



Grade:

C+

New York

The city that stretches its storm water plan across five boroughs

The **SWS City Report** is a year-long project, where SWS and a small committee of industry professionals collaborate to assign grades to the storm water infrastructure in some of the nation's largest cities. Modeled after the American Society of Civil Engineer's annual Infrastructure Report Card, the SWS City Report specifically examines storm water infrastructure on a city level. Keeping certain criteria in mind—the condition of the infrastructure, how it will meet future needs, its resilience, how it meets capacity requirements, and its level of innovation—the committee assigns a letter grade, which is followed by a brief, high-level overview of the city's storm water infrastructure. The project will examine one major city in each region of the U.S.: Chicago, New York, Los Angeles, Phoenix and Houston.

The largest city in the U.S. has the storm water management goals to match it. With a population of more than 8.6 million divided among five boroughs, New York City (NYC) has its hands full. Many groups in the city devote resources to improving the city's sewer system, mitigating combined sewer overflows (CSOs) and preventing flooding, ultimately improving storm water management and treatment. Despite these efforts, the city still has a long way to go. Overall, NYC has long-term, big-picture goals, as well as present-day efforts, to manage storm water. However, some of these efforts may be long overdue.

Sewer System

Not all boroughs are created equal, it seems, in NYC. While different areas of the city require different storm water management, basic grey storm water infrastructure is not installed city-wide. For example, some boroughs in NYC do not have storm sewers. To rectify the problem, the NYC Department of Environmental Protection (DEP) is rolling out a long-term plan to install storm sewers in southeastern Queens in addition to the existing sanitary sewers.

In the short term, green infrastructure (GI) can provide some relief, but grey infrastructure ultimately will be necessary. Not only does this lack of storm sewers poorly affect drainage in the

area, it also brings up the issue of environmental equality. Demographics vary across the boroughs. This is a trend we see with infrastructure across the U.S., with Flint, Mich., providing a relevant example. That being said, NYC is making an effort to improve the sewer system, even if it is overdue.

Where other grey infrastructure exists in NYC, there are combined sewer systems (CSS). Once the height of technology, CSS now are the bane of many cities' existences. DEP is allocating significant funds to mitigate combined sewer overflows (CSOs) to protect its waterways and ultimately beautify the city, but it has not eliminated them.

According to DEP, the city discharges approximately 20 billion gal per year in CSOs, which is the leading source of pollution in the New York Harbor. However, this number has significantly decreased in recent decades—the CSO capture rate has improved from approximately 30% in 1980 to approximately 80% today, according to DEP. This improvement is noticeable in the harbor. Fewer CSOs has meant improved water quality, leading to increased recreational opportunities and ecological advancement for aquatic life, said OneNYC. Local waterways are still subject to pollution, particularly during heavy rain events, until CSOs are eliminated. Not every waterbody in NYC is fishable or swimmable yet, according to Sri Rangarajan, principal engineer for Boomi Environmental LLC.

PHOTO: JIM FOSTER/GETTY IMAGES

To manage CSOs, NYC takes a multi-faceted approach, including efforts to separate CSS where possible, but it relies primarily on its Green Infrastructure Program.

Green Infrastructure

“Our Green Infrastructure Program is the foremost and most extensive, not only in New York City, but I think it’s the largest in the nation in the last four years,” said Pinar Balci, Ph.D., assistant commissioner, Bureau of Environmental Planning and Analysis, DEP.

To say New York’s GI program is far-reaching would be an understatement. DEP has more than 4,500 GI assets across the city, ranging from rain gardens to green roofs to green streets. From 2010 to 2017, it added 467 greened acres. The primary goal of the program is to reduce CSOs into the harbor—and it is a hefty goal. For the overall program, DEP promised a reduction of 1.67 billion gal of CSOs per year, and expects to hit ½ of this mark by 2020 by reducing 507 million gal per year. It is too soon to tell if it will accomplish this steep goal.

Source control is a major aspect of the plan. Part of this initiative includes DEP’s Rain Barrel Giveaway Program, which began in 2008. In one

year, NYC provided more than 5,000 60-gal rain barrels to residents and commercial properties across the city. The harvested rainwater can be used for non-potable activities, such as watering lawns and gardens, thus reducing the strain on NYC’s water system, conserving water and diverting storm water from the CSS. However, it may be difficult for the city to monitor the implementation of these rain barrels (e.g., controlling how well and frequently they are used).

Another useful impervious surface is rooftops, which comprise nearly ½ of the city’s total impervious surface area, according to DEP. NYC is testing the merits of blue—when weirs at drain inlets create ponding—and green—vegetated—roofs. Blue roofs are more affordable, but green roofs offer the added benefits of reducing air and noise pollution and reducing the heat island effect, while blue roofs only minimally counteract it. Until 2018, DEP also offered tax cuts for buildings that incorporated green roofs, which is a powerful incentive. While NYC offers a green roof program as part of its GI program, it is not utilized as much as other features yet.

