

The background is a soft, light green gradient. In the top right corner, there are several green leaves on thin branches. Scattered throughout the lower half of the image are several clear, spherical bubbles of varying sizes, some of which reflect light.

Blue-Green-Grey Infrastructures

by Mohsen Saadat

COTENTS

- **Urbanization and its consequences**
- **Grey Infrastructures**
- **Green Infrastructures**
- **Blue Infrastructures**
- **Green-Blue Infrastructures (GBI)**
- **Proposed Tools and procedure**
- **Proposed References**

- **Climate change**
(Effect of industrialization)
- **Impervious surfaces**
(Effect of urbanization)
- **Flooding risk**
(Effect of climate change and impervious surfaces)
- **Pollution of water**
(Effect of urbanization)



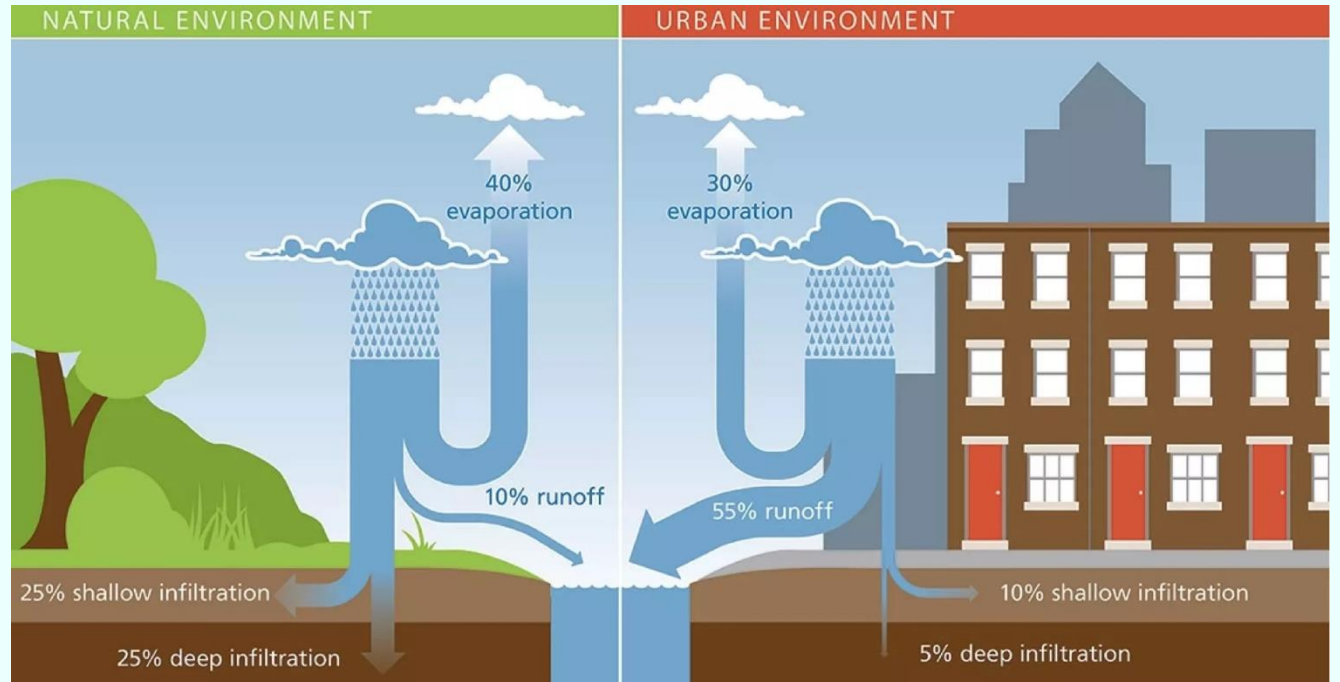
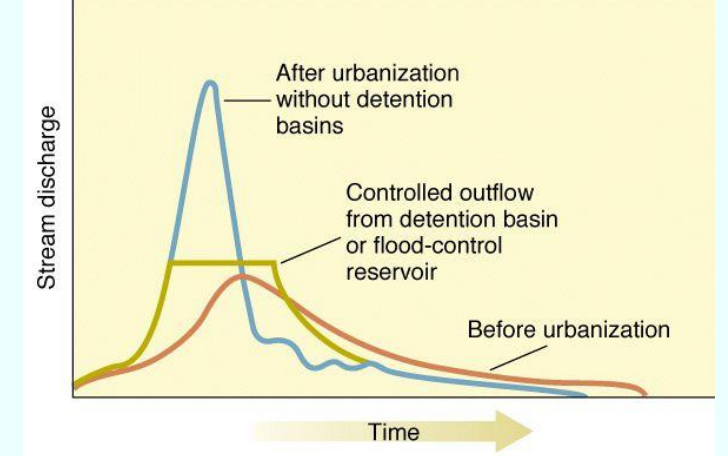
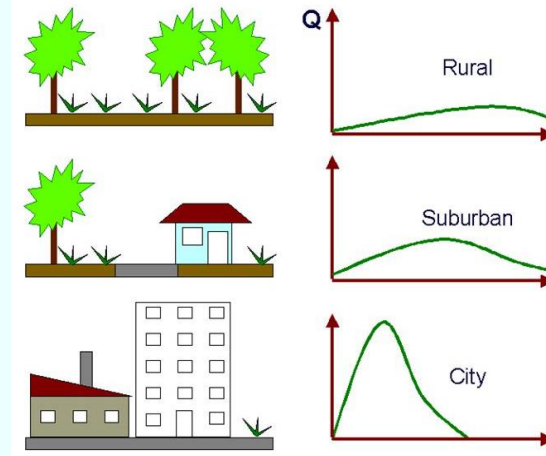
Figure 3.1 Chicago: An Example of a Dense Urban Area.

