Nature as Water Infrastructure for Smart Growth: Benefits Beyond the 4-walls of the Utility

Todd Gartner | Senior Associate, WRI

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Water stress is a measure of demand and supply for water in a given area, and is calculated as the ratio of local water withdrawal over renewable water supply.

References:
Aqueduct methodology: aqueduct.wri.org

Water woes are magnified when drought strikes places like Plainview, Texas, where baseline water stress is extremely high.

Arid & low water use (Ratio: withdrawals/supply)
Low < 10%
Low to medium 10% - 20%
Medium to high 20% - 40%
High 40% - 80%
Extremely high > 80%
Due to insufficient rains there is a 50% cut of water supply in Mumbai Hotels. KINDLY DO NOT WASTE WATER.
RETHINK ENGINEERED INFRASTRUCTURE

- Non-revenue water
- Energy efficiency
- Waste management
- Climate resilience
- Water Reuse
- System monitoring

Source: Advantech
Land Use Change


- **10 MHa**


- **24%**

**TREE COVER LOSS (2001 - 2014)**

- **1,118,267**

**TREE COVER GAIN (2001 - 2012)**

- **291,917 Ha**

Displaying tree cover and loss with >30% canopy density

**NOTE:** tree cover loss and gain statistics cannot be compared against each other. [Learn more](#)

Over 50K soccer fields every yr.
WHY NATURAL INFRASTRUCTURE – Nature for Water?

- Improve water quality
- Regulate hydrologic cycle
- Mitigate flood
- Reduce erosion
- Improve energy and food security
- Conserve biodiversity
- Protect coastlines
- Sustain livelihoods
- Reduce costs

Source: IUCN 2015
Natural Infrastructure: Current Challenges

1. Lack of awareness
2. Lack of capacity and resources
3. Lack of business case
4. Lack of access to investment
5. Lack of implementation support

$10 trillion will be spent between now and 2030 on water infrastructure worldwide

Raise Awareness: GFW Water

Know Your Watershed
visualize critical watershed related information

Identify Watershed Risks
understand type and severity of threats to watershed health

Plan for Action
obtain recommendation on natural infrastructure solutions and applicable guidelines and decision-support tools
Break down silos and leverage common risks and opportunities

**POLICY MAKERS & DEVELOPMENT**
Bilateral Development Banks, Policy Makers, NGOs, National/Regional Govs.

Achieve Sustainable Development Goals

**BUSINESS & INVESTORS**
Corporations, Corporate Consultants, Investors, Asset Managers

Manage operational & supply chain risks

**MUNICIPALITIES & UTILITIES**
Municipalities, Water Treatment & Hydroelectric Plant Management

Improve water and energy security

**CIVIL SOCIETY GROUPS**
Academics, Reports, Community Based Non-Profits, General Public

Awareness & Livelihoods

Transform the way we manage water
Loess Plateau

Before: 1999

Loess Plateau

After: 2005

- ↓ soil erosion on 920,000 hectares
- 99% ↓ in sediment in water
- 2.5 million people out of poverty
Conduct economic analysis to make the business case

Comparison of costs for natural and built options for cities to meet water quality requirements in the US (millions $)

![Bar chart comparing total investment for natural and gray infrastructure in different cities.]

Make the business case for investment in natural infrastructure

Present value of investment over 20 years, USD millions

*Most optimistic scenario* (Portland, Maine; USA)

- Gray infrastructure upgrade (membrane filtration): $155 M
- Green infrastructure investments: $44 M

71% savings

Detailed financials of green vs. gray infrastructure approaches for securing clean drinking water (Portland, ME)

Present value of investments over 20 years, USD millions

**Most Optimistic Scenario**

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Green-Savings</th>
<th>Total</th>
<th>Savings</th>
<th>Membrane filtration (gray)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reforestation</td>
<td>$15 M</td>
<td>$111 M</td>
<td>$155 M</td>
<td></td>
</tr>
<tr>
<td>Riparian buffers</td>
<td>$16 M</td>
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<tr>
<td>Conservation easements</td>
<td>$12 M</td>
<td></td>
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<tr>
<td>Culvert upgrades</td>
<td>$1 M</td>
<td></td>
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<tr>
<td>Forest certification</td>
<td>$.2 M</td>
<td></td>
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<tr>
<td>Total green</td>
<td>$44 M</td>
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</tbody>
</table>

