

# “Green” retrofit of stormwater BMPs for pollution prevention in urban coastal communities of New Jersey

**Dr. Dibyendu Sarkar**  
Principal Investigator  
Department of Civil, Environmental, and Ocean Engineering  
Stevens Institute of Technology  
dsarkar@stevens.edu

**Dr. Kirk Barrett**  
Co-Investigator  
Department of Civil and Environmental Engineering  
Manhattan College  
kirk.barrett@manhattan.edu

**Dr. Rupali Datta**  
Co-Investigator  
Michigan Technological University  
rdatta@mtu.edu

**Dr. Zeyuan Qiu**  
Co-Investigator  
Department of Chemistry and Environmental Science  
New Jersey Institute of Technology  
zeyuan.qiu@njit.edu



Excess nutrients and chemicals, including metals and hydrocarbons, are a major problem in coastal waters nationwide. New Jersey coastal waters are deemed the most polluted in the Northeast. The coast of New Jersey is highly urbanized; many coastal towns are “gray cities” with impervious surface cover that contributes heavily to water pollution during stormwater events. The goal of the project is to optimize and field demonstrate the effectiveness of several urban stormwater best management practices (BMPs) retrofitted with “green” technologies for in-situ removal of nutrients, metals, and hydrocarbons while still mitigating peak flow. The green retrofits, already developed from existing grants, will be field tested in the town of Secaucus, which is extremely vulnerable to coastal hazards.

The first green retrofit will be applied to an existing bioretention system, where locally-generated aluminum-based drinking water treatment residual (Al-WTR)-coated mulch will be used to remove metals, phosphorus, and hydrocarbon from stormwater

runoff. Al-WTRs are green from both environmental (second life to a waste) and economic (raw material at no cost) points of view. The bioretention system and storm drain catch basin inserts filled with Al-WTR and biochar-based filter media (the second green retrofit) will be continuously monitored for flow and chemical removal. The third green retrofit, a floating treatment wetland with vetiver grass (*Chrysopogon zizanioides*), a non-invasive, high-biomass, nutrient- and metal-hyperaccumulator, will be designed, optimized, and installed in a stormwater retention pond, and water quality will be monitored. Additionally, an assessment of potential socioeconomic impacts of broader scale implementation of these green retrofits on a typical New Jersey urban coastal community will be performed. Focus groups with shareholders will be initiated in order to analyze critical socioeconomic factors impacting optimal stormwater management in Secaucus.

Long-term, broad-scale implementation of such green retrofits to urban stormwater BMPs in coastal towns will significantly reduce pollution, and benefit users of New Jersey’s surface waters.