After urbanization,

1. Peak rate of runoff is larger
2. Hydrograph duration is shorter
3. Total runoff is larger

As a result, urbanization increases the threat of

“sudden and intensive” floods



A network of traditional water retention and purification infrastructures

- Dams
- Treatment Plants
- Sewers and Pipes
- Gutters
- Culverts



An approach to water management that protects, restores, or mimics the natural water cycle.

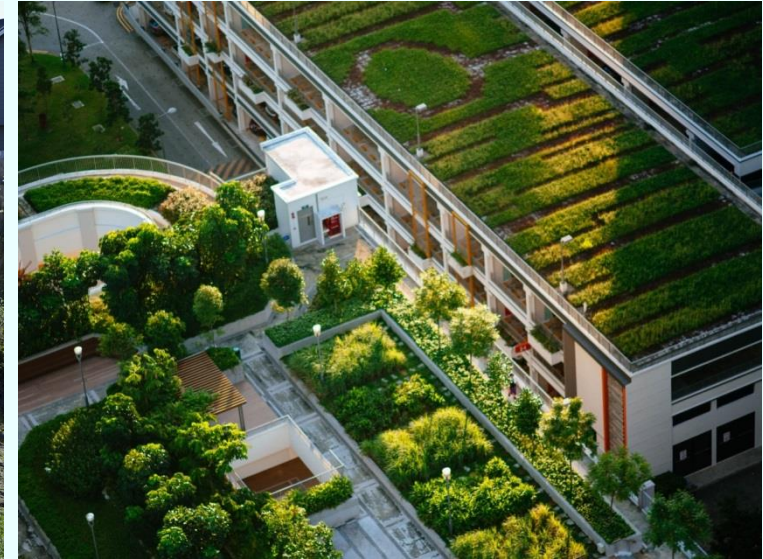
- Elements: natural systems including forests, floodplains, wetlands, soils, planted trees and restoring wetlands
- Characteristics: effective, economical, and enhances community safety and quality of life



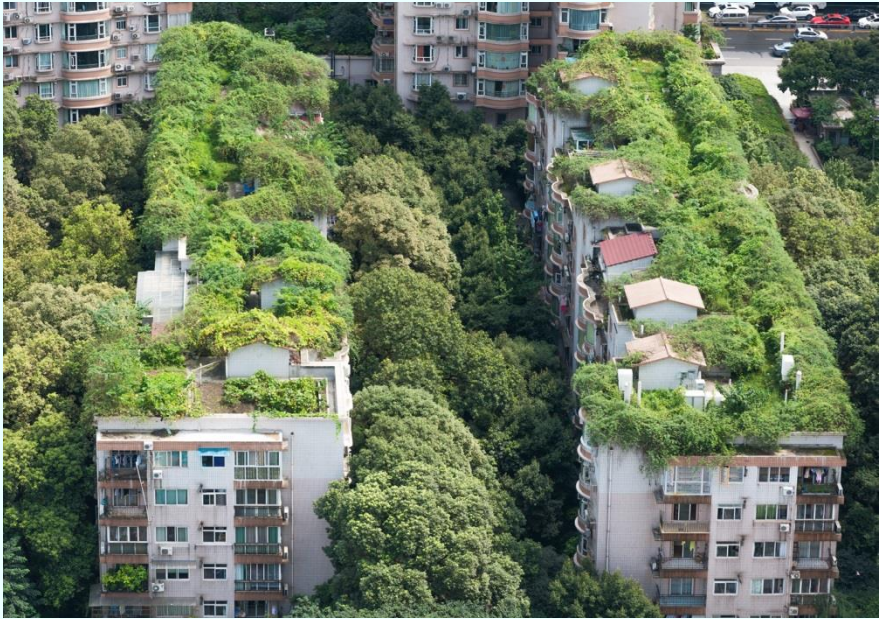
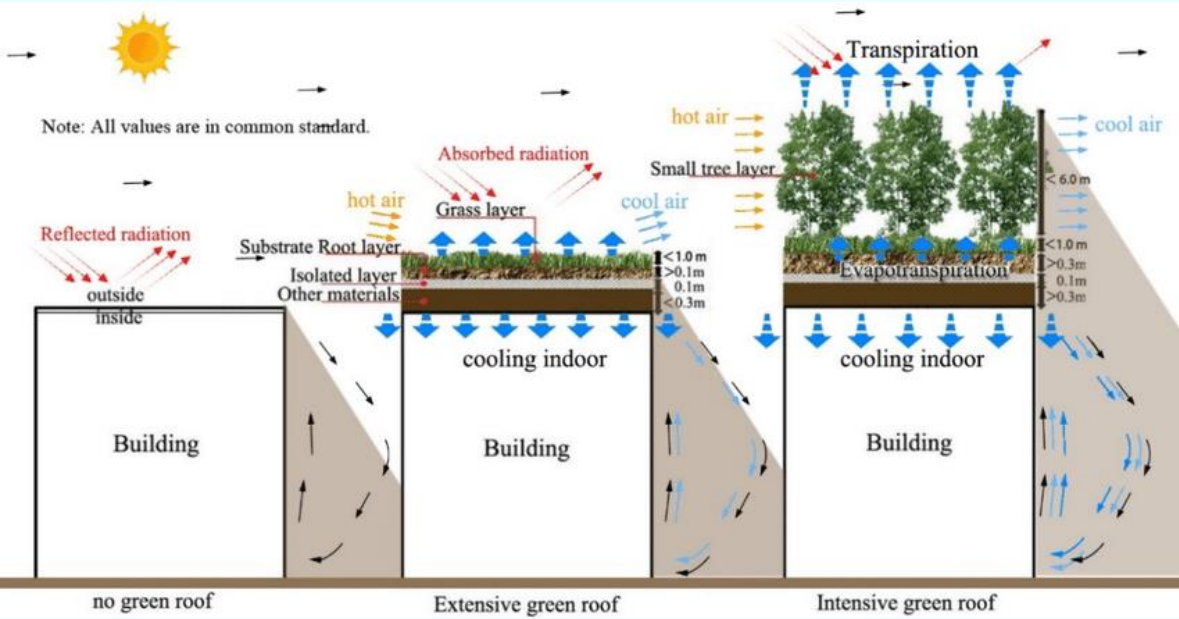
Greenways



