INCORPORATING COMMUNITY GOALS INTO WATER INFRASTRUCTURE DECISION: MAKING A DIFFERENCE

JIM HORNE
U.S. EPA, WASHINGTON, D.C.
MAKING THE RIGHT CHOICES FOR YOUR UTILITY

Using Sustainability Criteria for Water Infrastructure Decision Making
WHY WE DID THIS PROJECT

- Test our guide with a utility in the “real world”
- Bring stakeholders into the Alternatives Analysis in a meaningful way at the begging of the process
- Add value to utility decision makers
- Identify opportunities to work with other utilities
COMMUNITY CHARACTERISTICS

Jurisdictions:
• City of Camden
• City of Gloucester
• Camden County

CCMUA: a county-wide public wastewater utility.

<table>
<thead>
<tr>
<th>Wastewater System</th>
<th>Residents Served</th>
<th>Lines</th>
<th>Plant Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>510,000</td>
<td>125 mi.</td>
<td>58 mgd</td>
</tr>
</tbody>
</table>

Receiving Water: Delaware River

Revenues: ~$100 Million/Annually

Average number of Combined Sewer Overflows Annually: 70

LTCP Required to be in place by 2020
THE WORK GROUP:

▪ Camden County Municipal Utilities Authority (CCMUA)

▪ EPA Office of Wastewater Management (OWM)

▪ Camden SMART Team:
  ▪ City of Camden
  ▪ Cooper’s Ferry Partnership
  ▪ Rutgers
  ▪ New Jersey Tree Foundation
  ▪ New Jersey Department of Environmental Protection
CORE ELEMENTS OF CONVENTIONAL ALTERNATIVES ANALYSIS

1. **Determine Goals and Objectives**
   - Utility

2. **Refine Goals to Metric Level**
   - Tool and screwdriver

3. **Scale Metrics**
   - Stars

4. **Evaluate Alternatives**
   - Head with gears

5. **Determine the Best Alternative**
   - Target with arrow
AUGMENTED ALTERNATIVES ANALYSIS

1-2 Determine Goals and Objectives

3 Rank the Importance of Goals

4-5 Refine Goals to Metric Level

6 Scale Metrics

7 Evaluate Alternatives

8 Review Results with Community

9 Determine the Best Alternative

10 Clearly Communicate Decision and Process to Community

MODIFIED

NEW

NEW

NEW
AUGMENTED ALTERNATIVES ANALYSIS

- Explicitly incorporates community values into the decision-making process
- Creates an equal playing field for the consideration of additional criteria
- Allows utilities to effectively engage community stakeholders in the discussion

ALTERNATIVES ANALYSIS: STEPS AT A GLANCE

Step 1: Goals
Step 2: Objectives
Step 3: Rank Goals
Step 4: Criteria
Step 5: Metrics
Step 6: Scaling
Step 7: Evaluate
Step 8: Compare Alternatives
CAMDEN CASE STUDY
STEP 1: GOALS AGREED UPON BY THE WORK GROUP

- Enhance Public Health and Environment
- Meet or Exceed Permit Requirements (Water Quality Protected)
- Enhance System Climate Resiliency
- Produce Economic and Neighborhood Benefits
- Optimize Existing Public Resources
- Increase Public Understanding and Support for Combined Sewer Overflow (CSO) Solutions
STEP 3: RANKING IMPORTANCE OF GOALS

- Enhance Public Health and Environment = 10
- Meet or Exceed Permit Requirements (Water Quality Protected) = 9
- Enhance System Climate Resiliency = 8
- Produce Economic and Neighborhood Benefits = 8
- Optimize Existing Public Resources = 7
- Increase Public Understanding and Support for Combined Sewer Overflow (CSO) Solutions = 6
STEPS 4-5: REFINING THE GOALS TO METRIC LEVEL

Goal: Public Health and Environment Enhanced

Objective: Reduce Human Contact with Sewage

Criteria: Reduction in Street Flooding Events – Emphasis on Residential Areas

Metric: Flood Quantity % Reduction (Positive Only), Identify High Residential Impacts
Objective 1.A.: Reduce human contact with sewage
Criteria 1.A.i: Reduction in street flooding events – emphasis on residential areas
Metric 1.A.i.a: flood quantity % reduction (positive only), discern high residential area impacts

