Climate Creatives

Adapting to Rising Waters

With climate change fueling the increasing rate of sea level rise worldwide, humanity needs to do far more than it currently is to avoid and protect against the myriad of threats that rising waters present, including increased flooding, tsunamis, saltwater intrusions in fresh groundwater, coastal erosion and land submergence. Thwarting the threat of SLR will require climate change mitigation, reducing and eliminating greenhouse gas emissions. But, even if GHG emissions went to zero today, the seas would continue to rise due to past emissions because of the delay between warming and its effect. (PNAS, 2013) (PNAS, 2017) So, with SLR already causing trouble in coastal regions today and certain to continue in the future, it is vital that coastal nations adapt to our rising waters.

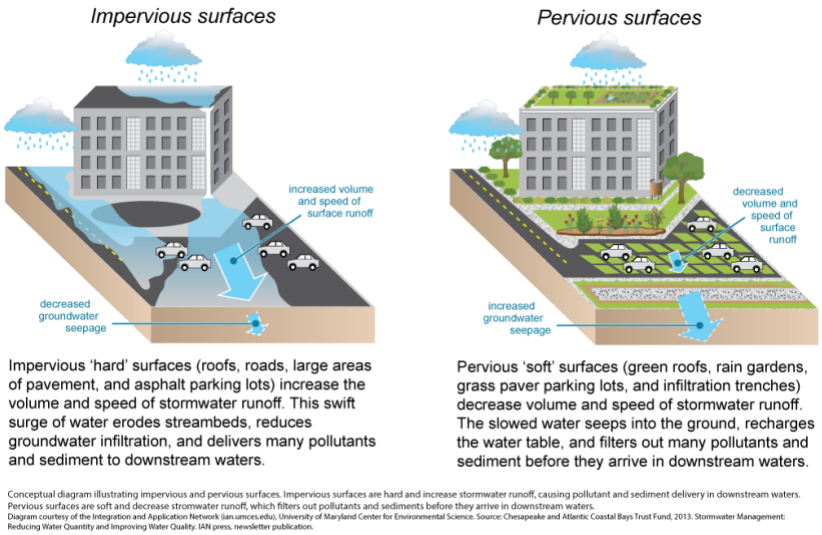
Solutions can be divided into two types, green infrastructure and gray infrastructure. The latter refers to structures such as sea walls or roads with gutters and storm drains. With gray infrastructure, water is being managed in completely artificial systems. By contrast, green infrastructure, also referred to as nature-based solutions, harness nature's capacity to manage water.

This FEMA guide (FEMA) outlines the various forms of green infrastructure including small-scale implementations such as green streets and roofs, larger projects such as stormwater parks and wetland restoration, and coastal solutions including dunes and 'living shorelines.'

"Green infrastructure options were found to be more cost-effective than gray infrastructure and often yield higher net benefits.

(Ocracoke observer, 2016)

A living shoreline in North Carolina made with oyster shells. (Georgetown Law Center , n.d.)



Conceptual diagram illustrating impervious and pervious surfaces. Impervious surfaces are hard and increase stormwater runoff, causing pollutant and sediment delivery in downstream waters. Pervious surfaces are soft and decrease stromwater runoff, which filters out pollutants and sediments before they arrive in downstream waters.
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source: Chesapeake and Atlantic Coastal Bays Trust Fund, 2013. Stormwater Management: Reducing Water Quantity and Improving Water Quality. IAN press, newsletter publication.

As FEMA explains, nature-based solutions should form the integral part of a community's defense strategy against sea level rise for several reasons.

- Nature-based solutions reduce the threat of flooding by collecting and filtering water, thereby reducing the volume of water facing a sewage system or shoreline.
- While gray infrastructure only fulfills the one purpose it is designed for, green infrastructure comes along with several external benefits.
    - Improved water quality: nature filters pollutants and sewage entering waterways
    - Improved air quality: trees and plants filter air pollution
    - Increased property values: properties adjacent to green spaces tend to have higher value
    - Green jobs
    - More recreational space
- Green infrastructure projects often costs less than their gray counterparts while being just as or more effective.
- Green infrastructure is usually more self-sufficient, requiring less maintenance and upkeep.

No system can rely solely on green infrastructure, the gray being needed to some extent especially for water transportation and treatment. An optimal approach to managing flooding and coastal regions should feature a hybrid approach with plenty of green infrastructure to reduce pressure on the gray.

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