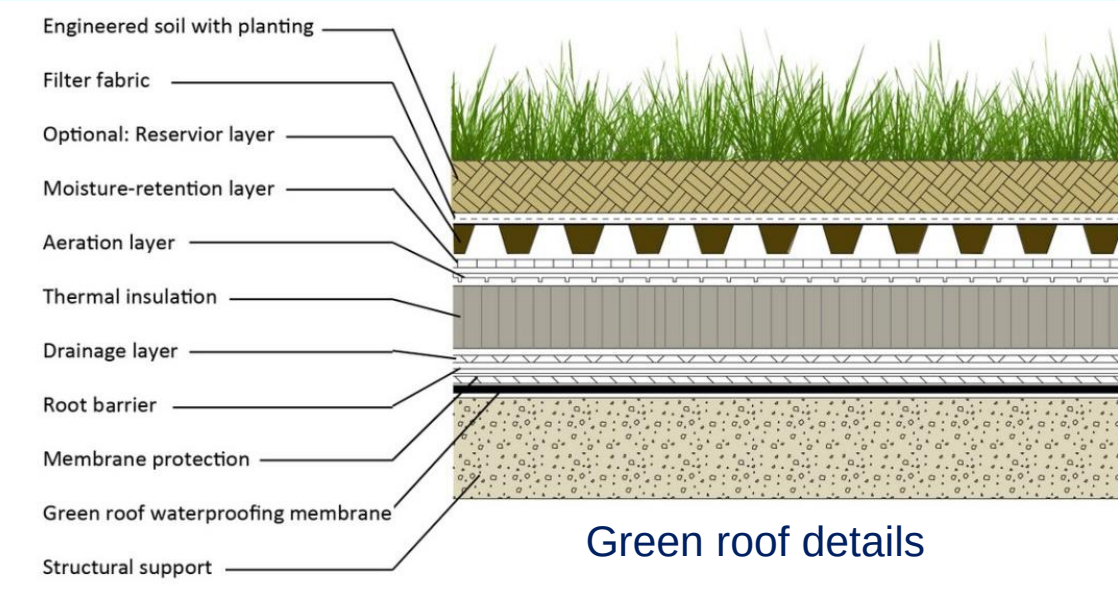
Vegetated Swale



Green Roof



Intensive green roof



Green roof details



Extensive green roof

Urban water infrastructures that rely on water bodies