<table>
<thead>
<tr>
<th>Score</th>
<th>-5</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative has no impact on the flood quantity</td>
<td>Alternative reduces flood quantity by 10% annually</td>
<td>Alternative reduces flood quantity by 20% annually</td>
<td>Alternative reduces flood quantity by 30% annually</td>
<td>Alternative reduces flood quantity by 40% annually</td>
<td>Alternative reduces flood quantity by 50% annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IDENTIFYING INFRASTRUCTURE ALTERNATIVES

▪ **Alternative A: All Grey**  
  (0% Impervious Reduction)

▪ **Alternative B: Moderate Green**  
  (10% Impervious Reduction)

▪ **Alternative C: Heavy Green**  
  (35% Impervious Reduction)
## C-32 ‘SEWERSHED-LEVEL ALTERNATIVES’ COMPARISON

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Alternative A (All Grey)</th>
<th>Alternative B (Moderate Green)</th>
<th>Alternative C (Heavy Green)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.A.i – Reduction in Flooding Events</td>
<td>0</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>1.B.i. - Reduction in CSO Discharge Volume</td>
<td></td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>2.A.i – Annual System-Wide CSO Volume Capture</td>
<td></td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>4.A.i – Flexibility in siting project</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.A.ii – Flexibility in timing of implementation of project</td>
<td>32</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>4.A.iii – Flexibility in phasing implementation of alternatives</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>4.B.i. – Green Space</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.B.ii – Reduction in heat island effect</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.B.iii. – Reduction in underdeveloped/vacant properties</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.A.i – Cost Effectiveness</td>
<td>14</td>
<td>-7</td>
<td>-21</td>
</tr>
<tr>
<td>6.A.i – Visibility to citizens and opportunity to present educational materials</td>
<td>6</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>169</strong></td>
<td><strong>178</strong></td>
<td><strong>188</strong></td>
</tr>
</tbody>
</table>
MESSAGE TO YOU

▪ **More Than Theoretical:** The Camden case study demonstrates that the *Making the Right Choices for Your Utility: Using Sustainability Criteria for Water Infrastructure Decision Making* guidance can work in a real-life context and that the process is replicable.

▪ **Stakeholders Bought In:** We were able to involve them in a meaningful and substantive way throughout the process—based on their values.

▪ **Strengthens Existing Processes:** Does not seek to replace, but rather augment and strengthen, existing alternatives analysis methodology.

▪ **Entirely Feasible for Other Communities:** Not overly resource intensive and can add real value.

▪ **BUT. . . . . . . The right culture at the utility and in the community is critical**
JIM HORNE
EPA, OFFICE OF WASTEWATER MANAGEMENT

horne.james@epa.gov
(202) 564-0571

https://www.epa.gov/sustainable-water-infrastructure
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
<th>Weight</th>
<th>Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.A.i – Reduction in Flooding Events</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>1.B.i. - Reduction in CSO Discharge Volume</td>
<td>4</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>2.A.i – Annual System-Wide CSO Volume Capture</td>
<td>5</td>
<td>9</td>
<td>45</td>
</tr>
<tr>
<td>4.A.i – Flexibility in siting projects</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.A.ii – Flexibility in timing of implementation of projects</td>
<td>4</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>4.A.iii – Flexibility in phasing implementation of projects</td>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>4.B.i. – Green Space</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>4.B.ii – Reduction in heat island effect</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>4.B.iii. – Reduction in underdeveloped/vacant properties</td>
<td>TBD</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>5.A.i – Cost Effectiveness</td>
<td>2</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>6.A.i – Visibility to citizens and opportunity to present educational materials</td>
<td>1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>169</strong></td>
</tr>
</tbody>
</table>
**C-32 ALTERNATIVE B: MODERATE GREEN (10% IMPERVIOUS AREA REDUCTION VIA GSI)**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
<th>Weight</th>
<th>Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.A.i – Reduction in Flooding Events</td>
<td>3</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>1.B.i. - Reduction in CSO Discharge Volume</td>
<td>4</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>2.A.i – Annual System-Wide CSO Volume Capture</td>
<td>5</td>
<td>9</td>
<td>45</td>
</tr>
<tr>
<td>4.A.i – Flexibility in siting projects</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.A.ii – Flexibility in timing of implementation of projects</td>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>4.A.iii – Flexibility in phasing implementation of projects</td>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>4.B.i. – Green Space</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.B.ii – Reduction in heat island effect</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.B.iii. – Reduction in underdeveloped/vacant properties</td>
<td>TBD</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>5.A.i – Cost Effectiveness</td>
<td>-1</td>
<td>7</td>
<td>-7</td>
</tr>
<tr>
<td>6.A.i – Visibility to citizens and opportunity to present educational materials</td>
<td>5</td>
<td>6</td>
<td>18</td>
</tr>
</tbody>
</table>

