Using Green Infrastructure and Low Impact Development to Address Impacts of Climate Change

Advantages of Incorporating Climate Change Projections into the Design of Stormwater Management (SWM) Systems

Stormwater infrastructure designs are based traditionally on rainfall, land use and sea level data modeled after historical trends and conditions. Infrastructure decisions and investments should consider future conditions in order to remain functional and able to respond to more frequent severe weather events. These decisions should promote design and management capacities that will improve community resilience—the ability of natural systems and physical structures to recover quickly from changes in environmental conditions by accommodating future temperature, rainfall and drought projections and the effects of land development.

IMPROVING DESIGN AND PERFORMANCE OF SWM SYSTEMS

Climate change is expected to affect traditional stormwater management system design calculations by:

- increasing rainfall intensity and frequency;
- raising moisture levels in soils; and
- increasing the average amount of water contained in storage ponds.

New or retrofitted SWM systems need to account for the anticipated intensity of future rainfall events, which could affect system design, lifecycle, performance, and timing of upgrades.

Traditional stormwater models may need to be updated to get a better picture of SWM system performance under future climate conditions. These components may include: changes in mean temperature; changes in mean rainfall (which affects soil moisture saturation); increases in total rainfall for storm events; and increases in wind.
ENHANCING THE RESILIENCY OF SWM SYSTEMS

Poorly managed stormwater runoff can lead to:

- higher mobility and transport of pollutants into surface and ground water;
- increased erosion potential, causing loss of property, aquatic habitat and organism passage, and damage to infrastructure; and
- increases in nutrients, leading to algae blooms, reduced dissolved oxygen levels, and the possible loss of sensitive aquatic species.

Climate projections can be incorporated into measures to improve water supplies, sanitation services, drainage systems, building codes, and flood-proofing of infrastructure.

PROTECTING HUMAN HEALTH

Direct health and safety impacts may include injury and disease from flooding, and contamination of drinking water. Standing water caused by floods and higher temperatures dramatically increase the risk of diseases transmitted by food, air, water, insects, and ticks. Resource-intensive disaster response and recovery efforts will be constrained by diminishing local, state and federal budgets.

REDUCING COSTS BY REDUCING IMPACTS

NH’s most densely-populated and developed areas occur along or in river floodplains, making riverine flooding the most common and costly disaster event in NH. Continued damage to infrastructure represents a serious drain on the economy. Better predictions of changing climate may lessen the need to repair and replace stormwater infrastructure. Expanding protection for and use of natural stormwater management assets, like wetlands and forests, will further reduce these costs.

Local officials can use climate projections to estimate long-term operation, maintenance, and investments in stormwater conveyance and drainage networks that can withstand changing conditions.

HELPING COMMUNITY LEADERS MAKE DECISIONS UNDER CONDITIONS OF UNCERTAINTY

It is challenging to pinpoint exactly when and where climate impacts will occur, but there is sufficient evidence that climate adaptation can no longer be responsibly postponed until all uncertainty is eliminated. Proactive and cost-effective methods can be identified to address lingering uncertainty and provide local leaders with support for implementing infrastructure adaptation programs.

Municipalities can begin directing funds toward protecting infrastructure prior to flooding impacts by incorporating climate projections into their planning decisions. Assessing community risks and identifying specific assets that might be vulnerable will help local officials prepare a range of appropriate responses prior to impact.

Applying climate projections in stormwater planning ensures that the future safety of communities is considered. Climate data can be used to identify areas that can sustain future economic development and population growth.

PROTECTING WATER QUALITY AND QUANTITY

Increased rainfall predicted for the northeast U.S. will alter the region’s hydrology, which is deemed to be a primary cause of water quality degradation. Communities may need to reassess the capacity of their reservoirs to withstand longer periods of drought. This can impact drinking water supplies and agricultural networks to support specific crops due to decreased water tables.

Benefits of Using Green Infrastructure and Low Impact Development to Adapt to Climate Change

Compared with conventional SWM systems, Green Infrastructure (GI) and Low Impact Development (LID) are easily adapted to most sites and environmentally friendly.

These approaches can:

- add water storage to the built landscape,
- provide open space allowing stormwater to naturally infiltrate soils,
- contribute to social and ecological resiliency,
- reduce the amount of polluted runoff reaching surface and ground waters,
- use to retrofit existing development,
- help maintain natural stream channel functions and habitat.

GI and LID minimize impervious surfaces and use natural landscape features to create functional and appealing drainage features that allow rain water and snow melt to soak into the ground.

Broad use of LID across a watershed can:

- reduce the urban heat island effect (by shading and minimizing impervious surfaces),
- address impacts from climate change by allowing plants to capture carbon dioxide,
- reduce energy use by installing green roofs and trees, and avoided water treatment,
- reduce air pollution by avoiding power plant emissions and reducing ground-level ozone,
- combat drought by increasing groundwater recharge.

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