- Pervious Pavements
- Ponds
- Lakes
- Rivers
- Storm water Stores



Retention Pond



Water Square

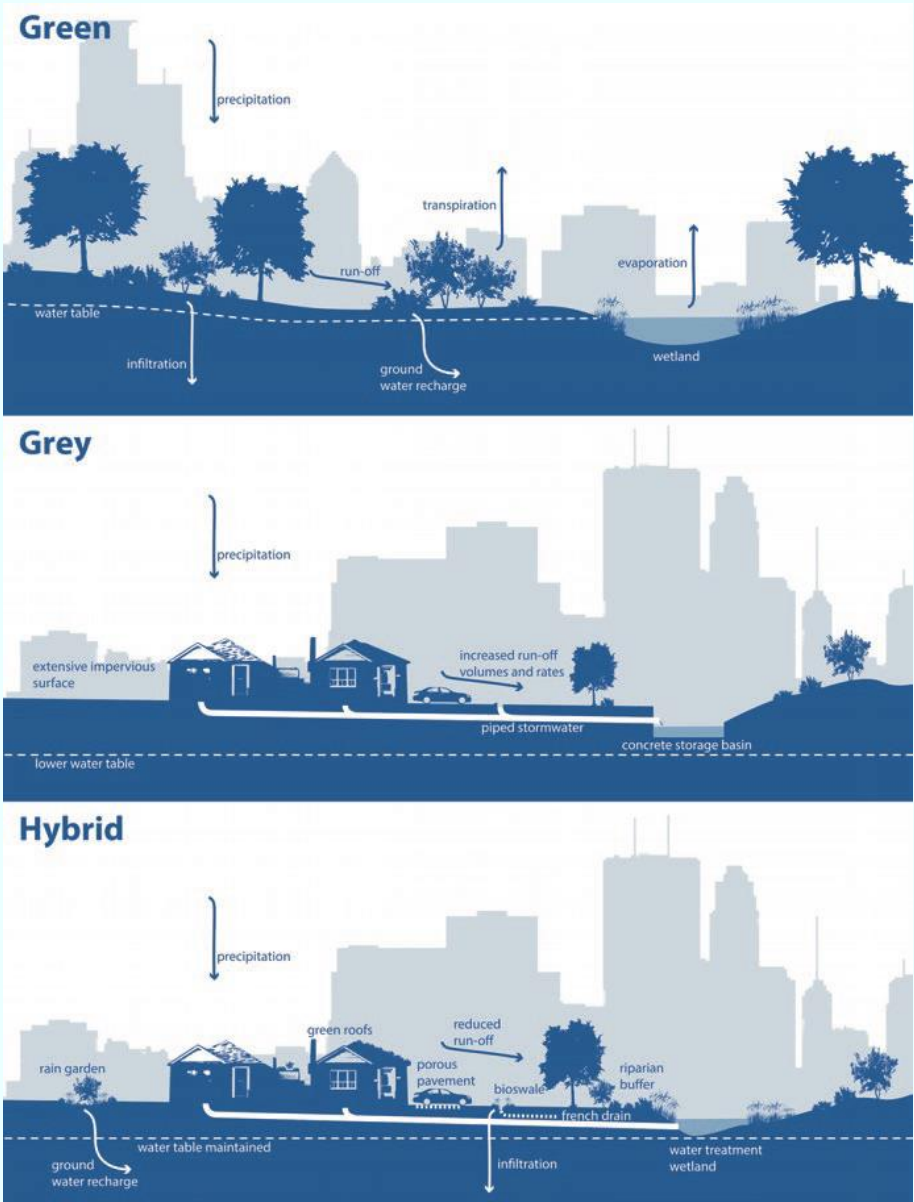
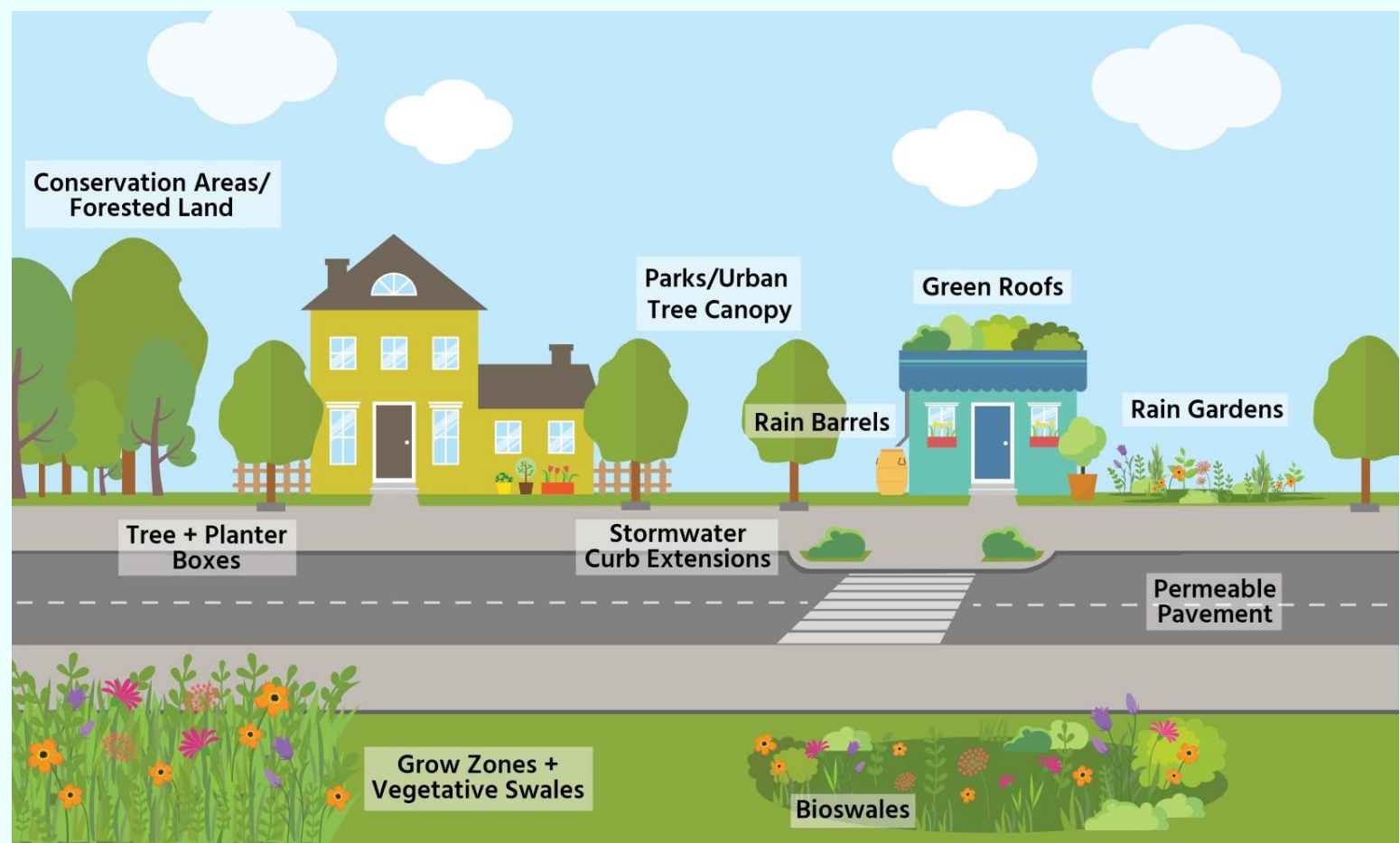