**TOTAL** 178
### C-11 ALTERNATIVE B: ALL GREEN (12% IMPERVIOUS AREA REDUCTION VIA GSI)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
<th>Weight</th>
<th>Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.A.i – Reduction in Flooding Events</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>1.B.i. - Reduction in CSO Discharge Volume</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>2.A.i – Annual System-Wide CSO Volume Capture</td>
<td>2</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>4.A.i – Flexibility in siting project</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.A.ii – Flexibility in timing of implementation of project</td>
<td>5</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>4.A.iii – Flexibility in phasing implementation of alternatives</td>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>4.B.i. – Green Space</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.B.ii – Reduction in heat island effect</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>4.B.iii. – Reduction in underdeveloped/vacant properties</td>
<td>5</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>5.A.i – Cost Effectiveness</td>
<td>-2</td>
<td>7</td>
<td>-14</td>
</tr>
<tr>
<td>6.A.i – Visibility to citizens and opportunity to present educational materials</td>
<td>5</td>
<td>6</td>
<td>30</td>
</tr>
</tbody>
</table>

**TOTAL** 167
## SCORING TABLE EXCERPT

<table>
<thead>
<tr>
<th>5.A.i Cost effectiveness</th>
<th>5.A.i.a Least present worth cost (for this exercise)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.A.ii Wastewater (and stormwater) costs &lt;2% of Median Household Income upon full implementation of LTCP</td>
<td>5.A.ii.a Annual wastewater and stormwater costs for a typical residential user as a percentage of Camden MHI</td>
</tr>
<tr>
<td>5.B.i Source reduction volume</td>
<td>5.B.i.a Million gallons of flow removed (Positive only)</td>
</tr>
<tr>
<td>5.C.i Increase in annual collection sewer rehab or replacement</td>
<td>5.C.i.a Length of rehab/replacement (Positive only)</td>
</tr>
<tr>
<td>5.C.ii Improved maintenance of infrastructure</td>
<td>5.C.ii.a Percent of pipe inch-miles and catch basins cleaned annually (after current initial 3 year remedial program) (note - check WEF, APWA, etc. best practices for values)</td>
</tr>
<tr>
<td>6.A.i Visibility to citizens and opportunity to present educational materials (design, construction, operation)</td>
<td>6.A.i.a H, M, L ranking for visibility and opportunity</td>
</tr>
<tr>
<td>6.B.i Multi-use nature of infrastructure and degree of access (operation)</td>
<td>6.B.i.a H, M, L ranking for multi-use and accessibility</td>
</tr>
</tbody>
</table>
Creating Sustainable Water Future

By connecting the dots, drops, and hearts
LA’s Water Challenges

- 90% of L.A. water supplies impacted by climate change, environmental and legal issues

- Drought
- Increasing population
- Aging infrastructure
- More stringent regulations
- Limited funding
- Dependence on imported water
- Climate Change
The Solution

INNOVATION

COLLABORATION

INTEGRATION

One Water LA

Connecting the dots, drops and hearts.
Transforming our Relationship with Water

- For every $1 Million in Water Quality investments, there is up to $22 Million in added benefits or avoided costs.

