Climate-Smart Brownfields Part II

June 13, 2024

Mid-Atlantic TAB
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www.brownfields.wvu.edu/

Our Team

Mid-Atlantic TAB is a collaboration among leading programs across the region:

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TAB

TECHNICAL ASSISTANCE TO
BROWNFIELDS COMMUNITIES

Our Services

Education & Outreach

- Webinars
- Fact Sheets
- Brownfields Bootcamp
- Community Trainings
- Conference Presentations
- General resources

EPA Grantee Support

- State Cohort Facilitation
- Cooperative agreement support
- Grant Kickoff
- RFP support
- Quality Assurance info
- Community Involvement
- Grant Debriefs

EPA Applicant Support

- Workshops & webinars
- Grant planning consultations
- SAM.gov/grants.gov support
- Grant review
- Grant debrief

Site-Specific Technical Assistance

- Design Assistance
- Community involvement & facilitation
- Resource Roadmaps
- Ownership & property transfer consultation
- VRP/VCP Support
- Redevelopment Roundtables

Area-Wide Technical Assistance

- Inventory support
- Business & Brownfields Walkabout
- State program support

Climate Smart Brownfields: Series Overview

Part I: June 6, 2024

- Why focus on climate resilience and brownfields?
- Planning
- Assessment

Part II: June 13, 2024

- Demolition/Deconstruction
- Clean up
- Redevelopment

Climate smart brownfields revitalization doesn't just happen. It's planned for.

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What is a Brownfield?

The US EPA defines a brownfield as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.”

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Redeveloping with Equity and Resilience

Historically, industrial areas:

- Were **located on** or **near** waterways for transportation
- Were **located in or became** areas with greater levels of **poverty**
- Posed significant **health risks** from
  - industrial practices AND
  - coal-based power

Redeveloping with Equity and Resilience

Brownfields provide a unique opportunity to:

- **Remediate contamination**, reducing existing health and environmental risks to actively *address past harms*

- Incorporate **green practices** and transition to **cleaner energy** to *prevent future* health and environmental *risks*

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Why is this important?

It is the right thing to do!

It will make your application more competitive!

Incorporating Equity and Resilience

Brownfield Cleanup Phases:

- Planning
- Assessment
- **Demolition**
- **Cleanup**
- **Redevelopment**

Opportunities at Every Stage of the Process!

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Demolition

Building demolition accounts for more than 90 percent of the 600 million tons of construction-related waste generated. Image via Shutterstock/Maksim Safaniuk

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145 million tons of construction and demolition debris was sent to landfills in 2018

Source: EPA Advancing Sustainable Materials 2018 Fact Sheet

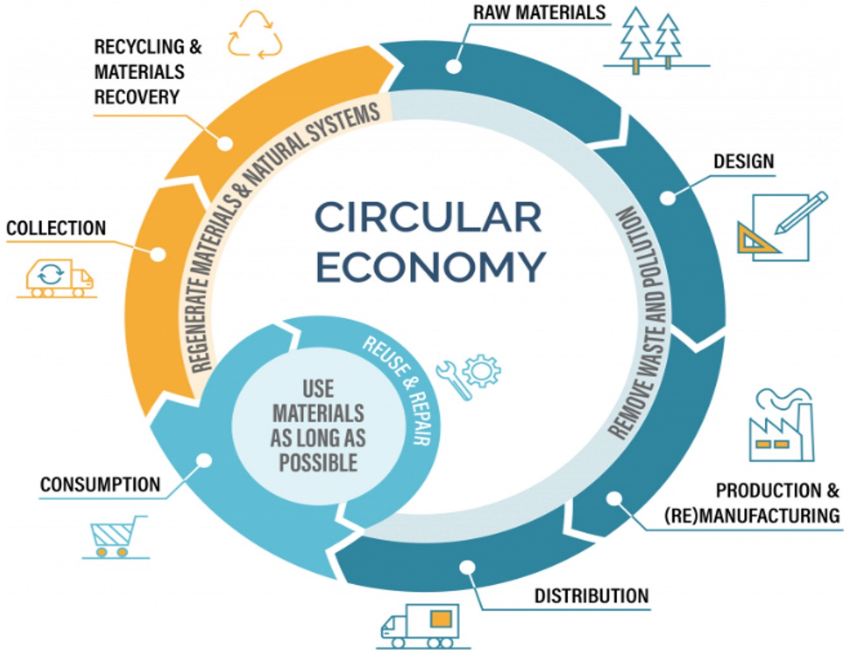
Demolition

- Brownfield remediation requires the removal of large quantities of structural and site materials
- Much of this material is mechanically removed and ends up in the landfill regardless of contamination or viability

What's the alternative?

DECONSTRUCTION: A systematic process of disassembling whole or parts of a structure to recover maximum economic and public good through reuse and recycling (City of Pittsburgh)

- Reduces materials sent to the landfill
- Reduces need for virgin materials that may be carbon intensive
- Deconstruction creates more jobs than demolition and is an opportunity to spur the local economy
- It is an emerging industry that faces its own unique challenges



Source: CircularPhiladelphia.org

Deconstruction Process

1. Create an inventory of materials that can be reused or recycled.
2. Identify local reuse partners.
3. Identify ways to reuse materials as part of the redevelopment.
4. Deconstruct where possible.

City name and/or seal. This is an opportunity for your organization to use this base form, customize it for your needs, and brand it accordingly.

DECONSTRUCTION RAPID ASSESSMENT TOOL FOR STRUCTURES

GENERAL					
Assessor's name:				Date:	
Address:				PIN #	
Year built:	pre-1900	pre-1930	pre-1950	pre-1978	post-1978
Occupied:	Yes	No			
Approx. size:					
Number of stories:	1	1 ½	2	3	more
Number of bedrooms:	1	2	3	4	5+
Number of bathrooms:	1	2	3	4	

SITE OBSERVATIONS & HAZARDS					
Is the structure currently secured to prevent unwanted entry?	Fully	Partly	No		
Is there room around the structure to serve as staging area?	Yes	No			
Presence of exterior trash?	No Trash	Limited Trash *(Scattered Debris)*	Significant Trash *(Piles of Trash)*	Large Appliances/ Bulky Furniture	Impassable/ Entry Restricted
Presence of interior trash?	No Trash	Limited Trash *(Scattered Debris on Floors)*	Significant Trash *(Piles of Trash)*	Large Appliances/ Bulky Furniture	Impassable/ Entry Restricted
Were any of the following observed on-site?	Tires	Abandoned cars	Graffiti	Signs of Drug Use	Containers of Chemicals / Oil
If observed, how many tires are present?					
Were hazards present on-site?	Dogs	Bees/Wasps	Excessive Dumping	Excessive Mold	Basement Flooding
Is structural evaluation recommended?					

[EPA Deconstruction Rapid Assessment Tool]