Rain Barrel (Cistern)



Pervious Pavement

In most cases separating different infrastructures is difficult and an integration of all strategies is employed



Blue-Green Infrastructure

planned interconnected networks of natural and semi-natural areas, including water bodies and green and open spaces, that provide different ecosystem services

(own definition, drawing on EU Commission 2013, Voskamp and Van de Ven 2015 and Ghofrani et. al 2016)



Green Infrastructure

planned networks of natural and semi-natural areas with other environmental features designed and managed to deliver different ecosystem services

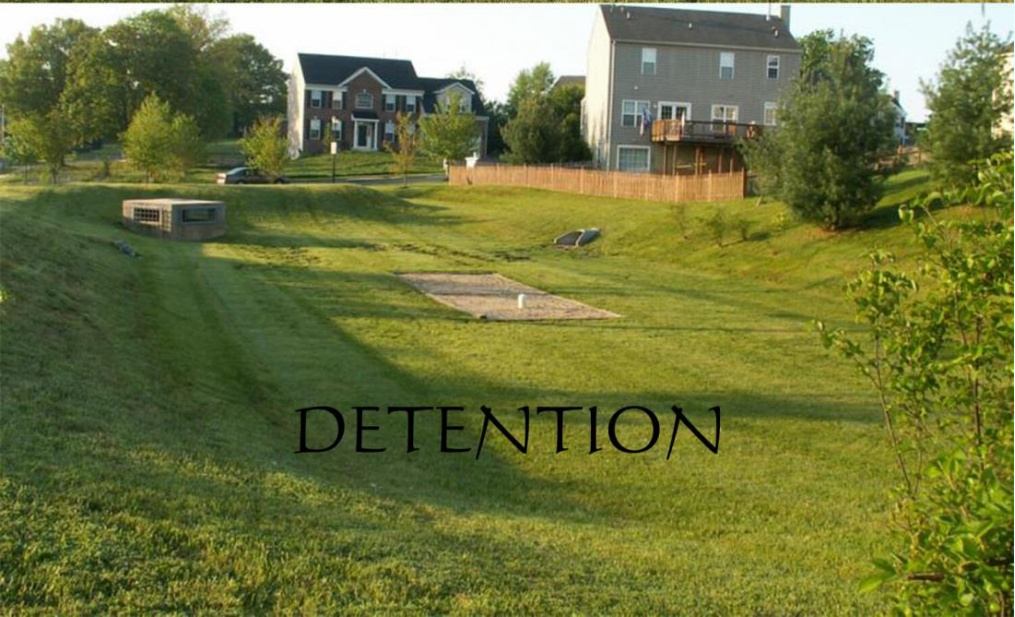
(EU Commission 2013)



Grey Infrastructure

traditional human-engineered measures that perform infrastructure functions such as water and wastewater treatment plants or protective infrastructure such as dykes and seawalls.



