IMPLEMENTING GREEN INFRASTRUCTURE – EXECUTING FOR TRIPLE BOTTOM-LINE

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Communities are struggling with a set of problems concerning stormwater management. Aging systems are rapidly degrading and need costly repairs and/or updates. Regulatory requirements are increasing and are thus impacting the cost of stormwater management. A key question is who should be responsible for paying for those costs – the community or the consumer? Innovative solutions to address these correlated and increasing problems are needed. One such solution used by communities is to replace some traditional grey infrastructure with green infrastructure.

Green infrastructure is an approach to water management that protects natural drainage patterns and mimics the sites' natural hydrologic cycle. A comprehensive green infrastructure program can cleanse stormwater, conserve ecosystem functions, and provide a wide array of social benefits to the community. Green infrastructure solutions can be implemented on differing scales ranging from site-level installations to watershed-level efforts. On the local scale, green infrastructure practices include rain gardens, permeable pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting systems. At the watershed scale, green infrastructure includes comprehensive planning including the preservation and restoration of natural landscapes such as forests and wetlands.

Despite its many benefits, large-scale implementation of green infrastructure is not common in many parts of the country due to many challenges. These challenges include a lack of overarching, community-wide strategy that align with policy frameworks, a lack of regulatory drivers, a lack of upfront capital needed to build green infrastructure, and finally, long-term maintenance issues. Before green infrastructure is more widely accepted, there needs to be a coherent effort that considers science/engineering, policy, and community engagement. Without sound science and engineering, green infrastructure elements may not adequately address water quality and ecosystem services issues, thus affecting the bottom-line cost benefits. Without effective policy, municipal ordinances and funding will roadblock green infrastructure evolving into mainstream stormwater management. Without community engagement, people will not readily accept integrating green infrastructure into their community fabric as a lifestyle choice.

There is an increasing body of literature on the science-backed effectiveness of green infrastructure. While the work is hardly complete, there is a greater understanding about the design, construction, and maintenance of the wide variety of green infrastructure best management practices (BMPs) across the United States. Water resources professionals have the greatest understanding of these principles, and, generally, have the highest comfort levels with integrating green infrastructure elements into BMPs.

Early reports produced by national groups, including the U.S. Environmental Protection Agency's (EPA) Reducing Stormwater Cost through Low Impact Development (LID) Strategies and Practices (EPA 2007), suggest that green infrastructure is less costly in nearly all situations so long as one relies on "triple bottom line benefits," which are three, interrelated categories of benefits: economic, social, and environmental. Subsequent – and more recent reports – by the Center for Neighborhood Technology (CNT 2010), Metropolitan Milwaukee Sewer District (MMSD 2013), and Water Environment Federation (WEF 2014) also suggest triple bottom line benefits for implementing green infrastructure. Finally, a business model framework to address the lack of upfront capital needed to design, build, and monitor green infrastructure projects was put forth by the co-author (Sinha et al 2014). That business model is based upon public-private partnerships, commonly established in transportation sectors across the United States, but new to stormwater management projects.

Green infrastructure implementation will not become pervasive without an educational strategy that involves citizens and decision makers alike. Planning and conceptualization are critical for acceptance. Utilizing design meetings to convey what is envisioned – and the number of benefits – can maximize acceptance for green infrastructure retrofits and its incorporation at new developments. For example, a parking lot can be reimagined to include porous pavement and rain gardens (see figure). Conceptual renderings such as this have been used to encourage communities to implement green infrastructure.

In summary, engineers are good at estimating costs and computing the volume of runoff retained through these installations, but those are only relevant if green infrastructure practices are actually implemented. Therefore, the social elements of green infrastructure must be included in the process. Implementing green infrastructure is an emotional decision. A community must envision what it wants to look like in 5, 10, or 15 years. Where will the citizenry want to live, work and raise their children? While technical data is an important piece of the infrastructure puzzle that we are not discounting, we encourage water resources professionals to not underestimate or undervalue the importance of the emotional response to green infrastructure.