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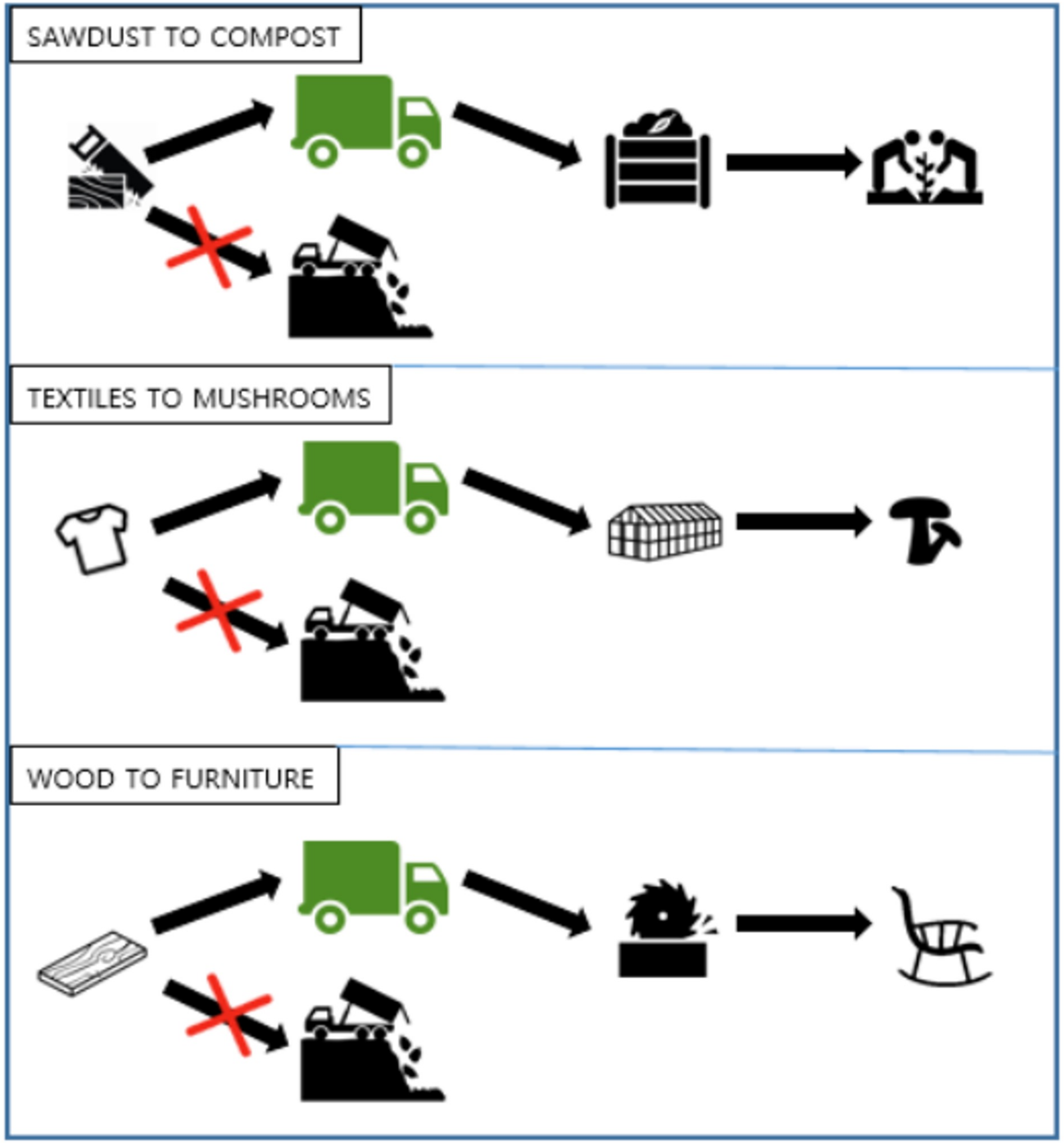
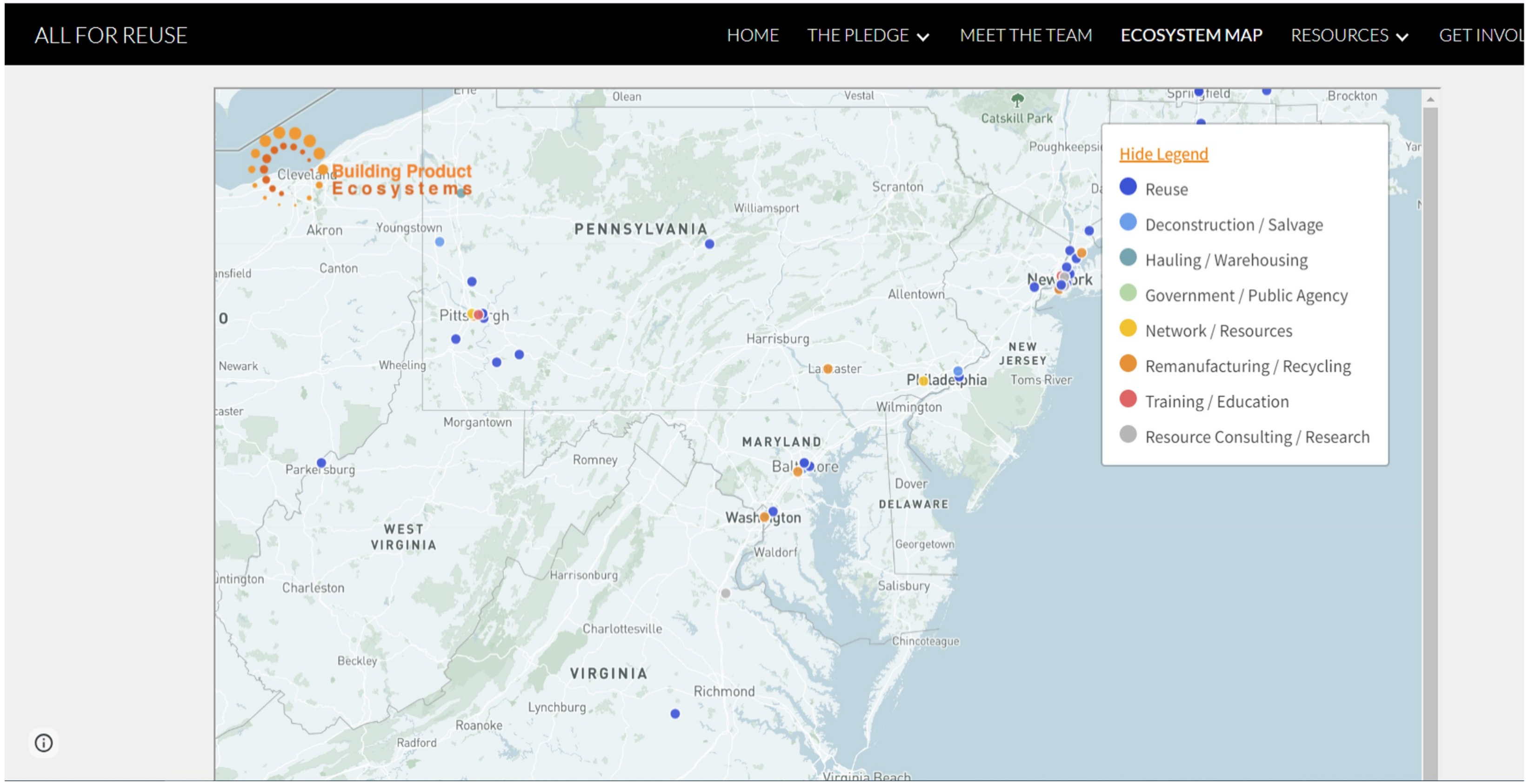

SAWDUST TO COMPOST
TEXTILES TO MUSHROOMS
WOOD TO FURNITURE

Where to find Reuse Partners?

All for Reuse: https://www.allforreuse.org/ecosystem-map



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Where to find Reuse Partners?

Build Reuse: https://www.buildreuse.org/

- National nonprofit and membership directory

Reuse Development Organization (directory):
https://loadingdock.org/redo/index.htm

Construction and Demolition Recycling Association:
https://www.cdrecycling.org/find-a-recycler#/

ReuseWood: https://reusewood.org/

Direct Providers:

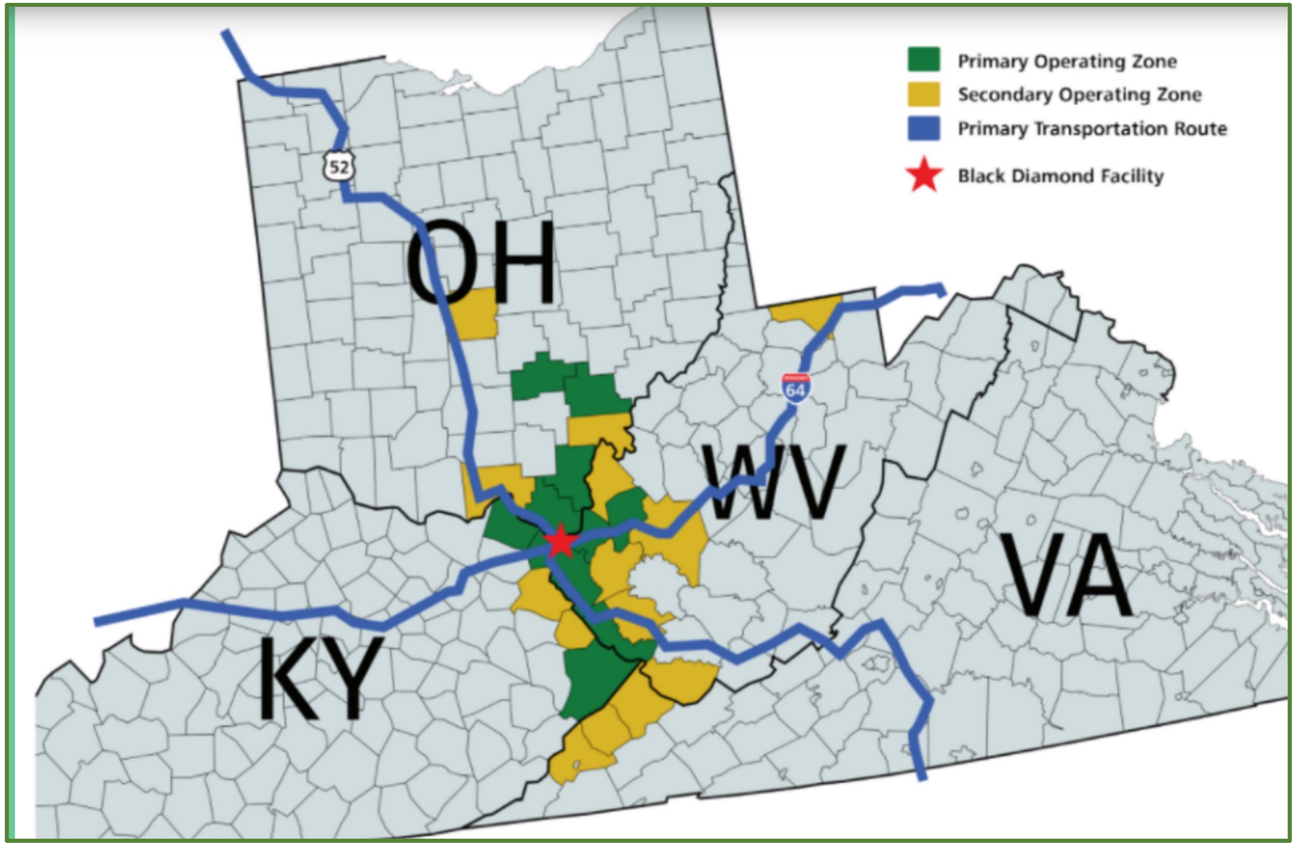
Community Forklift: https://www.communityforklift.org/