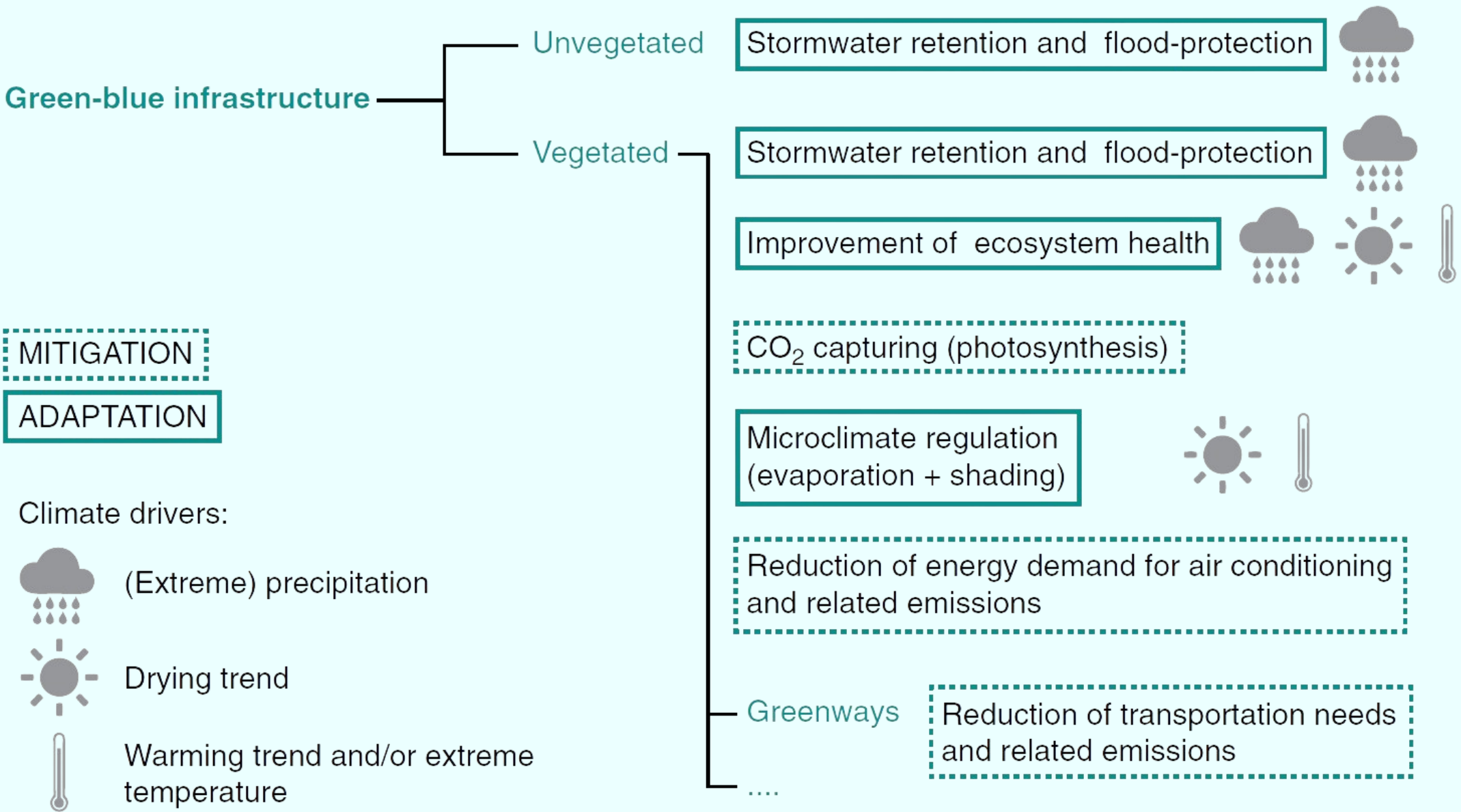


What is a Detention / Retention Pond?

Retention Ponds (Wet Pond) **vs** **Detention Ponds** (Dry Pond)

Permanently holds stormwater. Temporarily holds excess stormwater.



