Guide to Demonstrating the Economic Benefits of Green Infrastructure for CSO Mitigation

Jeff Rexhausen

Ohio WEA-AWWA 2014
Focus of Today’s Presentation

- Different Types of Economic Benefits
- How to Measure the Value of Certain Benefits
  - Why it is important to define the benefitting community
  - Why many economic benefits require a longer time frame for assessment
- Notes about Ohio’s Outlook for Green Infrastructure
Introduction

- In Nov 2013, EPA released report commissioned from UC’s Economics Center – a framework for identifying and organizing economic impacts of “green” sewer infrastructure projects, entitled:

Evaluation of Green Alternatives for Combined Sewer Overflow Mitigation: A Proposed Economic Impact Framework and Illustration of its Application
EPA Report Conclusions

- Communities have to make very expensive program decisions.
  - This motivates consideration of alternatives that can achieve the same environmental goals while allowing for progress economically, socially, and aesthetically.
  - A comprehensive framework is needed for an accurate benefit-cost analysis.

- This framework fills a significant gap by including economic development impacts.
  - Need supported by interviews with community officials and review of case studies.
  - Does not rely on complex estimation of non-market benefits.
  - A systematic way of sorting the economic impacts by timing, scope and scale, complexity, and proximate relationship to project investment
  - Lick Run case study demonstrates the accessibility of data for analyzing these impacts.

- With a tool such as this, the future of these GI programs can more readily be effectively managed rather than guessed at or hoped for.
Growing Interest in Green

- Green Infrastructure Share of Capital Budgets (in OH)

- Green Infrastructure Characteristics
  - More decentralized, visible, sustainable
  - Produces more non-water quality benefits
Challenges in Measuring Green Benefits

- Lack of Generalizability
  - Heavily dependent on local conditions and particular technologies/interventions chosen

- Often Difficult to Interpret or Relate
  - Valuation of externalities or public goods
  - Privately-experienced v. community v. diffuse benefits
Commonly-Identified Benefits of Green

- Construction cost savings
- Reduced damage from flooding
- Reduced disruption in project area
- Amenity value of green space
- Pollution reduction
- Carbon reduction
- Heat stress reduction
# Framework of Commonly-Used Metrics

## Initial Economic Impacts

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Communitywide</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Disruption Due to Construction <em>Businesses: lost sales; motorists: lost time</em></td>
<td></td>
</tr>
<tr>
<td>· Life Cycle Costs (savings) <em>Construction and O&amp;M</em></td>
<td></td>
</tr>
</tbody>
</table>

## Subsequent Economic Impacts

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Communitywide</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Flood damage Reduction &amp; Reduced energy use</td>
<td>· Monetized Environmental Benefits <em>Reduction in pollutants, water and air</em></td>
</tr>
<tr>
<td>· Changes in Privately-owned Property Values</td>
<td>· Monetized Health Benefits <em>Reduction in heat stress, pollution-related ailments</em></td>
</tr>
<tr>
<td></td>
<td>· Monetized Public Amenities <em>Newly created green space, parks, recreational space</em></td>
</tr>
</tbody>
</table>

*Missing: Subsequent Impacts Associated with Redevelopment*
## Metrics Added to the Framework

<table>
<thead>
<tr>
<th>Land Use and Property Conditions</th>
<th>Economic Activity</th>
<th>Socioeconomic Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Land Use Mix</td>
<td>• Commercial Occupancy Rates</td>
<td>• Residential Occupancy Rates</td>
</tr>
<tr>
<td>• Share of Undeveloped Property</td>
<td>• Business Composition</td>
<td>• Resident Median Income</td>
</tr>
<tr>
<td>• Public/Private Ownership Mix</td>
<td>• Employment &amp; Employee Wages</td>
<td>• Resident Labor Force Participation</td>
</tr>
<tr>
<td>• Physical Conditions</td>
<td>• Property Values</td>
<td>• Resident Public Assistance Receipt</td>
</tr>
</tbody>
</table>

*Most data available from local, state, federal government*
Advantages of Comprehensive Framework

- Systematic Approach to Measurement
  - Categorize measures
  - Criteria for new measures
    - Market-based
    - Readily available

- Understandable and Acceptable by Citizens
Cincinnati Case Study: Lick Run

Going from this ... to this
## Cincinnati Case Study: Lick Run

<table>
<thead>
<tr>
<th>Land Use and Property Conditions</th>
<th>• Land Use Mix (% Com/Ind/Resid)</th>
<th>27/ 14/ 11%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Share of Undeveloped Property</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>• Public/Private Ownership Mix</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>• Physical Conditions (% Condemned)</td>
<td>22%</td>
</tr>
<tr>
<td>Economic Activity</td>
<td>• Commercial Occupancy Rates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Business Mix (% Com/Ind/Public)</td>
<td>41/ 38/ 21%</td>
</tr>
<tr>
<td></td>
<td>• Employment &amp; Average Wage</td>
<td>330; $31,000</td>
</tr>
<tr>
<td></td>
<td>• Property Values (developed, private)</td>
<td>$470,000/ac</td>
</tr>
<tr>
<td>Socioeconomic Benefits</td>
<td>• Residential Occupancy Rates</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td>• Resident Median Income</td>
<td>$25,031</td>
</tr>
<tr>
<td></td>
<td>• Resident Labor Force Participation</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>• Resident Public Assistance Receipt</td>
<td>37%</td>
</tr>
</tbody>
</table>
Key Considerations for Economic Metrics

- **Study Area**
  - Where will benefits occur? Geographic substitution?

- **Land Use**
  - What are the changes?

- **Timeframe**
  - Much longer; dependent on external factors

- **Funding**
  - What is counted? Are alternative uses considered?

- **People**
  - Living in area now? Future?
More Ohio Green Infrastructure Survey Results

- Where will it be implemented?
  - 56% retrofit or redevelopment only; 22% new; 22% unsure
  - 67% public property; 33% unsure (0% definitely private)

- Green Infrastructure O&M budgets
  - 25% have secure funding (75% not) – a crucial issue
More Survey Results

- **Evaluating effectiveness**
  
<table>
<thead>
<tr>
<th>Install Cost</th>
<th>Life Cycle</th>
<th>TBL</th>
<th>All 3</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>11%</td>
<td>33%</td>
<td>22%</td>
<td>22%</td>
<td>11%</td>
</tr>
</tbody>
</table>

- **Ohio sewer community responses**
  
  - 55% urban, 33% suburban, 11% metro
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