DoorsUnhinged: https://doorsunhinged.com/

Second Chance: https://www.secondchanceinc.org/deconstruction

Appalachian Reuse Corridor Initiative

MISSION: The reuse corridor is a coalition of businesses, individual stakeholders and communities throughout central Appalachia who are building a market around reuse, upcycling and recycling.



https://coalfield-development.org/

Black Diamond Reuse Warehouse- Westmoreland, WV

Municipal Deconstruction Programs

2018 • Baltimore City Deconstruction Project

Mutual of America Foundation
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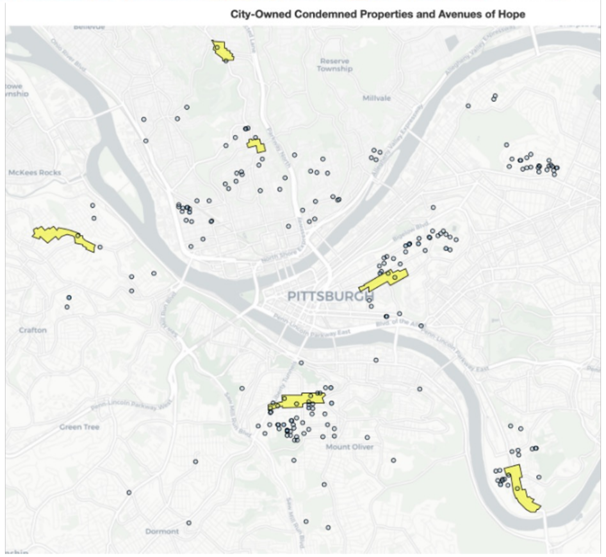
https://www.youtube.com/watch?v=Drmgd33IRrs



The Cleanup

Green Remediation

Overarching Principles

Minimize Environmental Impact

- Reduce the overall ecological footprint of remediation activities

Optimize Resource Use

- Efficiently utilize resources such as water, energy,and raw materials

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Green Remediation

American Society for Testing and Materials

Standard E2893-16e1

[Standard Guide for Greener Cleanups]()

ASTM INTERNATIONAL
Helping our world work better

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ADAPTATION VS. MITIGATION

ADAPTATION

A variety of actions that are meant to reduce or compensate for or adapt to the adverse impacts that arise from changes in the Earth's climate

MITIGATION

Actions or changes in societal behavior taken to reduce or eliminate greenhouse gas (GHG) emissions and/or to remove GHGs from the atmosphere to prevent significant adverse climate effects

Adaptation

Use materials and resources that will withstand a changing climate

- Climate resilient organisms and plants
- Stabilized conditions such as temperature, etc.

Mitigation

Reduce greenhouse gas emissions that will exacerbate climate change

- Emphasis on Energy Efficiency
- Low-Emission Vehicles and Equipment
- Use of Renewable Energy

In-Situ (On-site) Cleanup

Bioremediation

The process of using microorganisms to remove or neutralize contaminants from polluted environments

- Use climate-resilient microbial strains to break down contaminants
- Manage temperature to optimize microbial activity despite climate variations

Adaptation

Phytoremediation

The use of plants to uptake and accumulate contaminants which can then be sequestered or destroyed

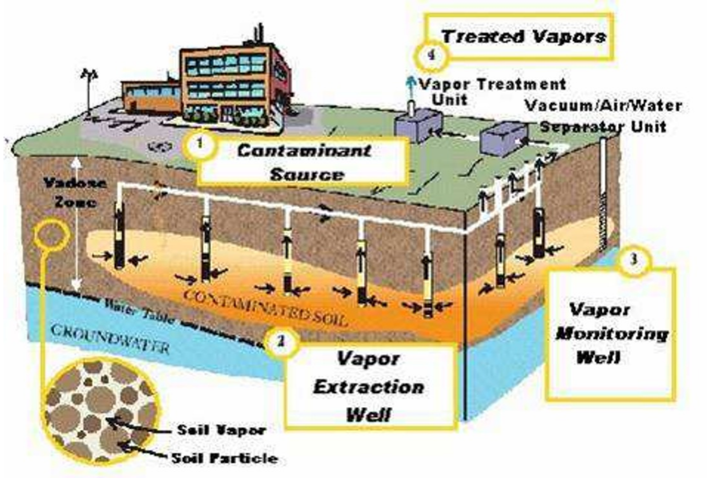
- Use plant species that
  a. can withstand changing climate conditions
  b. capture and store carbon dioxide

Adaptation & Mitigation

Soil Vapor Extraction (SVE) or “Air Sparging”

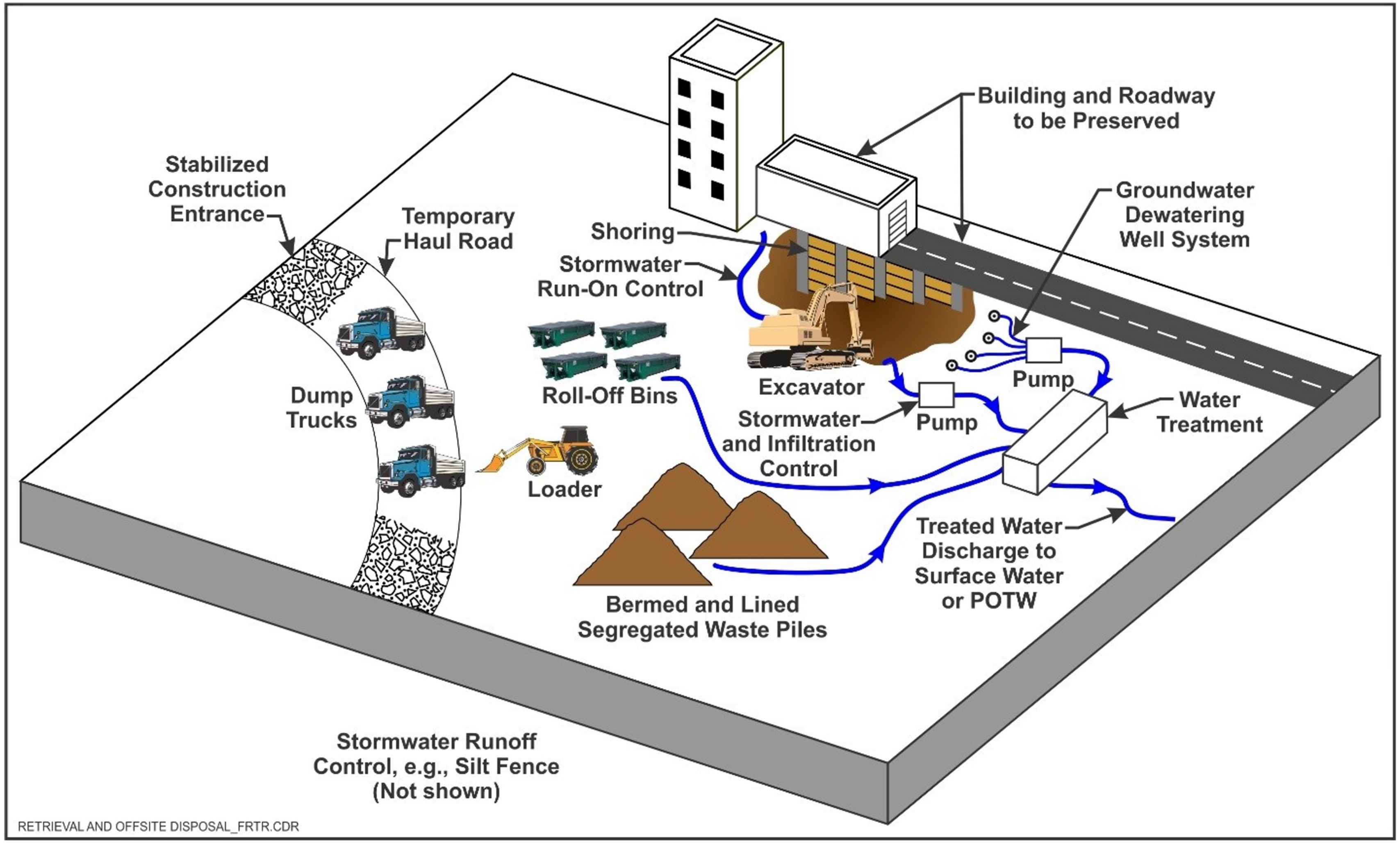
Volatile Organic Compounds (VOCs) are pulled out of the soil using a system of wells and pumps. The extracted vapors are then treated or purified before being released into the atmosphere

