BUILDING RESILIENT BMP TOOLKITS

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Jurisdictions are struggling to make their infrastructure more resilient (https://www.estormwater.com/erosion-control/rockaway-coastal-resilience-study-expedited) in light of challenges such as recurrent flooding, higher intensity and longer duration rainfall events, aging conveyance systems, and the lack of financial resources, to name just a few issues. These concerns are shared across the country to varying degrees, but one constant is the need to plan for the future impacts caused by them. So it should surprise no one that affected communities are seeking reliable, adaptable and long-term storm water management solutions as part of any resiliency planning process. This exercise should include evaluating all best management practices (BMPs) for vulnerabilities and considering how to best deploy them within the community to continue achieving intended water quality benefits.

Before you can solve the problem of providing resilient BMPs, you must first understand what resiliency is all about (https://www.estormwater.com/flood-control/epa-releases-route-resilience-tool) in the first place. The American Planning Assn. defines resilient communities as “the capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt and grow no matter what kinds of chronic stresses and acute shocks they experience.” In other words, it is not about just bouncing back, but bouncing back in better shape than before. Resilience also necessitates looking at these stressors not as challenges, but as amenities. It’s an immense undertaking at the community scale and requires a seismic shift from historical thinking. When applied specifically to storm water infrastructure that lift is equally heavy, but ultimately necessary.

A national example of this complex exercise comes from my own backyard within the Mid-Atlantic. Over the last several years, the Chesapeake Bay Program’s Scientific and Technical Advisory Committee (STAC) has been studying what resilient BMPs may look like in the future. The Chesapeake Bay watershed is America’s largest estuary and subject to the largest Total Maximum Daily Load (TMDL) ever developed by the U.S. EPA. Restoration efforts within the 64,000 sq. mile watershed are intended to comply with a 2025 pollution diet for nitrogen, phosphorus and sediment. Developing next generation, more resilient treatment practices will help Bay communities comply with this mandate. It also begins the process of looking beyond the finish line. The STAC’s work provides wide-ranging guidance beneficial to any community across the country interested in developing more resilient BMPs.

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In a report by Johnson, et al. (2018), the STAC considered how to make the siting and design of storm water (https://www.estormwater.com/erosion-control/resilient-relationships) BMPs more resilient by identifying key characteristics allowing the practice to withstand the chronic stressors that come with future unknown environmental conditions. Characteristics such as:

- Sensitivity to future climate and land use changes and the ability of the BMP to respond to them;
- The ability of a BMP to adapt to changing conditions over time;
- How quickly a BMP can be altered due to changing conditions;
- Presence of cost-benefit analyses to determine the greatest overall return on capital investment;
- The ability for a BMP to meet expected performance in spite of future environmental conditions, otherwise known as robustness; and
- BMPs that provide additional community benefits.

While all of these are worthy of greater discussion, I'd like to highlight two specific areas for further analysis:

Cost-effectiveness: BMPs with lower installed costs are not always the cheapest to own or operate over the long-term, so cost-effectiveness should be measured by life-cycle costs since all BMPs require maintenance. BMPs should be expected to meet performance expectations over time in order to return the greatest bang for the buck. Yet, all too often we see BMPs installed that are never properly maintained during their lifespan or maintenance money was never budgeted for maintenance in the first place. Accounting for long-term maintenance costs is part of being a responsible BMP owner. Choosing to deploy the right BMP for the right site conditions while properly planning for maintenance on the front end will reduce overall costs and help cultivate future practice resiliency.

Robustness: Maintaining functionality in light of changing conditions is vitally important. Meeting performance expectations by providing pollutant removal certainty is a permit necessity. This is most definitely the case with MTDs, which historically have been subjected to significantly higher levels of scrutiny than green infrastructure (GI) practices by permitting agencies. In many instances, GI practices and MTDs have similar pollutant removal capabilities. So, when GI practices relying on infiltration to meet runoff reduction requirements are selected, it is essential these practices are deployed where infiltration rates support that design requirement. Otherwise, runoff reduction benefits are negated and overall performance is diminished. Creating resilient BMPs means developing a robust evaluation protocol for both BMP classifications in order to maintain confidence the practices are working as intended.

Considering the aforementioned characteristics when designing BMPs for resilience is only part of the battle against changing weather. Since future conditions are difficult to predict, a community's BMP toolkit should be strong enough to achieve compliance today, but flexible enough to account for future innovation