20th Annual Building Professional Institute

Sustainable or *Green* Public Infrastructure

University of Texas at Arlington
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North Central Texas Council of Governments
Transportation Department

Sustainable or *Green* Public Infrastructure

- What is Sustainable or *Green* Public Infrastructure
- Benefits of Sustainable or *Green* Public Infrastructure
- Examples
- Sustainable Community Building Standards
- Sustainable Development at NCTCOG
- Questions

Portland, Oregon

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WHAT IS SUSTAINABLE OR *GREEN* PUBLIC INFRASTRUCTURE?

- Sustainability is meeting the needs of today without jeopardizing the ability of future generations to meet their needs.
- Public Infrastructure is basic facilities, such as water and sewer lines, roads, and drainage systems – located in the public Right-of-Way – that is needed for the functioning of a community.

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WHAT IS SUSTAINABLE OR *GREEN* INFRASTRUCTURE CONTINUED…

- Considers long term cost effectiveness
- Considers the community and environmental impact of infrastructure components
- Reduces or helps mitigate environmental degradation often caused by traditional public infrastructure

Portland, Oregon

Source: Wayne M. Feiden and Elisabeth Hamin. Assessing Sustainability: A Guide for Local Governments. 2011

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BENEFITS OF SUSTAINABLE OR *GREEN* INFRASTRUCTURE

- Cost effectiveness
  - The estimated cost of constructing and maintaining a 40,000 sf parking lot for 25 years is $190,200 if permeable pavements are used; $275,875 if traditional asphalt is used
  - Drainage costs are also reduced because the parking lot can be used for detention

Source: Permeable Paver Research Summary. Lake County Forest Preserve, 2003
Permeable Pavement System: http://www.ecosmartinc.com/catpave3.php

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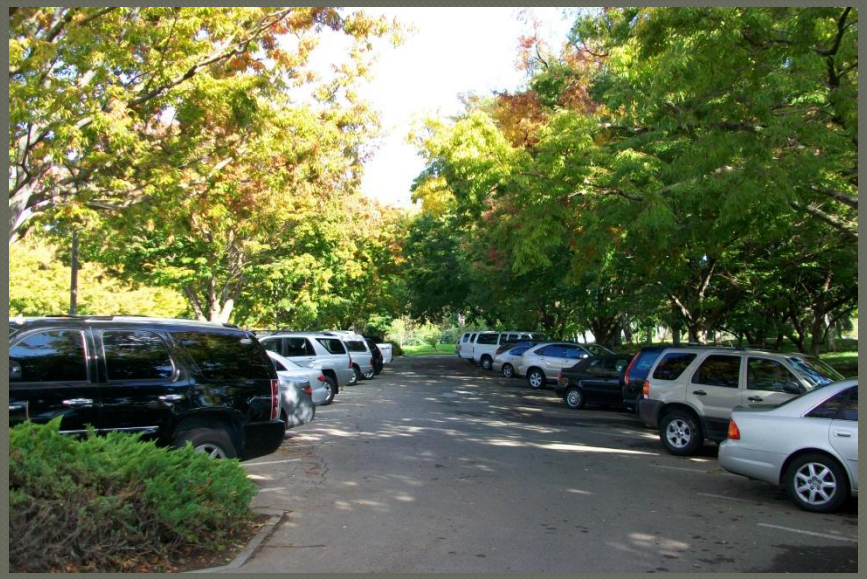
BENEFITS OF SUSTAINABLE OR *GREEN* INFRASTRUCTURE CONTINUED…

- Reduced energy use
  - 20 percent tree canopy on the south side of a home reduces cooling costs by 8 to 18 percent.
- Reduces Volatile Organic Compound (VOC) emissions
  - According to the EPA, increasing the tree canopy in parking lots from 8 to 50 percent can reduce VOC by 2 percent per day.



Sacramento, California

Source: Reducing Urban Heat Islands: Compendium of Strategies, Trees and Vegetation
In the Spirit. Paradise Lost and Found Garden: http://localecologist.blogspot.com/2009_10_01_archive.html

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EXAMPLES OF *GREEN* PUBLIC INFRASTRUCTURE

- Green Infrastructure
- Permeable Pavement
- Green Roofs
- Bioswales
- Green Streets

The Headwaters – Portland, Oregon

Source: Jason King. Green Streets – Green Infrastructure.
http://www.oeconline.org/our-work/rivers/rivers-files/green-streets-jason-king

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GREEN INFRASTRUCTURE

Green infrastructure uses vegetation and soil to manage rainwater where it falls.