9,400 acres | 370 acres | 13,220 acres | 44 units | 4,700 acres

Beijing

PADDY LAND-TO-DRY LAND PROGRAM

Agricultural BMPs to reduce erosion and nutrient runoff

- Pays farmers in headwaters to switch from rice to corn - requires less water and produces less runoff
- Program estimated to produce more than $800 per acre in benefits through increased water yield and quality, but costs only about $530 per acre of farmland

Source: The Nature Conservancy, Stanford University, Crack Two, proskauer
Costa Rica

NATIONAL FUND FOR FOREST FINANCING
Forest restoration, conservation and BMPs to reduce sediment

- P3 – Enel pays landowners $10-20/ha, Government contributes an additional $30/ha; $340M distributed
- Environmental improvements on 1 million hectares, involving 10,000 landowners; Reduced siltation and increased longevity of reservoir system

Source: Hanson et al. 2011; Porres, Barton, Chaco-Cascanet, and Miranda 2013
Preliminary summary financials for Northern Front Range, CO
Distribution of (real-time) Savings, USD millions

Base Case Scenario

- 35% Savings
- Fire Suppression $124, 42%
- Insured Property Loss $73, 25%
- Carbon Emissions $37, 12%
- Dredging Costs $30, 10%
- Burned Area Rehabilitation $17, 6%
- Lost Recreation $11, 4%
- Turbidity $2, 1%

Design innovative and sustainable financial mechanisms

<table>
<thead>
<tr>
<th>FINANCE MECHANISM</th>
<th>TYPICAL REVENUE ALLOCATION</th>
<th>TYPICAL USER OF FINANCE MECHANISM</th>
<th>POTENTIAL SCALE OF INVESTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAND ACQUISITION</td>
<td>EASEMENTS</td>
<td>LAND MANAGEMENT ACTIVITIES</td>
</tr>
<tr>
<td>Direct Investment by Governments and Utilities</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Indirect Investment by Governments and Utilities</td>
<td></td>
<td>Property tax incentives</td>
<td>X</td>
</tr>
<tr>
<td>Voluntary Donations by Individuals and the Private Sector</td>
<td>Voluntary surcharge</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Market-based Mechanisms</td>
<td>Nutrient trading</td>
<td>No additional revenue</td>
<td>Government, NGO</td>
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<tr>
<td></td>
<td>Mitigation banking</td>
<td>No additional revenue</td>
<td>Government</td>
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<tr>
<td></td>
<td>Tradable development rights</td>
<td>No additional revenue</td>
<td>Government</td>
</tr>
<tr>
<td></td>
<td>Forest banking</td>
<td>No additional revenue</td>
<td>Private sector</td>
</tr>
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Provide comprehensive roadmaps and guidelines.
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<table>
<thead>
<tr>
<th>THEME</th>
<th>SUCCESS FACTOR</th>
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<tbody>
<tr>
<td>Building Momentum</td>
<td>▪ Presence of drivers or windows of opportunity for natural infrastructure investments</td>
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<td>▪ Presence of champions and effective advocates</td>
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<td>▪ Investment is supported by a sound business and economic case</td>
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<td>▪ Effective partnerships are established for source water protection</td>
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<td>▪ Effective public outreach and communication</td>
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<tr>
<td>Designing</td>
<td>▪ Landscape assessments are conducted to identify priority areas for investment</td>
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<td>▪ Sustainable financing mechanisms are available</td>
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<td>Implementing</td>
<td>▪ Partners have defined responsibilities and the capacity for implementation</td>
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<td>▪ Capacity to work across different types of landownership</td>
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<tr>
<td>Maintaining</td>
<td>▪ Outcomes are monitored and reported based on an agreed upon definition of success</td>
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<td>▪ Capacity to leverage sufficient funding to achieve landscape scale impacts</td>
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<td>▪ Capacity to look ahead and plan for the future</td>
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Source: Gartner, T. et al. (forthcoming)
Implement

Monitor on-the-ground projects and adaptively manage — share lessons learned