Sustainable City Plan Targets:

- Water Supply
- Climate Adaptation
- Habitat Restoration
- Open Space
- Jobs
- Flood Protection
- Water Quality

Stormwater Quality: Improve beach water quality grade-point average (GPA) to:
- 2025: 75 GPA
- 2035: 80 GPA

150,000 AFY
- Capture 150,000 acre-feet per year of stormwater
- 2035

Reduce the purchase of imported water by 50% in 2025
- 50% of water locally
- 2035
Collaborative approach to develop an integrated framework for managing the City’s watersheds, water resources, and water facilities in an **environmentally**, **economically**, and **socially** beneficial manner.
### Integration

<table>
<thead>
<tr>
<th>Conserve</th>
<th>Reuse</th>
<th>Capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce demand and make supply last longer</td>
<td>Non-Potable</td>
<td>Centralized</td>
</tr>
<tr>
<td><img src="image1.png" alt="Save the Drop" /></td>
<td><img src="image2.png" alt="Non-Potable" /></td>
<td><img src="image3.png" alt="Centralized" /></td>
</tr>
<tr>
<td><img src="image4.png" alt="California Friendly Landscaping" /></td>
<td><img src="image5.png" alt="Potable" /></td>
<td><img src="image6.png" alt="Distributed" /></td>
</tr>
</tbody>
</table>
Creative Water Management:

• Maximize recycled water production and use from existing water reclamation plants (WRPs)

• Augment sewer flows with runoff to increase water recycling

• Reconfigure sewer alignment(s) to increase flows to WRPs

• New strategically located City-owned satellite water reclamation plant(s)
Water Balance Tool

- First-ever flow balance of LA's entire Water Cycle
- Collaborative data effort of multiple departments
- **Annual flow projections from 2015 to 2040**
- Normal, wet, and dry year hydrology
Innovation

Preparing for the future by evaluating all strategies on the table

Evaluation process identifies the most beneficial strategies including projects & programs to achieve long-term goals.
Amount consumed by 1.1 million people (assuming 100 gpd)

**Enhanced Watershed Management Plans (EWMPs)**
- 4 watersheds, 30 Agencies, 300 stakeholders
Low Impact Development

- Cisterns - Lowe’s
- Porous Pavement – Rio del Los Angeles State Park (aka: Taylor Yard)
- Planter Boxes - Versailles Luxury Apartments Oxford St, Los Angeles
- Infiltration - Costco Parking Lot
- Bioretention - Sam’s Club Parking Lot
- Parkway Swale 11th St & Hope St
Rory Shaw Wetlands Park – A collaborative project led by LA County in collaboration with City of LA and other partners

- Project area: 46 acres
- Upstream drainage area: 929 acres
- Expected water capture and use: 900 ac-ft
Garvanza Park Rainwater Capture & Use Project
South Los Angeles Wetlands Park
Avalon Green Alley Project

Broadway Neighborhood Greenway
Elmer Paseo Alley Greenway

Before

After
Inclusion

Steering Committee

Advisory Group

Ad Hoc Technical Experts

Focused Meetings

Special Topic Groups

One Water LA Team

Stakeholder Workshops
Stakeholder Representation

- 500+ Stakeholders including over 200 Organizations
- Dedicated website for info & sign ups

www.OneWaterLA.org
Inclusion

- Outreach Events
- Stakeholder Meetings
- Special Topic Groups
- Schools and Academia

- Urban Semillas: Cultivating Communities, Building Capacity
- TreePeople
- LA BT: Los Angeles Beautification Team
- North East Trees: Nonprofit Urban Forestry
- LATTC: A Community College
- Los Angeles Conservation Corps: Transforming Youth, Enhancing Communities
One Water is a collaboration of people throughout LA working together to change the way we think about and manage water.
NOAA’S SEA LEVEL RISE VIEWER