Green infrastructure provides stormwater management, flood mitigation and air quality management by weaving natural processes into the built environment.

Source: Green Infrastructure http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm
SVR Design Company. Green Infrastructure http://www.svrdesign.com/blog/tag/green-infrastructure/

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GREEN INFRASTRUCTURE CONTINUED…

- Green Infrastructure Application
  - Rain gardens
  - Wetlands
  - Green roofs
  - Bioswales
- Green Infrastructure Benefits
  - Storm Management and Retention
  - Flood Mitigation
  - Nutrient Recycling

Source: Green Infrastructure http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm
Toledo Metropolitan area Council of Governments. Green Infrastructure for Storm Water Management. http://www.tmacog.org/Environment/Green_Infrastructure/green_infrastructure.htm

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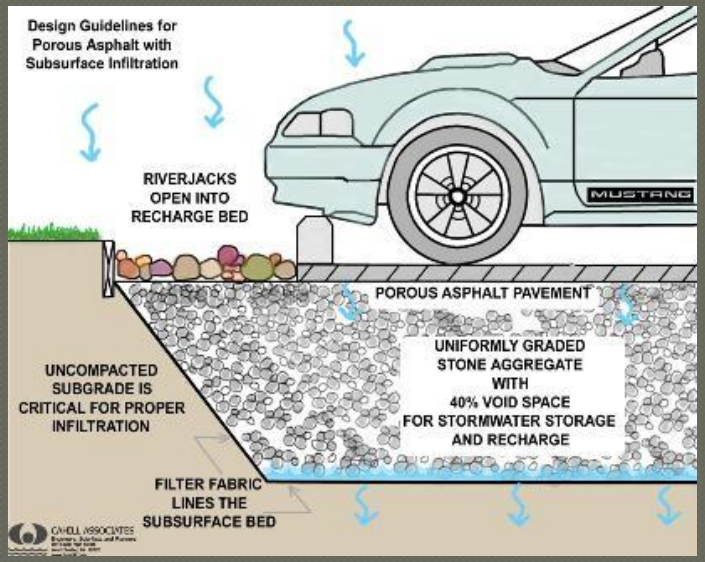
PERMEABLE PAVING

Permeable pavement is a porous pavement that filters and allows a portion of roadway and/or parking lot runoff to infiltrate the surface to recharge ground water sources.



Source: http://www.mytorontohomeimprovement.com/permeable-pavements.htm

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PERMEABLE PAVEMENT CONTINUED…

- Permeable Pavement Application
  - Parking lots
  - Sidewalks
  - Bike Trails
- Permeable Pavement Benefits
  - Filters runoff for pollutants that may run off into drinking water sources
  - Replenishes ground water sources
  - Reduces flood risks
  - More aesthetically appealing than traditional concrete pavement
  - Life cycle costs are over 30% cheaper than traditional pavement

Beaumont Village Lofts – Portland Oregon

Source: California Stormwater BMP Handbook. New Development and Redevelopment. www.cabmphandbooks.com
Jason King. Green Streets – Green Infrastructure.
http://www.oeconline.org/our-work/rivers/rivers-files/green-streets-jason-king

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GREEN ROOF'S

- A green roof is a garden or vegetative layer on the top of structure used to absorb sunlight and reduce ambient temperature through evapotranspiration.

City Hall – Chicago, Illinois

Source: http://www.explorechicago.org/city/en/about_the_city/green_chicago/Green_Roofs_.html
Kelly F. Duke. The Versatile Green Roof. BOMA, 2010