- Use energy-efficient vacuum pumps
- Optimize the extraction process to minimize energy use



Mitigation

Ex Situ (Off-site) Cleanup



Excavation and Treatment "Dig & Haul"

Physically removing the contaminated soil or materials from the site and then treating them to neutralize or remove the hazardous substance

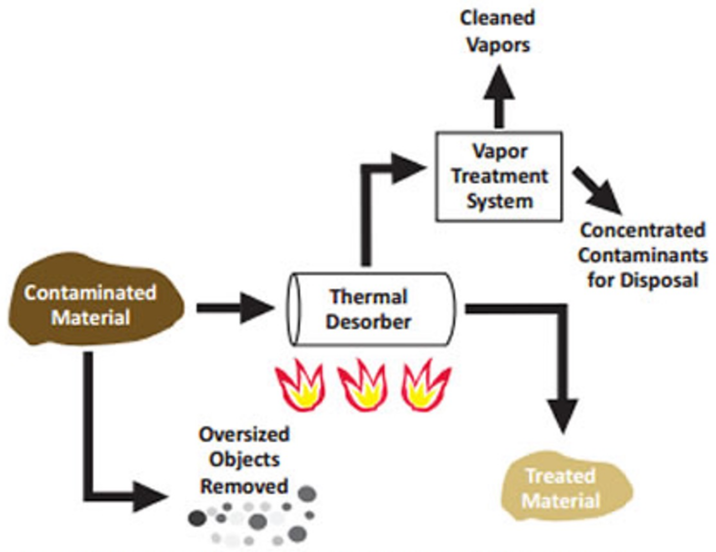
- Use dust control measures and low-emission transport
- Use landfills that capture and utilize methane emissions

Mitigation

Thermal Desorption

Contaminated soil or sediments are heated until they vaporize and collected to be treated elsewhere in a gas treatment system

- Power thermal desorption units with solar or wind energy
- Capture and reuse heat generated during the process



Thermal desorber heats contaminated material to evaporate

Mitigation

Chemical Treatment

The use of chemical reactions to neutralize, convert, or remove contaminants from polluted soil, water, or sediments through reactions such as oxidation, neutralization and precipitation

**can be in-situ or ex-situ

- Select chemicals that are less volatile and more stable under changing climate conditions
- Use environmentally friendly chemical processes and reagents

Adaptation & Mitigation

Calculating the Carbon Footprint of Cleanup

[EPA Spreadsheets for Environmental Footprint Analysis (SEFA)]

- Excel workbooks with automated calculations
- 21 metrics that evaluate
  - Materials and Waste
  - Water
  - Energy
  - Air
  - Land & Ecosystems

CLU-IN | Strategies & Initiatives | Green Remediation Focus | Footprint Assessment | Spreadsheets for Environmental Footprint Analysis (SEFA)

Green Remediation Focus

Minimizing the environmental footprint of site cleanup

Spreadsheets for Environmental Footprint Analysis (SEFA) *Update*

- Home

EPA developed a set of analytical workbooks known as "SEFA" (Spreadsheets for Environmental Footprint Analysis) to help decision-makers analyze the environmental footprint of a site cleanup project, determine which cleanup activities drive the footprint, and adjust project parameters to reduce the footprint. Information to be input by the user may be gathered from project planning documents, field records and other existing resources. Automated calculations within SEFA generate outputs that quantify 21 metrics corresponding to core elements of a greener cleanup.

Core Element	Green Remediation Metric		Unit of Measure
	M&W-1	Refined materials used on site	tons
	M&W-2	Percent of refined materials from recycled or waste material	percent
	M&W-3	Unrefined materials used on site	tons
Materials & Waste	M&W-4	Percent of unrefined materials from recycled or waste material	percent
	M&W-5	Onsite hazardous waste generated	tons
	M&W-6	Onsite non-hazardous waste generated	tons
	M&W-7	Percent of total potential onsite waste that is recycled or reused	percent
		Onsite water use (by source)	
	W-1	- Source, use, fate combination #1	millions of gallons
Water	W-2	- Source, use, fate combination #2	millions of gallons
	W-3	- Source, use, fate combination #3	millions of gallons
	W-4	- Source, use, fate combination #4	millions of gallons
	E-1	Total energy use	MMBtu

Redevelopment

American Car Foundry Site (Huntington, WV)
The plant manufactured railcars and rail car parts from the 1880s to 2010.

Opportunities in the redevelopment process

A brownfield redevelopment project is an opportunity to redevelop the property in a manner that positively contributes to creating a more climate change resilient community.