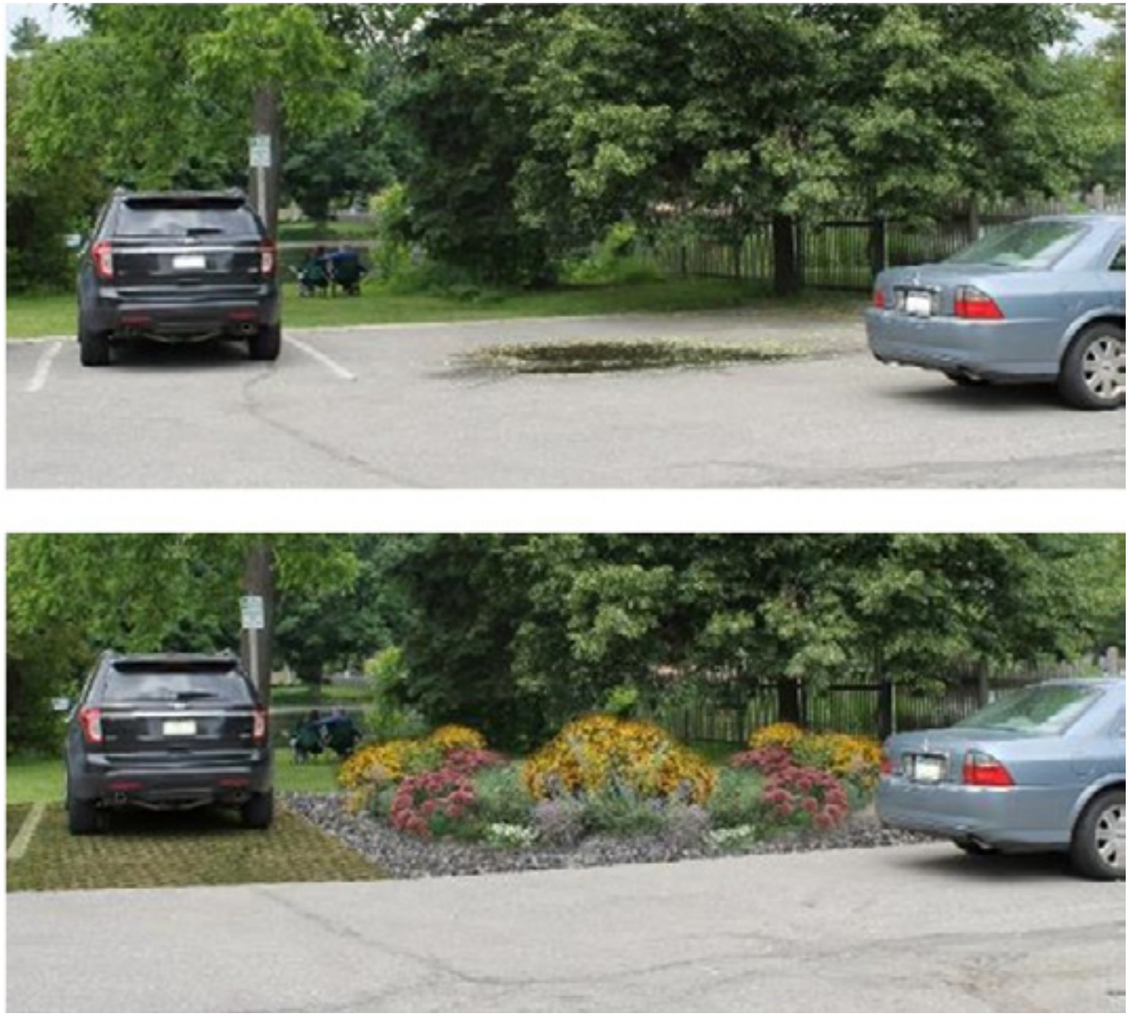

Figure : Clarkston Parking Retro Figure

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