The City is looking for a firm with experience in…**cost-benefit analyses (looking at both direct and indirect costs and benefits**). Please specify the method/program you would propose to undertake this study (i.e., **Autocase**, etc.)." – City of Phoenix Request for Firm Information, 2017

SFO

"Contractor shall develop a comprehensive business case analysis that includes data on external **economic, social, and environmental costs…(e.g. Autocase)**"
- San Francisco International Airport Terminal 1 BID Spec Document, 2015

City of Miami - Flood Mitigation Urban Resilience Planning





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Rethinking Resilience: Valuing Sea Wall Designs in Downtown Miami

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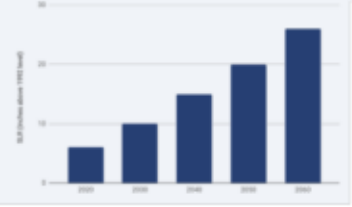
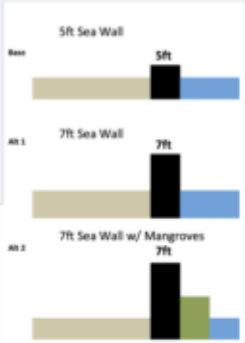
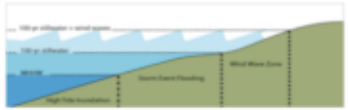
The City of Miami faces various natural hazards, including **sea level rise (SLR)** and storm surges.

Miami Downtown Development Authority (Miami DDA) engaged Impact Infrastructure to conduct a **Triple Bottom Line Cost Benefit Analysis (TBL-CBA)** to estimate the incremental costs and co-benefits over a 40-year time period into a **net present value (TBL-NPV)** of 7ft sea wall and 7 ft sea wall+living shoreline (mangroves+seagrasses) compared against current shoreline protections of the 5ft sea wall.







7ft sea wall
reduce coastal flooding risk

Investing in 8.3 miles of 7ft sea wall along Downtown Miami shoreline costs -$66M but yields $404M in avoided coastal flood risk resulting in

$338M TBL-NPV
Annual avoided flood risk of $10M
$6.10 for every $1 invested
830 jobs

7ft sea wall+living shoreline
reduce coastal flooding risk and create ecosystem services

Investing in 8.3 miles of 7ft sea wall+living shoreline along Downtown Miami shoreline costs -$108M but yields $552M in avoided coastal flood risk and $11M in ecosystem service benefits resulting in

$454M TBL-NPV
Annual avoided flood risk of $14M
$5.20 for every $1 invested
1,300 jobs

SFO Terminal 1 Redevelopment

Infrastructure owner SFO makes the case for sustainability investments and design elements in SFO's $2.4B 1.18 M sq ft Terminal 1 re-development

"Contractor shall develop a comprehensive business case analysis that includes data on external **economic, social, and environmental costs…(e.g. Autocase)**"

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SFO Terminal 1 Redevelopment - Boarding Area B (BAB)

	Green Roof	Electrochromic Glazing	Motorized Window Shades	Interior Landscaping	Radiant Heating and Cooling	Ground Source Heat Pump
Lifecycle Financial NPV	-$1.05	-$3.29	-$7.59	-$8.48	-$2.84	-$5.82
Social & Environmental NPV	$6.34	$6.26	$6.26	$11.39	$0.44	$0.59
Triple Bottom Line NPV	$5.29	$2.97	-$1.34	$2.91	-$2.41	-$5.23

*In Millions

BAB & T1 Highlights:

- TBL CBA supported SFO sustainability design decisions
- Owner requirement to support design-build teams for value-based design
- Used outputs as part of broader MCDA decision approach

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Miami Dade County - Office of Resilience - Building 305 Program

City Energy Project partnered with 20 cities and counties across the U.S. to create and implement customized, impactful energy efficiency policies and programs

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Building Efficiency 305 Ordinance Components

BE305 Program is a building performance policy that was developed through local stakeholder engagement. This policy has three main components:

- **Benchmarking and Transparency** - tracking a building's energy and water use
- **Retuning** - basic systems are tuned with no-cost or low-cost minor repairs and adjustments so that buildings operate and function as designed.
- **Auditing** – a whole-building performance evaluation to identify and prioritize improvements.