Green Infrastructure

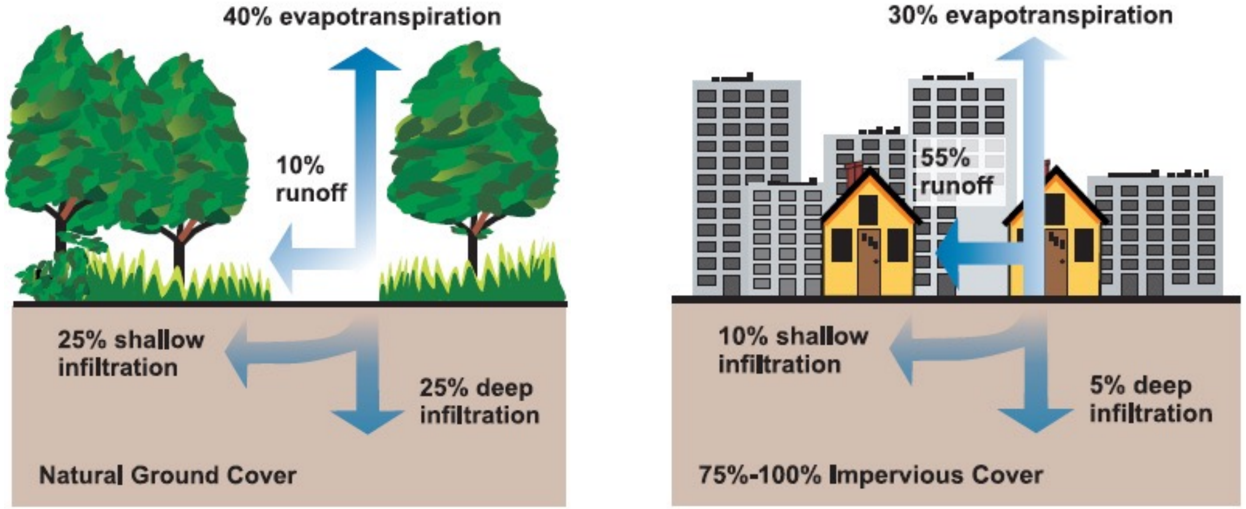
Green Building Techniques

Renewable energy

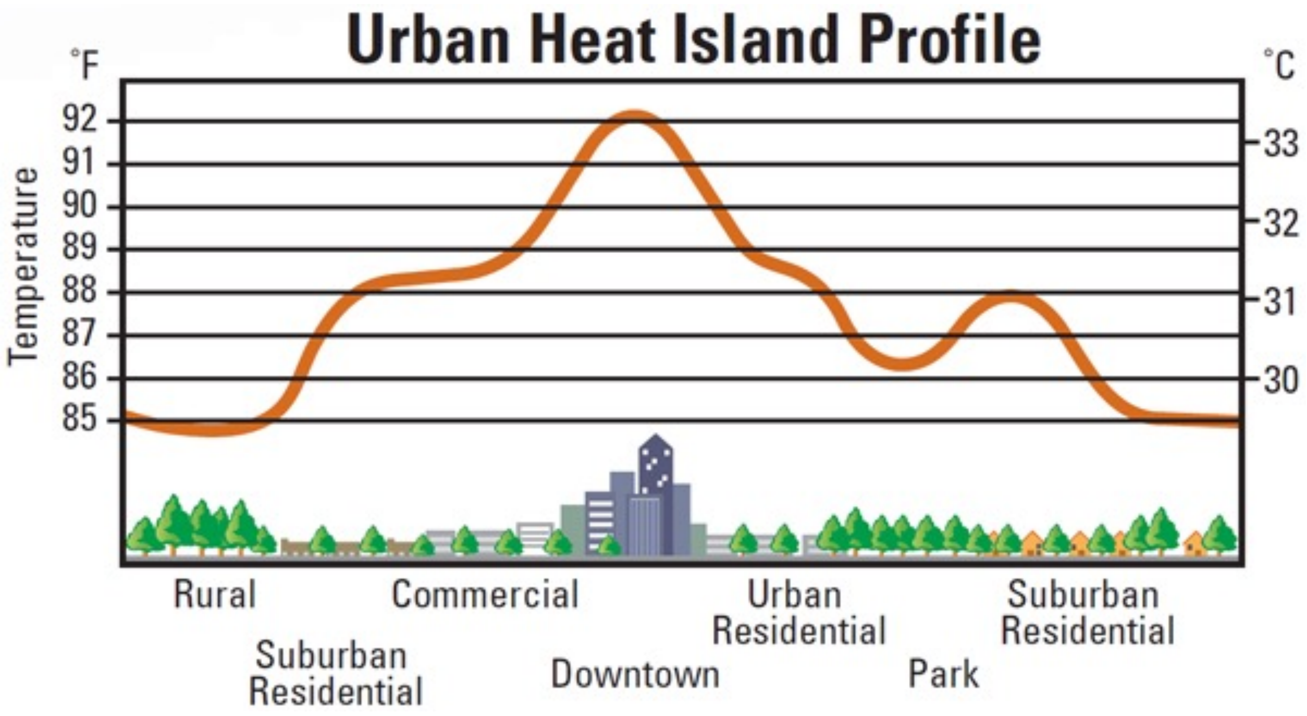
The Urban & Urbanizing landscape creates problems…

Specifically - Impervious surfaces in the form of streets, rooftops, parking lots

- Alters natural hydrology, generally leading to **more frequent, larger magnitude and shorter duration peak flows creating "FLASHY" streams in urbanized areas.**
- **Alters stream channel morphology**, generally leading to changes such as increased channel width, increased downcutting and reduced bank stability.
- Increases delivery of pollutants from the landscape to the stream.
- Increases stream temperatures, due to the transfer of heat from impervious surfaces to stormwater runoff.
- Falling groundwater levels
- Urban heat islands



Urban Heat Island effect



"Urban heat islands" occur when cities replace natural land cover with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat. This effect increases energy costs (e.g., for air conditioning), air pollution levels, and heat-related illness and mortality.

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Stormwater Infrastructure

Gray infrastructure is traditional stormwater infrastructure in the built environment such as gutters, drains, pipes, and retention basins.

Green infrastructure is an approach to water management that protects, restores, or mimics the natural water cycle.

Green Infrastructure

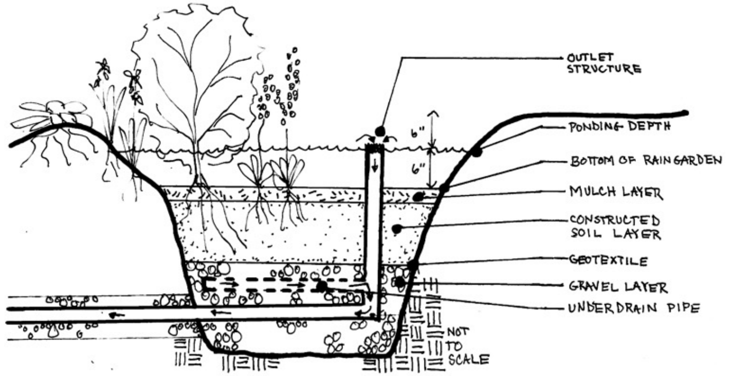
Infrastructure that uses nature-based processes to manage stormwater, reduce heat stress, and mitigate other climate-related challenges

- Green roofs
- Bioswales and rain gardens
- Permeable pavement
- Stormwater planters
- Harvesting Rainwater
- Urban Tree Canopies/Green space
- Green Streets/parking lots

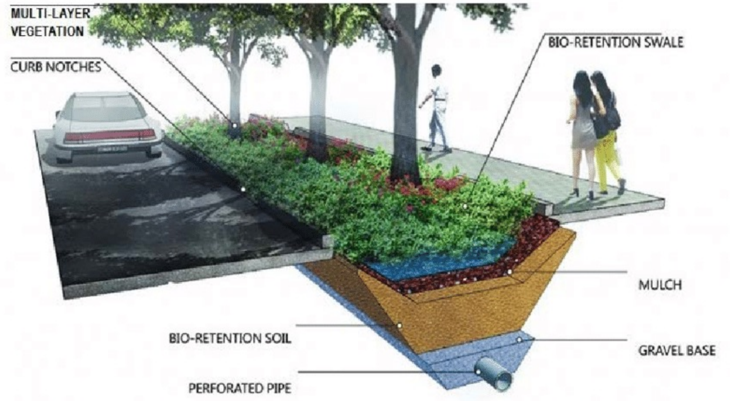
Benefits of green infrastructure

- Improved water quality
- Reduced municipal water use
- Groundwater recharge
- Flood Risk Mitigation
- Increased resilience to climate change impacts like: heavier rainfalls, hotter temperatures, and higher storm surge
- Reduced air pollution
- Reduced air temperatures in developed areas
- Many others

Rain Gardens/Bioswales

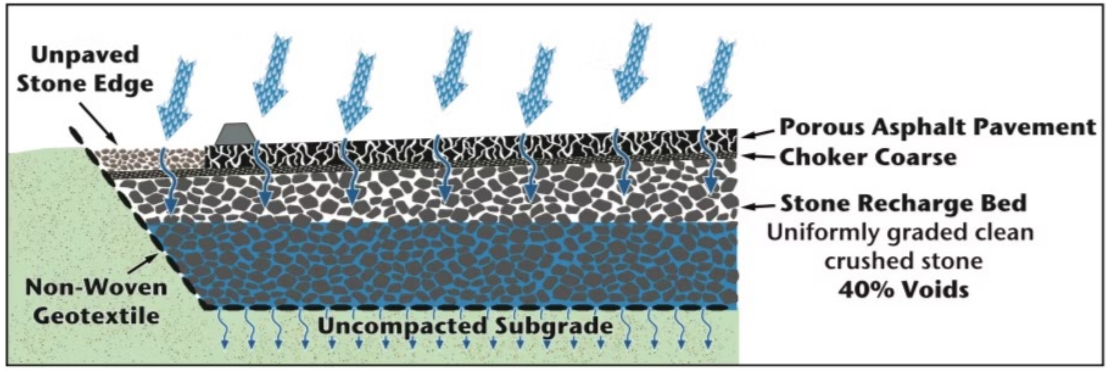


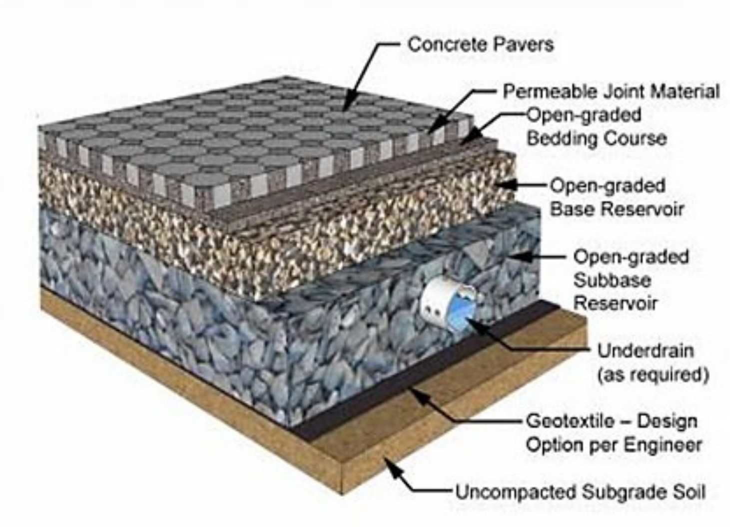
A **rain garden** is a garden of native plants that is watered by stormwater. A rain garden accomplishes stormwater filtration by collecting water on low gradients, slowing it, and allowing the water to infiltrate into a porous surface, instead of flowing across asphalt or concrete. When the water is slowed, suspended particles settle out, and pollutants are decomposed by soil microbes, immobilized, or incorporated into plants.