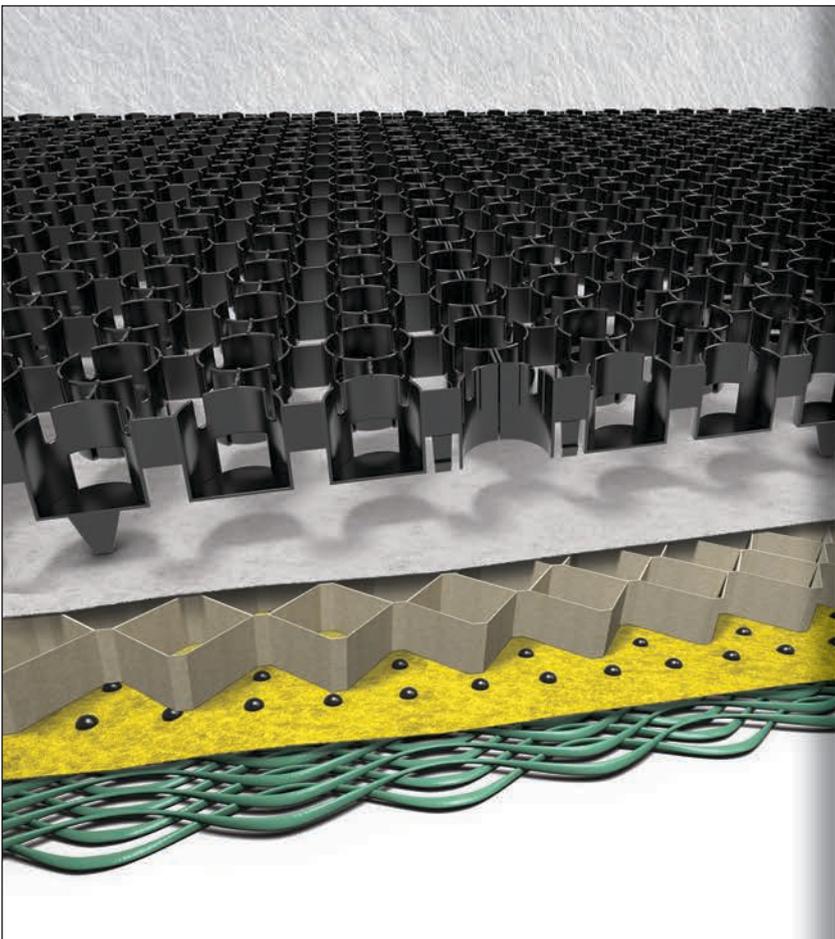
In addition, DEP implements public right-of-way (ROW) GI, such as rain gardens.

According to DEP, ROW space makes up approximately 30% of the impervious cover in NYC. This high percentage of space offers a large opportunity to divert runoff from the CSS. NYC takes advantage of as many spaces as possible to counteract CSOs and incorporate green features, which not only manage storm water, but also ultimately improve the quality of life in NYC.

To help mitigate flooding, the GI plan also incorporates less common features. The Bluebelt Program, for example, uses natural drainage corridors, such as streams and ponds, for filtering and controlling storm water and flooding. Overall, the program covers 14,000 acres and 19 watersheds, and it covers nearly ½ of Staten Island.

“The Bluebelt Program is very unique to highly urbanized environments,” Balci said.

In 2017, DEP invested \$48 million in expanding the Staten Island Bluebelt Program with storm sewers, catch basins, replaced water mains and other expansions. The wetlands will naturally filter storm water from the new sewers and release it into the environment, ultimately welcoming more diverse wildlife in these spaces.



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Unfortunately, an expansive GI program like DEP's means maintenance is in high demand during warmer months. Sediment build up may need to be removed, grass may need to be mowed, and vegetation may need upkeep. Although, according to Eric Rosenberg, Ph.D., associate for Hazen & Sawyer, a program similar to "adopt a highway"—"adopt a Bluebelt"—is involving communities in maintaining the bluebelts.

The DEP reached out to the three largest landowners in NYC when developing its GI plan—the parks, the schools and the public housing authority. Then, they reached out to smaller landowners, such as fire departments and public libraries. These partnerships created hundreds of GI projects across the city, but the real work is on private property. DEP started a grant program to incentivize GI on private properties at the point of design.

So far, DEP has successfully secured 35 projects under this program, with another 15 in progress. In order to successfully roll out this program, DEP tapped into community-based organizations, which have more relationships with private landowners in the boroughs. The DEP has committed more than \$14.5 million

to these projects, strengthening public-private partnerships in the process.

Climate Change

With larger and more frequent storms an imminent threat for an urban coastal environment like NYC, a proactive approach is necessary to mitigate flooding. NYC developed the Climate Resiliency Design Guidelines to provide recommendations to incorporate climate change data in the city's capital projects, Rosenberg said. The plan addresses how climate change will affect NYC and how certain design and construction can be changed to respond to the changing climate.

For storm water, it addresses changes in drainage and design for onsite storm water management systems. In addition, it addresses how sea level rise will affect flood risk for NYC, as well as potential floodplain change. This in-depth and comprehensive plan helps prepare the city for weather-related threats. After Hurricane Sandy devastated the city in 2012, it hopes to proactively prevent another impact of that scale.

Even with an expansive climate change plan, the exact effects of climate change are

difficult to predict. While the plan itself is commendable, NYC may find that different design procedures may operate more effectively in the years to come.

NYC's cloudburst management plan may be the effective option they need. Cloudburst management is an aspect of NYC's program for modifying GI to manage storm water above the 5-year storm, which is what the city's storm water system is designed for, said Rosenberg. Cloudburst management intends to use open, dry-weather recreational spaces, such as parks and baseball fields, for storm water management during intense rain events. It maximizes the space available in a congested urban environment by converting them to drainage basins, for example. The city developed two pilots to test how this concept will perform in NYC.

NYC's list of initiatives is long. It juggles short- and long-term priorities to continually provide quality storm water management resources. And while it is not perfect, it manages a lot of programs for a large city. ♦

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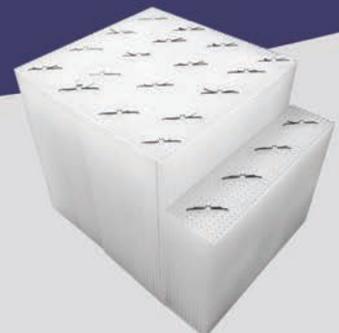
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