Market-Based Approaches to Green Infrastructure

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Background, Status, & Lessons Learned
Green Infrastructure

- Method of managing stormwater runoff better
Project Goal

- Develop the first draft of a business model to assess the roles of various parties if private funding is to become a key driver of green infrastructure, by answering:
  - Who are the key players and what customer segments exist?
  - What is the value proposition?
  - What customer relationships exist or need to be in place
  - Primary drivers: Regulatory, cost savings, and profits
  - What key resources are needed?
  - What are the cost structure and revenue streams
  - What is the pay-off to an investor?
The Business Model Approach

- Who does what for whom?
- How much does it cost and where does the revenue come from?
- What are the specific activities and how do the partners/customers work together?
The Project Approach

- Examined
  - Use and effectiveness of infiltration-based green infrastructure (such as bioswales, rain gardens and other naturalistic infrastructure) and
  - Use and effectiveness of storage-based green/blue infrastructure designed to hold water during peak runoff events, but release water after a rain event or in advance of a rain event: Dumb retention to smart retention

- Identified potential pilot projects and assessed challenges and opportunities with each of them
The Project Approach (cont.)

- Contrasted a *volume-based* storage capacity approach rather than an *every rain event-based* approach
  - Access to storage prior to large rain events is more valuable than uncontrolled storage
  - Development of a contract between beneficiaries and financing entities
- Focus on developing a business plan that targets specific areas with well defined problems (and high cost grey solutions) to optimize the value of the GI solution
Who/What Benefits from Better Stormwater Management?

**Present:**
- Wastewater Utilities and their ratepayers
- Homeowners in flood prone areas
  - Basement flooding
  - Downstream property owners
- Property Owners with gray water needs
- The ecosystem
  - Aquatic life in streams
  - Surface ecology
  - Groundwater recharge
- Others?

**Future:** All of the above as well as the Private Investor
Cistern Area #1
Cistern Area #2
Cistern Area #3
Cistern Area #4
Primary study area
Cisterns installed at Primary School built on previously empty lot

Cisterns to be installed at homes experiencing basement flooding

Tennis Courts to add controls to retain stormwater
Findings

- Only large-scale approach to implementation provides the scale needed to encourage investment, rather than the pilot approach.
  - Small Scale Pilot projects could not justify the administrative overhead to justify a transaction or yield significant benefit or financial return for potential investors.
  - Distributed network of Best Management Practices (BMPs) will yield better results that can drive GI systems, but there are barriers such as building on private property that need to be addressed.

- Not all geographical regions have the same need for innovation
Findings

- Design financial model around the party that aggregates the most revenues/costs associated with stormwater management. Others have an interest, but that does not provide enough revenue to pay for the green infrastructure.

- Overcome some practical constraints like capital versus operating funding - There is an argument for the development of a system that capitalizes operations of green infrastructure and stormwater BMPs (similar to contract construct/own/operate WWTPs).

- Focus on a transaction-based approach for a larger area such as a sewershed that allows
  - Diverse (public and/or private) Ownership
  - Defined Liability and appropriate insurance
  - Access for repairs/maintenance
  - Public and/or private operations and maintenance
Why Should a Utility Be Interested?
Hydrology Impacting Rate Payers: CSO versus MS4 Communities

- **Combined Sewer Communities**
  - Reduce risk of overflows of combined sewers into streams and basements
  - Reduce risk of flooding
  - Driven by consent decrees
  - Goal: Keep water out of treatment system

- **MS4 Communities**
  - Separated sewer systems
  - Reduce velocity and volume of water entering receiving streams
  - Reduce runoff of contaminants entering streams through stormwater flow
  - Driven by permit reviewers
  - Goal: Slow water entering the storm sewer system
Combined sewer will release the water at the rate of treatment. The issue is bigger during overflows for CSO communities.

They do, but the driver here is the constant flow of water with grit. CSO water is generally cleaner when discharged due to treatment (unless there is an overflow). Separated Sewers don't clean the water before the outfall.
Managing Benefits and Harms

- Overall benefits of better stormwater management are large, but individual benefit is spread out among many groups who may not recognize importance of individual benefit.