Bioswales are designed to slow down rainwater through a curving or linear path, while rain gardens are designed to capture, store, and infiltrate rainwater in a bowl shape.

Permeable Pavement





Stormwater Planters

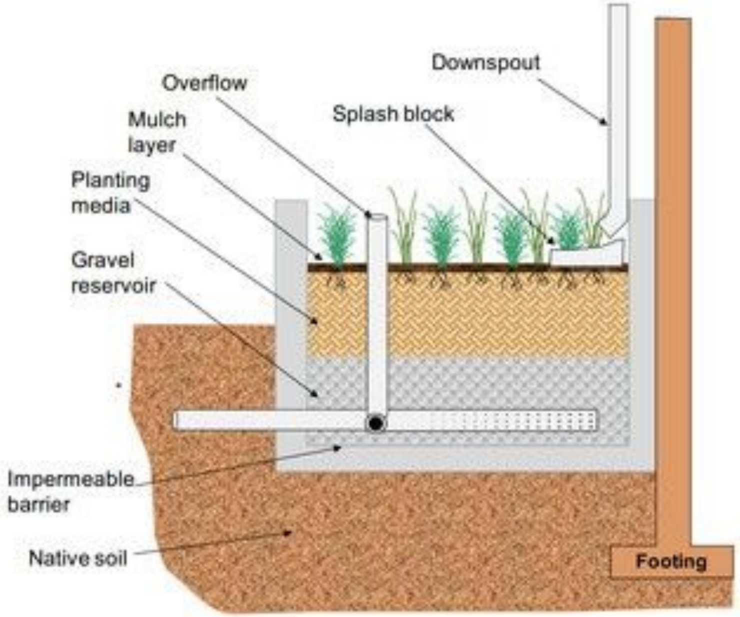


Illustration of a Planter Box

Harvesting Rainwater

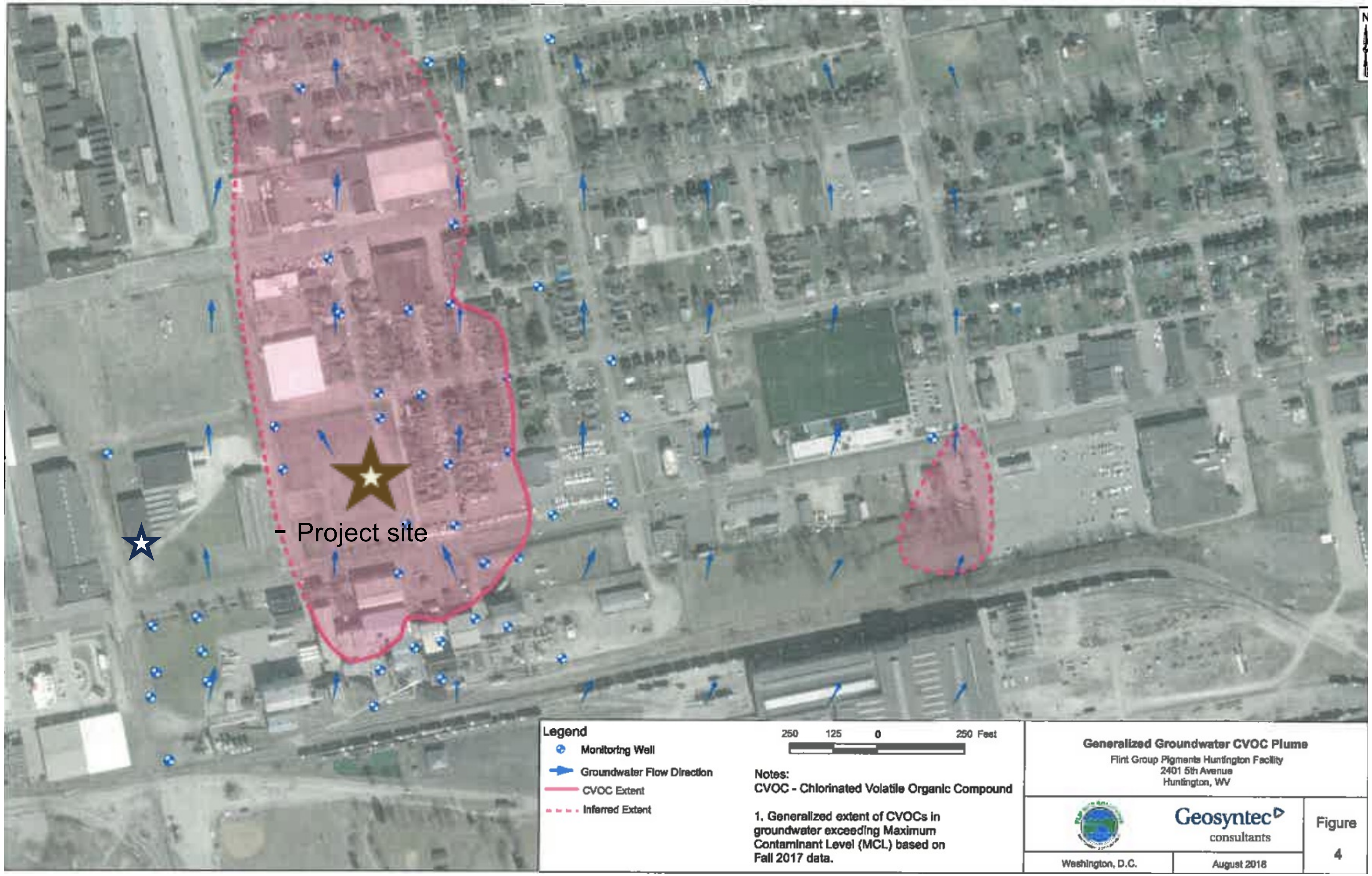
(Disconnecting from a combined system)

Systems can be as elaborate or as basic as a site or budget dictates

Captured water can be used for:

- Landscape Irrigation
- Flushing Toilets
- Washing Equipment
- Washing Vehicles
- Livestock

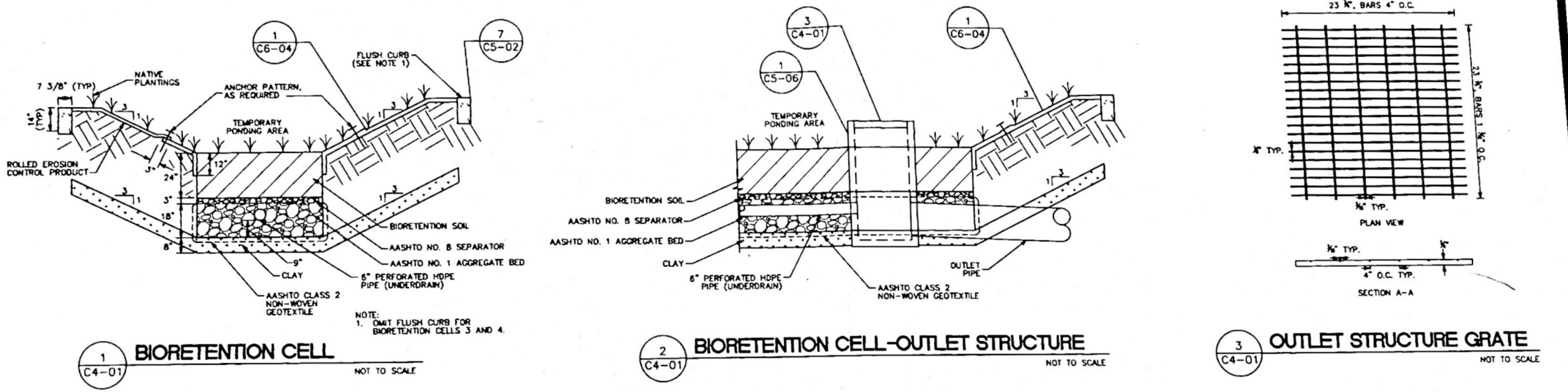
Siting of Marshall University's Baseball Stadium on a brownfield property in Huntington, WV