- 3 years of implementation, 40 years of operation
- **10,778 buildings covering 1,080,000 square feet of floor space**

Building Efficiency 305 Ordinance Components

Triple Bottom Line of the Building Performance Ordinance and Components					
Impact Type	Cost/Benefit	Benchmarking	Retro-commissioning	Auditing	Total
		Value	Value	Value	Value
Owner/Occupant	Operation & Maintenance	-$46,829,000	-$1,079,000	-$351,900	-$48,612,000
Owner/Occupant	Financial Savings from Electricity	$1,626,560,000	$2,008,459,000	$523,591,000	$4,158,610,000
Owner/Occupant	Financial Savings from Natural Gas	$119,101,000	$214,356,000	$40,034,000	$373,492,000
Community	Social Value of Air Pollution	$515,604,000	$672,099,000	$166,866,000	$1,354,569,000
Community	Social Value of Carbon Emissions	$715,245,000	$979,879,000	$232,674,000	$1,927,798,000
Community	Social Value of Water	$2,122,000	$2,230,000	$673,500	$5,026,000
Total Owner/Occupant NPV		$1,698,832,000	$2,221,736,000	$563,273,100	$4,483,490,000
Community NPV		$1,232,971,000	$1,654,208,000	$400,213,500	$3,287,393,000
Triple Bottom Line NPV		$2,931,803,000	$3,875,944,000	$963,486,600	$7,770,883,000

- >44 million tons CO2e reduced
- ~52 thousand tons of Criteria Air Pollutants reduced

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City of Pittsburgh - Green First Program

Phase I: City-wide Green Infrastructure (GI) Assessment: Evaluate GI benefits in targeted areas across the **30 combined sewersheds** with TBL-CBA tool

‘Green First’ Program: implementing GI first to capture stormwater at its source:

- Chronic surface flooding (CSO & SSO)
- Poor water quality and recreation opportunity enhancements
- Meet EPA consent decree obligations

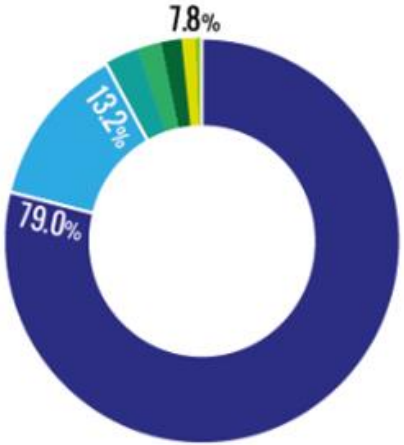
GI Investment Scenarios

- 1,286 acres of impervious area managed by GI in 13 sewersheds
- 1,835 acres of impervious area managed by GI in 18 sewersheds

City of Pittsburgh - Green First Program

Benefits

- Local Flood Mitigation
- Property Value Increase
- Recreational Value Added
- Economic Water Quality
- Air Pollution Reduction
- Heat Island Effect Reduction
- Carbon Reduction



	LOW	HIGH
TBL TOTAL BENEFIT	$428M	$850M
BENEFIT PER RETROFITTED IMPERVIOUS ACRE	$233,000	$462,000

Evaluated benefits of a city-wide GI investment to reduce CS and SS overflows, remove/detain stream inflows, reduce flood hazards, and reduce basement sewage backups

Developed a stormwater overlay lens for use as a comprehensive planning tool for future development & redevelopment

Autocase required in subsequent design/construct project planning

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City of Pittsburgh - Green First Program, Phase II

Phase II: Individual priority sewersheds and sites identified in Phase I

Professional engineering, landscape architecture, ecological, and hydrology services

Four Mile Run Project: 3rd largest CSO contributor, 400 million gallons flow sewershed

2. **PURPOSE:** The proposed design requires a combination of both green and gray solutions to be evaluated to ensure cost-effectiveness for the PWSA rate payers. The Consultant should be collaborative and inclusive in its design approach as this project has significant stakeholders from both in public and private entities as well as multiple community based organizations. The overarching goal of this design is to address CSO overflows, reduce localized flooding, spur further park improvements, and align with mobility corridors where appropriate.

3. **SCOPE OF WORK:** The Consultant shall do all the work and furnish all supervision, labor, materials, equipment, tools and appurtenances necessary or proper for the performance and completion of the following:

A. Task 1: Preliminary Design Assessment and Expansion

1. Development and Validation of Alternatives

b. Evaluate the Preliminary Design Report and critically assess if each of the key design locations are maximizing their fullest stormwater capture and suggest alternatives where appropriate. The analysis shall include, but is not limited to:

4) Financial, social, and environmental costs and benefits. The cost analysis performed shall determine the cost per impervious acre captured. The Consultant shall provide inputs to a benefits valuation performed by the PWSA, which will be based in Autocase software, to evaluate: financial costs and benefits, combined sewer overflow reduction, surface and basement flooding risk, and other inputs of interest. Inputs shall be updated for each subsequent design milestone (e.g. 60%, 90% and final). The Consultant shall incorporate material options that minimize carbon footprint and negative environmental implications.