- Participation in system may not benefit an individual, but that individual’s stormwater impact may cause damage downstream for others.

- Costs of green infrastructure constructions generally less than gray infrastructure.
Utilities and Green Infrastructure

- So far as Green Infrastructure, utilities have traditionally paid for:
  - Construction through capital budgets
  - Long-term maintenance through operating budgets (i.e. rates)

- If a private entity builds and operates a green facility, the utility would be expected to provide a payment that would repay the capital, the cost of money and the cost of maintenance.

- Many current installations have been based on pilots and/or a parcel by parcel implementation. Generally not targeted.
What is stopping the utilities from investing in it already?

- Change is difficult (utilities and regulators)
  - Perceived to be less predictable than Grey Infrastructure solutions
  - Maintenance requires new skill sets
- Public versus private land ownership issues
- Compliance and liability issues
Approaches examined:
Mandate Peak Discharge Reductions

1. If the cost of stormwater capture is placed on the land owner, this cost can be quantified, monetized, aggregated, and placed off site for a fee - e.g. wetlands banking

2. The transaction would be between landowner and aggregator

3. Smart systems that would benefit the collection system operator could affect the “trading ratios” of the storage requirement

4. Responsibility of operation, maintenance and “compliance” would likely remain with the aggregator (who could contract it out to local NGO).
Approaches examined: Ordinance Driven Transactions

- If the cost on reducing peak runoff falls on the property owner, they will have incentive to reduce that peak
  1. Incentivize reduced Directly Connected Impervious Areas
  2. Incentivize reduced peak flows
  3. Smart Systems (similar to peak energy meters for electricity)
  4. Transaction between property owner and aggregator, property owner and utility, or aggregator and utility
Approaches examined: Capital Lease

- GI sites could be constructed, aggregated, and treated as a capital lease
  - Capitalizing operating costs
  - Ability to place assets on private property
  - Ownership and maintenance responsibilities
  - Risk, liability, and insurance
Preliminary Business Model
(for Aggregators)
Business Model Impetus

- Wastewater and stormwater utilities are currently required to invest in improving their management of stormwater (as CSO, SSO and/or SW Control);

- Cost of managing stormwater fall on an already burdened system where bonding capacity, rate hikes and operating budgets are all challenged; and

- Private financing of Green Infrastructure may have fewer constraints
Business Model

- What’s the value proposition?
- What are the customer segments?
- What are the customer relationships?
- How do the interact? What are the channels of communication?
- Who are the key partners?
- What are the primary activities?
- What are the key resources?
- What is the cost structure?
- What are the revenue streams?
Initial Business Model Thoughts

- Set stormwater storage goals
- Compare cost of gray versus green infrastructure
- Concentrate green infrastructure in a specific area
  - Treat as infrastructure
  - Store water close to where it falls
- Set a per gallon value for annual storage
- Allow aggregators to find ways to meet volume goals
Conclusions
Conclusions

- GI is the low cost solution for managing urban stormwater in both combined and separate collection systems.
- The value of flood prevention, pollutant discharge avoidance, enhanced green space, and water quality benefits are spread among diverse entities.
- Disparity of risk, delivery, and technology exist between entities, and the market is not yet evolved when compared to energy sector.
- Allowing GI on public AND private land allows low cost/high return projects, but has issues associated with access, maintenance, liability.
- Need a target for volume needed to capture.
- Need a value per gallon set by a utility and aggregators willing to seek out projects.
Conclusions

- Need to draw revenue from capital funds that can cover construction, operations and maintenance.

- Three customer segments (cash streams):
  - Water makers
  - Water takers
  - Other water users (e.g. those reusing for irrigation)

- Value proposition: Turn "dumb" retention to "smart" storage, which is distinguished by:
  - Volume (storage)
  - Location
  - Operational profile

- Role of aggregators/middle market, revenue streams, key markets, and channels need more work.
Questions

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