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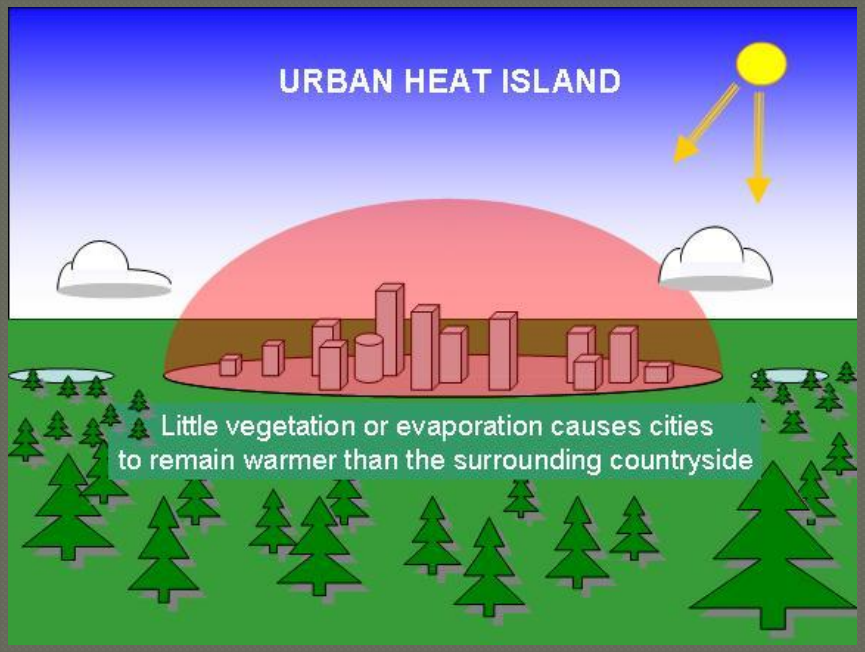
GREEN ROOFS CONTINUED…

- Green Roof Application
  - Mitigates the Urban Heat Island Effect
  - Reduces ambient Temperature
  - Improves air quality
- Green Roof Benefits
  - Lasts twice as long as conventional roofs
  - Reduces heating and Cooling costs



Source: Kelly F. Duke. The Versatile Green Roof. BOMA, 2010

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BIOSWALES

Bioswales are vegetated bioretenion tools used to partially treat site runoff, reduce flood potential, and direct stormwater from away from vertical development and critical infrastructure.

Source: Fact Sheet: Bioswales, Vegetated Swales. University of Florida IFAS Extension, 2008
Permeable Interlocking Concrete Pavements:
http://www.coastal.ca.gov/nps/lid/9Smith(Youngs-Metz)-PermeableInterlockingConcretePavements.pdf

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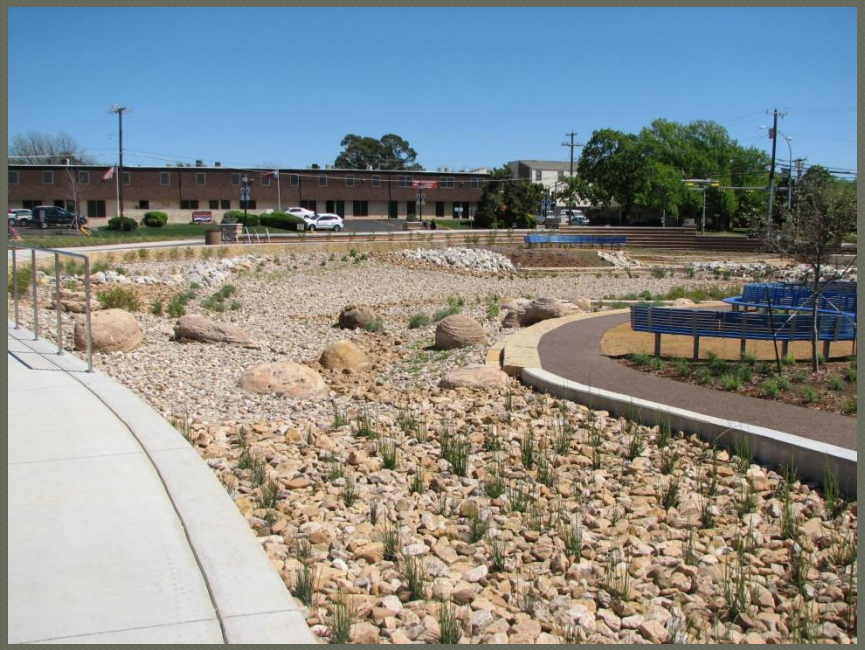
BIOSWALES CONTINUED…

- Bioswale Application
  - Parking Lot Islands
  - Storm Drain Alternatives
  - Roadside Swales
- Bioswale Benefits
  - Flood prevention
  - Storm water treatment, reduction, and reduction
  - Ground water recharge
  - Erosion Control



The Green at College Park - Arlington, Texas

Source: Dennis Jurries, PE. Biofilters: Bioswales, Vegetative Buffers, & Constructed Wetlands for Storm Water Discharge Pollution Removal, Oregon Department of Environmental Quality, 2003.