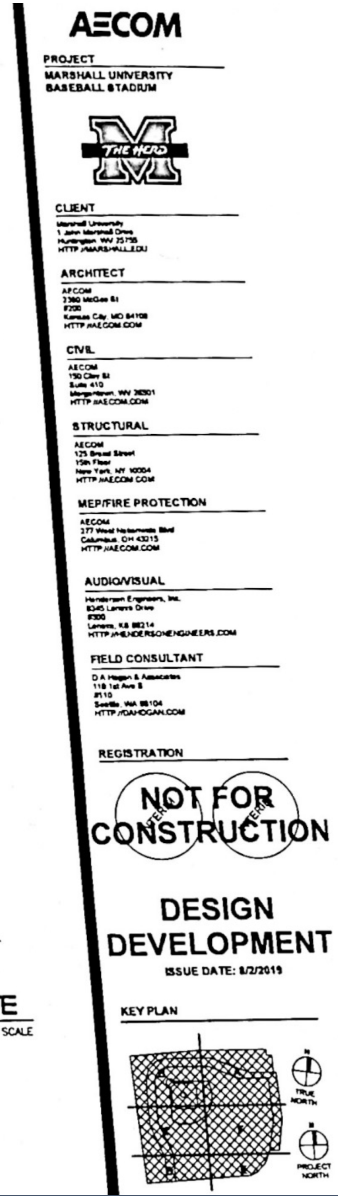


Original plans had the stadium sited along 5th Avenue on a brownfield property that the University acquired in 2017.

MS4 regulations required the capture/treatment of the 1st inch of rainfall.

The Best Management Practice (BMP) proposed for the parking lot of the stadium





Green Building Techniques

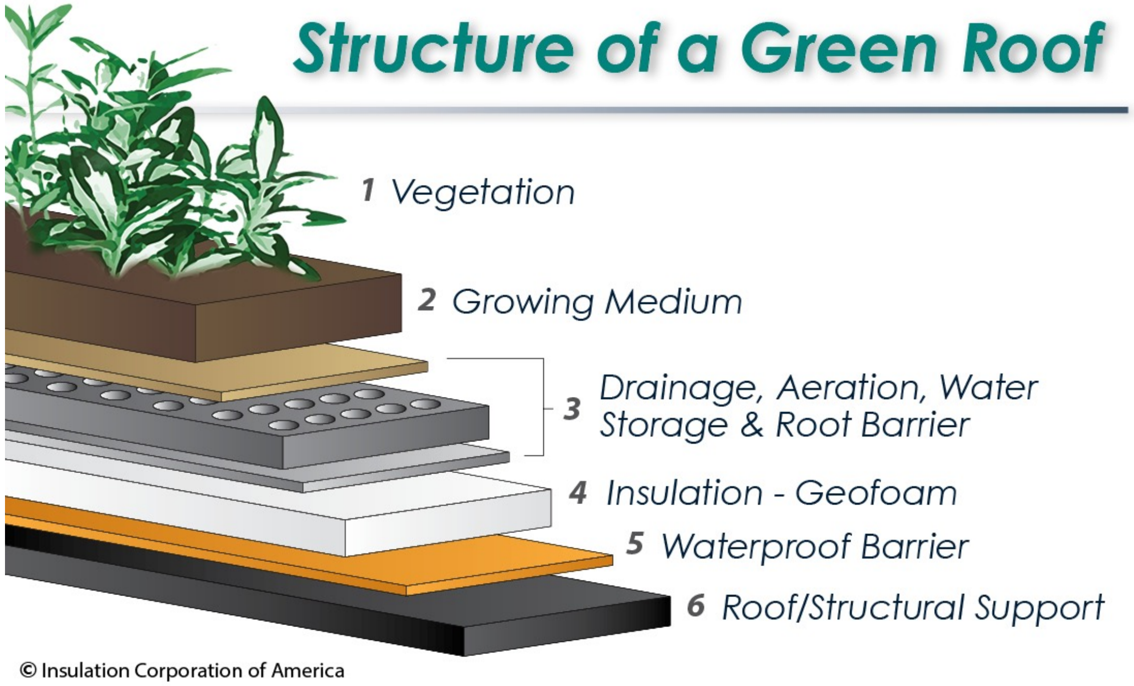
Green Building is the practice of creating healthier, more resource-efficient models of construction, renovation, operation, maintenance, and demolition. It aims to reduce air and water pollution, stormwater runoff, waste, and unhealthy indoor environments, and transform buildings into a sustainable part of the landscape. Green building techniques can be instrumental in addressing climate change impacts by more effectively controlling stormwater, reducing waste and emissions, and designing smarter infrastructure.

- Use recycled, repurposed or sustainable building materials
- Prioritize solar energy and other renewable forms of energy when possible
- Using rainwater harvesting systems
- Passive Survivability
- Preservation of green space
- Development of green roofs
- Energy & Water efficiency measures

Preservation of Green Space

- Helps minimize erosion and sedimentation
- Improves habitat in local small streams/watersheds (improving water quality
- Provides infiltration for groundwater recharge
- Helps to moderate temperatures in urban/urbanizing areas

Green Roofs



- Reduce the stormwater runoff rate from a roof by up to 65%
- Make roof surfaces 30-40% cooler
- Reduce heat flux from roof to building by up to 72%
- Last 40 years or more
- Attract wildlife such as birds, bees and other beneficial insects
- Cost ~ $25-30/sf for design, materials, labor, and installation. This estimate does not include the standard costs for replacing or repairing the underlying roof itself if needed
- Maintenance costs tend to be higher

Energy & Water Efficiency Measures

Charleston Civic Center in WV

- 45% less water
- 25% reduced energy costs

Energy Efficiency

ENERGY STAR

High-performance windows
Green insulation
Efficient heating and cooling systems

Lighting efficiency

Natural lighting
LED light bulbs

Water efficiency

- Low-flow bathroom fixtures
- High efficiency appliances
- Rainwater collection

In 2016, Marshall University converted the entire campus to LED lighting. The upgrade expected to yield an energy savings in lighting costs of 20%-50%.

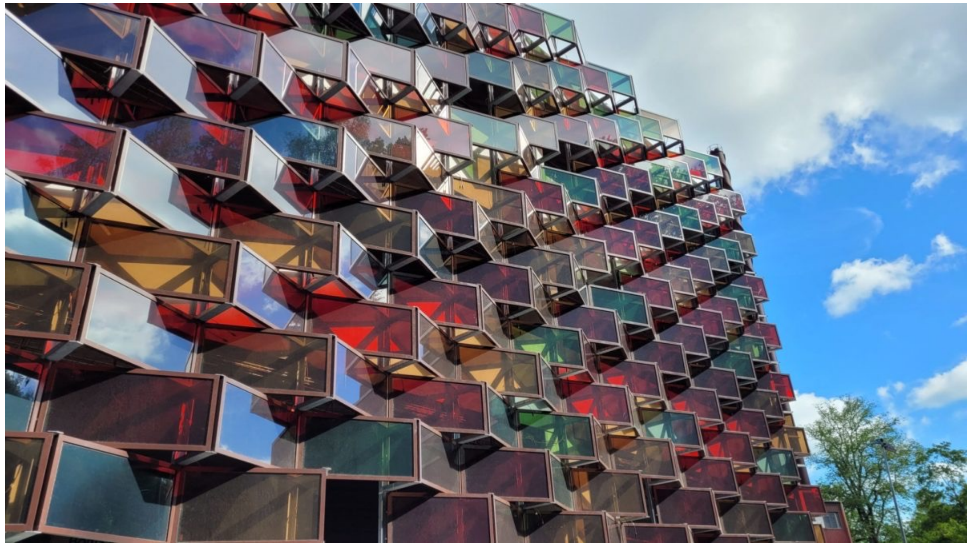
Since 2016, campus officials have seen a reduction in usage of approximately 4,000,000 kWh’s - saving an estimated $321,000.