Data Visualization for Coastal Flooding and Risk at the National Level

Melissa Rosa
West Coast Geospatial Specialist
NOAA Office for Coastal Management
New Partners for Smart Growth Conference 2018

https://coast.noaa.gov/digitalcoast
Digital Coast

- **Approach:** Bring the geospatial and coastal management communities together

- **Outcome:** A constituent-driven, integrated, enabling platform supporting coastal resource management that is used

https://coast.noaa.gov/digitalcoast
version 3.0.0!!
St. Petersburg: 1 Foot of Sea Level Rise
High Scenario
Digital Coast Data Access
Customized Sea Level Rise Viewers

https://coast.noaa.gov/digitalcoast
Connect with the Digital Coast

https://coast.noaa.gov/DigitalCoast

https://coast.noaa.gov/slr/

Digital.Coast@noaa.gov
melissa.rosa@noaa.gov
http://www.facebook.com/NOAADigitalCoast
@NOAADigCoast
Adapting to Rising Tides

A regional program that uses findings, processes, tools and relationships built by ART and its partners to lead and support efforts that increase the resilience of San Francisco Bay Area communities to sea level rise and storm events

San Francisco Bay Conservation and Development Commission

www.adaptingtorisingtides.org
What is Adapting to Rising Tides?

A Bay Area Program that:

- Develops, leverages and identifies best available data, information and research
- Builds and supports partnerships with agencies and organizations
- Identifies challenging issues or regional priorities that need further assessment
- Helps local agencies, businesses, and other partners understand and address their own vulnerabilities
- Based on assistance, non-regulatory
Impacts from coastal and/or riverine flood events including:

- More frequent flooding of existing flood-prone areas
- Flooding in areas that are not currently at risk
- Elevated groundwater and increased salinity intrusion
- Permanent inundation along the shoreline, in particular tidal wetland systems
- Shoreline erosion and overtopping
- Tidal creek and channel flooding
ART Regional Sea Level Rise Maps

- Uniform mapping for all 9 counties including 10 total water level scenarios for inundation, low-lying disconnected areas, and shoreline overtopping.
- An effective planning tool to:
  - Communicate temporary and permanent flooding
  - Identify low spots on the shoreline that can lead to inland flooding
- Stakeholder reviewed and validated
- High resolution topographic data (1 meter DEM)
- Water levels from the SF Bay Coastal Study
ART’s One Map = Many Futures

- Uses an equivalent water level approach to reduce the number of maps needed to understand flooding
- Communicates that areas that may be *permanently inundated* will first be *temporarily flooded*
- Provides information that allows local jurisdictions and agencies to develop thresholds for action

Source: AECOM
ART’s One Map = Many Futures

This single map depicts:

High tide permanent inundation from 36” SLR

or

Temporary flooding from:

- 2-year storm surge with 18” SLR
- 5-year storm surge with 12” SLR
- Today’s 50-year extreme tide

SLR Inundation & Overtopping -36”
Identifies shoreline locations that may be too low, which helps prioritize where further study or immediate actions may be necessary.
ART Shoreline Overtopping Analysis
Stakeholder Input is Key!

Will OAK flood with 12 inches of sea level rise?

If so, flooding would have been observed during a King Tide.
When to use the data?

- Support robust, local-scale vulnerability assessments in San Francisco Bay
- Support development of both near-term and long-term adaptation strategies for San Francisco Bay
- Regional scale vulnerability assessments in San Francisco Bay
ART/NOAA Dasymetric Population Map
Story Map and Interactive Viewer

Coming July 2018!
<table>
<thead>
<tr>
<th><strong>Audience:</strong></th>
<th><strong>Goals:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• ART working group members</td>
<td>• Educated users about SLR and flood risk, Describe appropriate uses for the maps</td>
</tr>
<tr>
<td>• Press</td>
<td>• Enable users to explore and interact with the maps</td>
</tr>
<tr>
<td>• Regional, state agency partners</td>
<td>• Allow data download for technical users</td>
</tr>
<tr>
<td>• General public (e.g., student groups)</td>
<td></td>
</tr>
<tr>
<td>• Elected officials and their staff</td>
<td></td>
</tr>
</tbody>
</table>
Story Map and Interactive Viewer

Coming July 2018!
Adapting to Rising Tides

Thank you!

Heather Dennis
heather.dennis@bcdc.ca.gov
415-352-3646
www.adaptingtorisingtides.org