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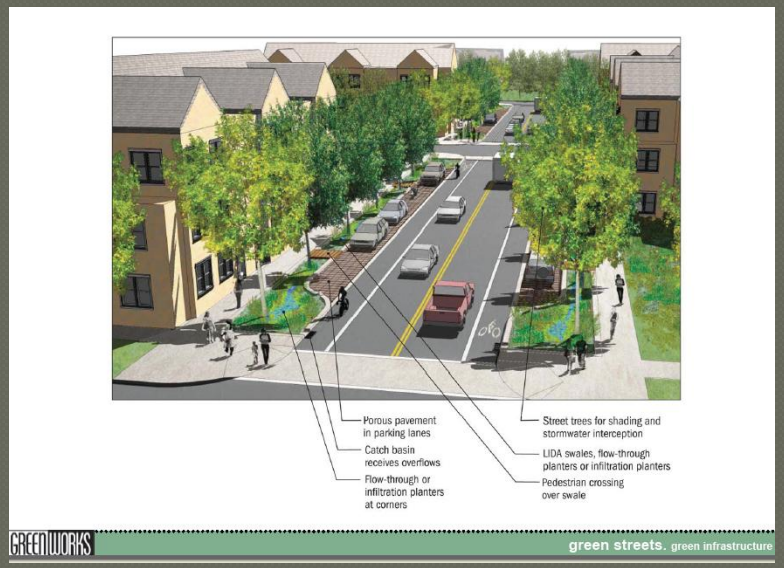
GREEN STREETS

A Green Street is a roadway that uses vegetated Right- of-Way and/or permeable pavements to manage or mitigate stormwater runoff.



Source: Jason King. Green Streets – Green Infrastructure.
http://www.oeconline.org/our-work/rivers/rivers-files/green-streets-jason-king

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ADVANTAGES OF GREEN STREETS

- Green Streets Application
  - Storm Water Retention
  - Reduces and Filters Stormwater runoff
  - Pedestrian Safety
- Green Street Benefits
  - Replenishes the water table
  - Creates a more livable street
  - Reduces the cost of drainage infrastructure

Source: Jason King. Green Streets – Green Infrastructure.
http://www.oeconline.org/our-work/rivers/rivers-files/green-streets-jason-king

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SUSTAINABLE COMMUNITY BUILDING STANDARDS

- Sustainable community building standards encourage the construction of green buildings and sustainable or green public infrastructure in Smart Locations.

Jack Evans Police Headquarters – Dallas Texas

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SUSTAINABLE COMMUNITY BUILDING STANDARDS CONTINUED…

- Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND)
  - The U.S. Green Building Council and the Congress for New Urbanism developed (LEED-ND) to certify and promote urbanism, smart growth, and green building efforts for neighborhoods.

West Berry Streetscapes – Fort Worth, Texas

Source: Appendix—LEED-ND and Healthy Neighborhoods: An Expert Panel Review
http://www.cdc.gov/healthyplaces

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SUSTAINABLE COMMUNITY BUILDING STANDARDS CONTINUED…

LEED-ND Criteria

- Smart Location
  - The location must be environmentally superior in terms of access and location
- Sustainable Neighborhood Design and pattern
  - Walkable streets
  - Compact development
  - Mixed Income

Source: 5 Ways Local citizens Groups can use LEED-ND:
http://switchboard.nrdc.org/blogs/kbenfield/5_ways_that_citizens_and_local.html

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SUSTAINABLE COMMUNITY BUILDING STANDARDS CONTINUED…

LEED-ND Criteria

- Green Buildings
  - Certified green buildings
  - Energy efficient homes
- Green Infrastructure
  - Sustainable waste water management
  - Green streets
  - Green roofs

Source: Appendix—LEED-ND and Healthy Neighborhoods: An Expert Panel Review
http://www.cdc.gov/healthyplaces

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SUSTAINABLE COMMUNITY BUILDING STANDARDS CONTINUED…

- NCTCOG's Sustainable Development Funding Program
  - Provides funding for sustainable infrastructure, landbanking, and Planning projects in the North Central Texas Region

Trinity Bluff Streetscapes – Fort Worth, Texas

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SUSTAINABLE COMMUNITY BUILDING STANDARDS CONTINUED…

- Sustainable Development Funding Program Provides Incentives for:
  - Mixed Use Development
  - Infill Development
  - Projects located within a quarter mile of passenger rail
  - Projects located in areas with high environmental justice group populations

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QUESTIONS

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For more information Please Contact:

Staron Faucher
Transportation Planner
sfaucher@nctcog.org
(817) 704-2505
or
Patrick Mandapaka, AICP
Senior Transportation Planner
pmandapaka@nctcog.org
(817) 704-2503

http://www.nctcog.org/trans/sustdev/