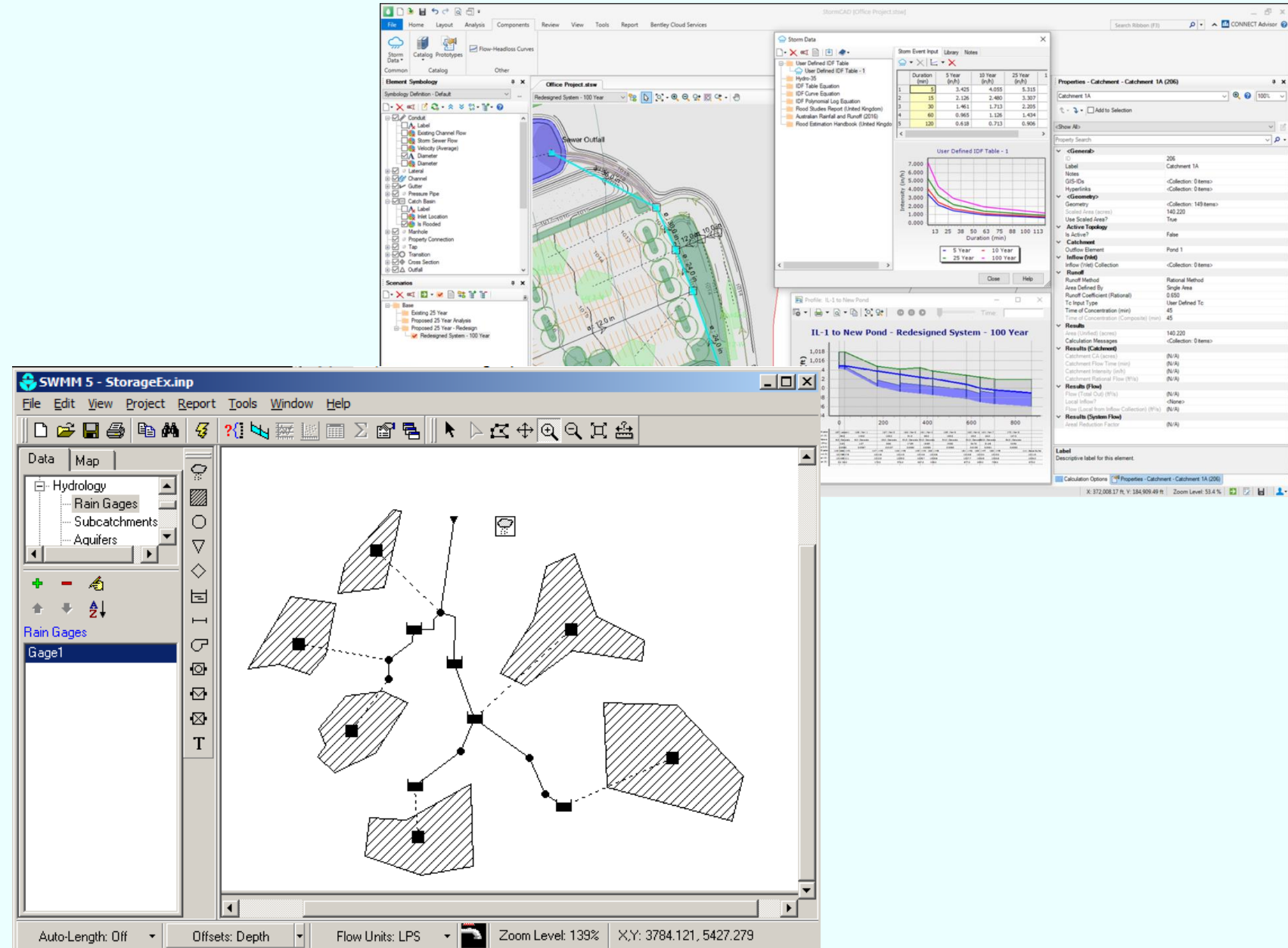


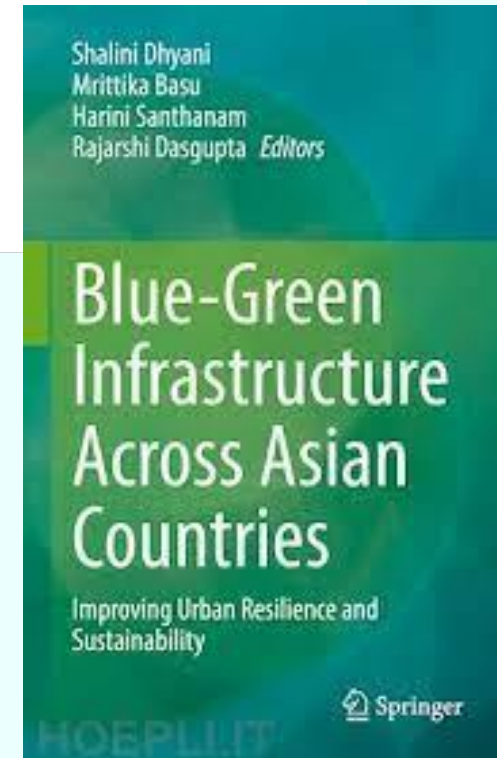
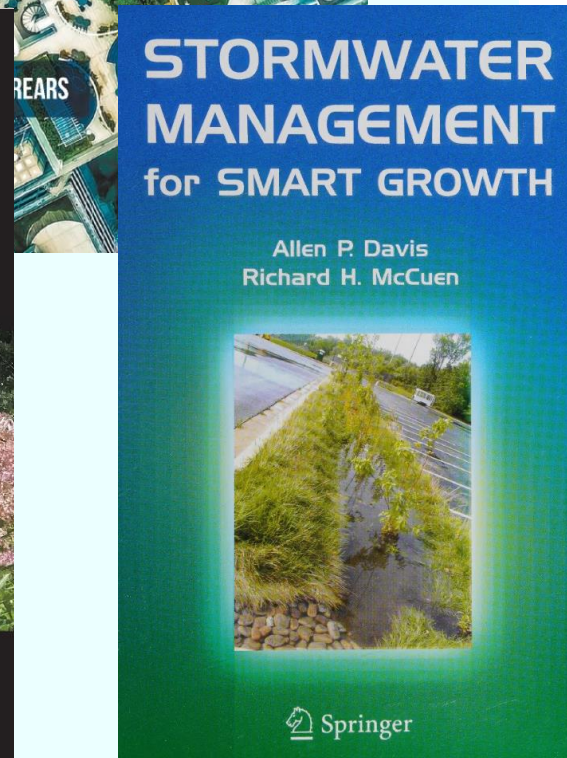
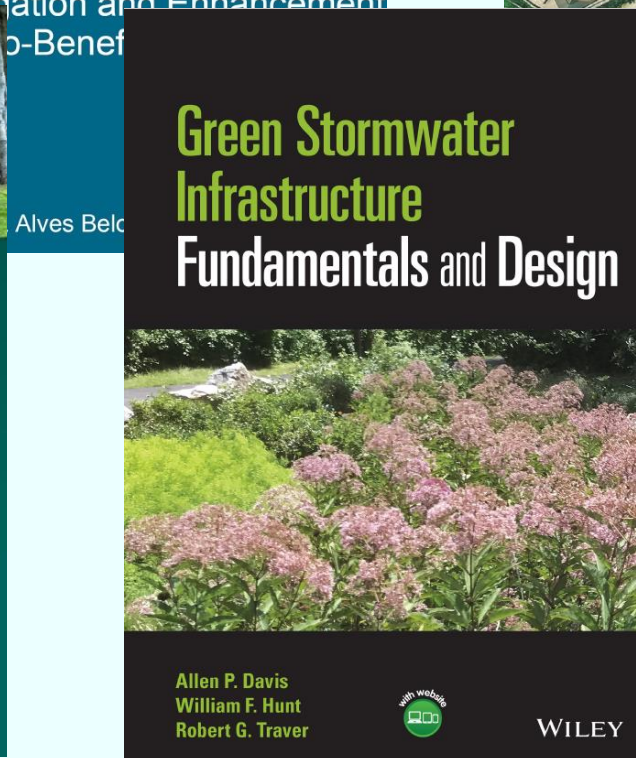
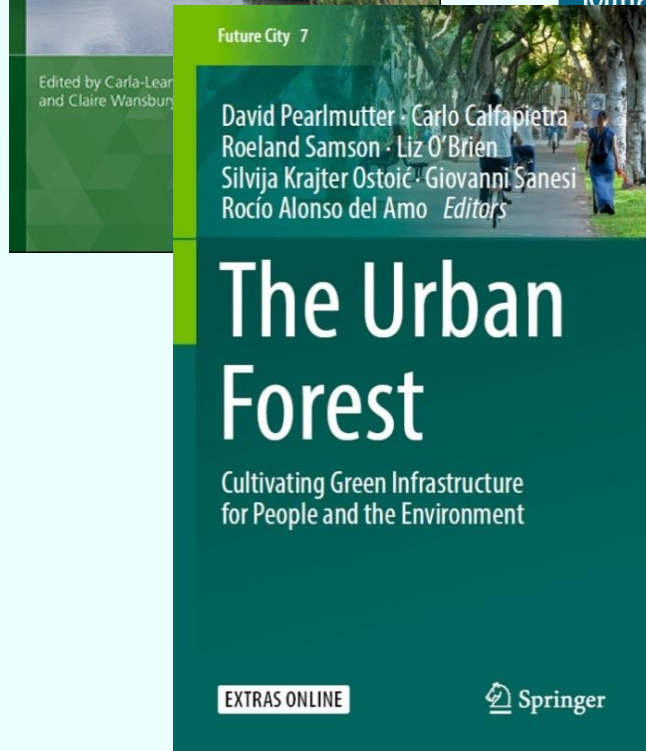
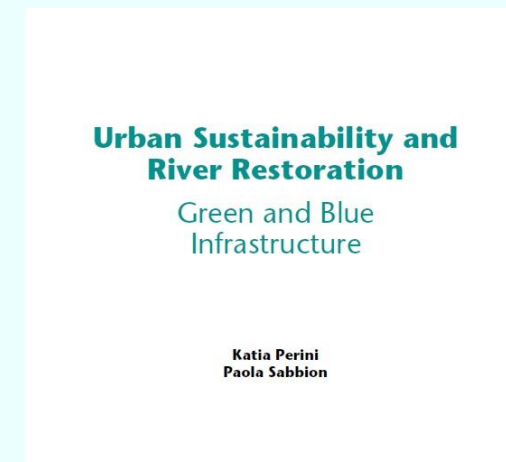
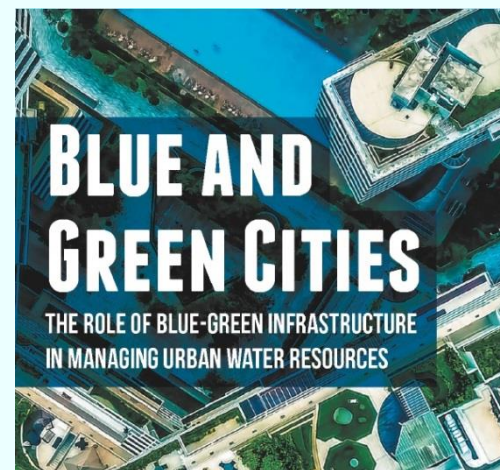


Items like green roofs, permeable pavement, infiltration trenches, etc. to reduce runoff and pollution

Implementation Steps

- ✓ Assess the site
- ✓ Define the goals
- ✓ Select the practices
- ✓ Design the details
- ✓ Implement the plan
- ✓ Monitor and evaluate





Proposed References

جمهوری اسلامی ایران
سازمان برنامه و بودجه - وزارت نیرو

مکمل ضوابط طراحی شبکه‌های جمع آوری آبهای سطحی و فاضلاب شهری

نشریه شماره ۱۶۳

معاونت امور فنی
دفتر تحقیقات و معیارهای فنی

۱۳۷۶

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ضابطه شماره ۱۱۸

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