Rainwater harvesting systems

Benefits

- Helps reduce peak flow to receiving streams
- Reduces combined overflow events from sewer lines (improves water quality)
- Saves money on water bill
- Saves energy

Prioritize solar energy and other renewables



- Offsets GHG, Sulfur dioxide and Nitrogen Dioxide emissions as well as particulate matter
- Solar systems have little to no maintenance costs

Use recycled, repurposed or sustainable building materials

Using recycled construction materials provides several advantages in combating climate change…

- Requires less energy than using virgin materials
- Reduce landfill waste
- Reduces emissions
- Conserves natural resources

RECYCLINGWORKS MASSACHUSETTS

repurposedMATERIALS

Habitat for Humanity ReStore

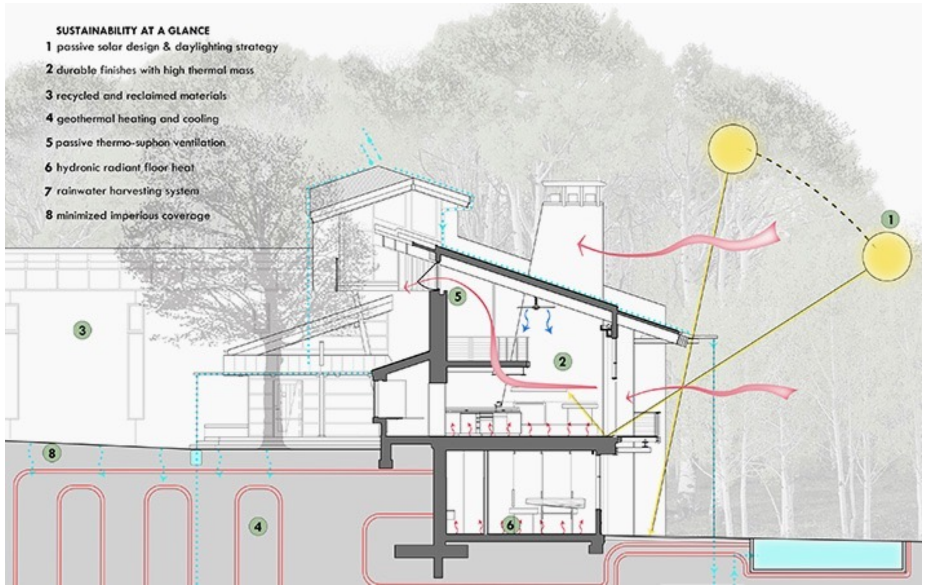
Home improvement stores and donation centers selling new and gently used furniture, appliances, home goods, building materials and more

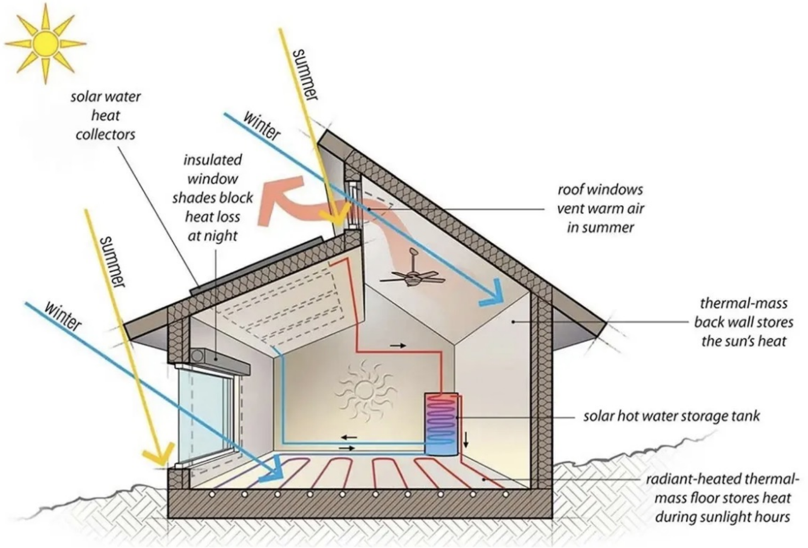
Passive Survivability

“Passive survivability” is a building’s ability to maintain habitability without relying on external utility systems for power, fuel, water, or sewer services, as well as being better able to withstand floods, severe weather, and temperature extremes.

Passive survivability combines many of the green building strategies discussed earlier and can be accomplished through passive and active means. Improved energy efficiency combined with passive heating, cooling, ventilation, and natural lighting strategies can be employed.

Additionally, an onsite renewable energy source, rainwater harvesting, treatment, and storage; and wastewater systems can also be incorporated into this strategy for passive survivability.

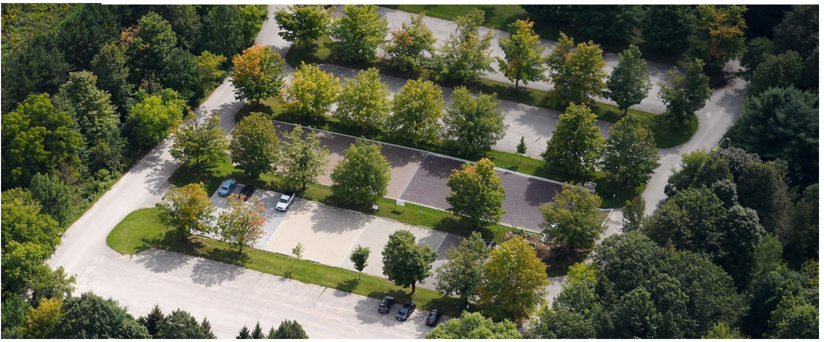


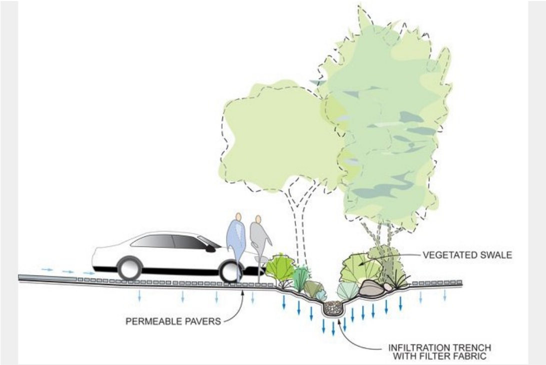


Managing Urban Heat Island effect

- Plant trees and increase vegetation
- Install green or cool roofs
- Replace normal pavement with cool pavement (solar reflecting asphalt coating)

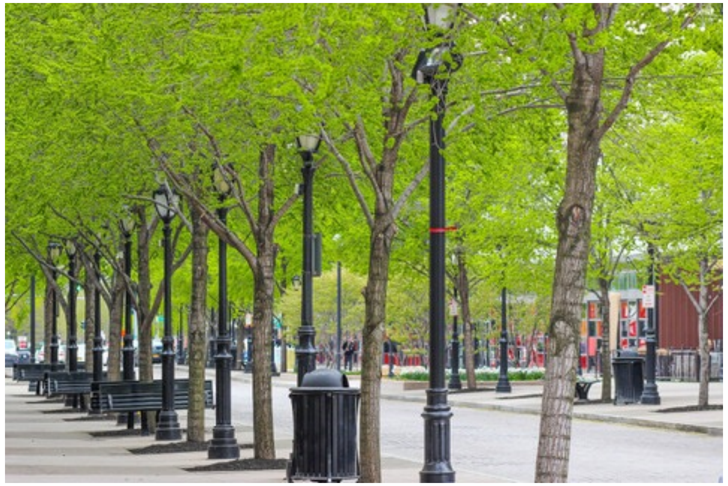
Solar reflective asphalt coating





Green parking lots

Urban Tree Canopies



- Providing protection from the wind and sun, leading to home energy savings by 30% for cooling, and 20-50% for heating.
- Reducing heat build-up in the City (known as the ‘urban heat island effect’) by between 2°C and 8°C
- Improving the overall neighborhood aesthetic and increasing property values;
- Supporting the physical and mental health, safety and an improved quality of life for the entire community
- Improve air quality, through the absorption of pollutants and trapping of dust and other fine particles
- Promoting biodiversity by providing habitat and food for wildlife
- Absorbing as much as 330 lbs. of CO_2 per year per tree, helping to mitigate climate change.
- Reducing storm water runoff and instances of flooding resulting from erosion, reducing summer evaporation and increasing groundwater recharge – leading to improved water quality and quantity

Questions?

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WestVirginiaUniversity

COLLEGE OF ARCHITECTURE, ARTS, AND DESIGN
COMMUNITY DESIGN ASSISTANCE CENTER
VIRGINIA TECH.

UNIVERSITY OF DELAWARE
BIDEN SCHOOL OF PUBLIC POLICY & ADMINISTRATION

MARSHALL UNIVERSITY.

Climate Smart Brownfields Manual

https://www.epa.gov/land-revitalization/climate-smart-brownfields-manual