



Green Building & Sustainable Construction (TCM 5330)

Sustainable Sites



Dr. Tommy Tafazzoli

Why is the project location the foundation for sustainability?

- The selection and development of a site has a dramatic impact on the performance of a building over the course of its life, from the way people travel to the building to how the project coexists with the local ecosystem.



A sustainable site significantly paves the path for a sustainable project.

In what ways does a sustainable site promote a sustainable project?

encouraging proximity
to amenities

integrating mixed-use
development

prioritizing walkability
and bikeability

providing access to
public transportation

incorporating green
spaces and biodiversity

incorporating energy
efficiency and
renewable energy
sources

implementing water
conservation

promoting waste
management fostering
community
engagement and social
inclusivity

supporting local
economic opportunities

incorporating resilience
to climate change

utilizing smart
infrastructure

What are the four key issues that help define how a project's location affects the sustainability of the project over its lifetime?



A. Transportation

B. Site selection

C. Site design and management

D. Stormwater management

Sustainable Sites

A. Transportation



Watch the video

How can cities shift people to more sustainable transport? | With Sam Morgan

- Link:

https://www.youtube.com/watch?v=PzhwrDgrqUA&ab_channel=EITUrbanMobility

- (you may also click on the YouTube Logo below)



How does transportation impact the environment, the economy, and the community?

Environment

- Vehicle emissions are one of the leading contributors to climate change, smog, acid rain, and other air quality problems. Moreover, miles of roads and parking lot not only affect water quality but also require massive amounts of energy to construct.

Economy

- Beyond the environmental cost of vehicle transportation lies a huge economic cost to build and maintain roads. The economic cost of purchasing gas and oil to fuel these vehicles represents a significant portion of a household's expenditures, ranking with electricity and clothing.

Community

- Human health is affected by transportation in numerous ways, including climate change and air quality issues. But perhaps most troublesome is the reduction in physical activity that has come with the increased use of vehicles. With the incidence of obesity and overweight individuals rising at alarming rates in this country, there are plenty of data to support the value of getting out of the car and walking or biking instead.

What is the link between project location and transportation demand?

- Buildings and the way we develop land generate demand for transportation.



How is the location of a project linked to its transportation demand? *(slide 1 of 2)*

Accessibility and Proximity

- How close/far the project is to residential areas, commercial centers, and transportation hubs
- Walkability or cycling to high-demand destinations
- Accessibility to public transportation options, such as buses, trains, or subways

Land Use and Zoning

- Mixed-use developments that combine residential, commercial, and recreational spaces can potentially reduce the need for extensive travel.
- Well-planned land use that promotes walkability and minimizes the separation of residential and commercial zones can contribute to lower transportation demand.

Infrastructure Planning

- The availability and quality of transportation infrastructure in the project location influence travel behavior.
- Infrastructure investments, such as the construction of roads, bike lanes, or pedestrian pathways, can impact transportation demand by providing alternative modes of travel.

How is the location of a project linked to its transportation demand? *(slide 2 of 2)*

Employment Centers

- Projects situated near major employment centers may experience higher demand for commuting services, leading to increased traffic during peak hours.

Urban Density

- Higher-density areas often support more efficient public transportation systems and encourage walking or cycling, potentially reducing the reliance on individual cars.

Parking Availability

- The availability and cost of parking in a project area can influence transportation choices.

Economic and Demographic Factors

- Economic factors, such as income levels and affordability, can impact transportation demand. For instance, lower-income areas may have higher reliance on public transportation.
- Demographic characteristics, including the age distribution and preferences of residents, can also influence transportation demand.

Sustainable sites → Transportation-related strategies

1. Locate the project near mass transit.

- Make it easy on employees to take the bus or train to work by picking a site that is within easy walking distance of bus or train stops.



Sustainable sites → Transportation-related strategies

2. Limit parking.

- You can't drive there if there's nowhere to park, and that's the point! Challenge the perception of how much parking is really needed to support the project, and provide the least amount possible.



Sustainable sites → Transportation-related strategies

3. Encourage carpooling.

- Give the best parking spots to those who carpool, as a token of your appreciation.



Sustainable sites → Transportation-related strategies

4. Promote alternative-fuel vehicles.

- Provide the best parking spots for alternative fuel vehicles. Take the next step by providing electric-car charging stations.
- Go even further by actually providing an alternative-fuel vehicle for building occupants' usage.



Sustainable sites → Transportation-related strategies

5. Offer incentives.

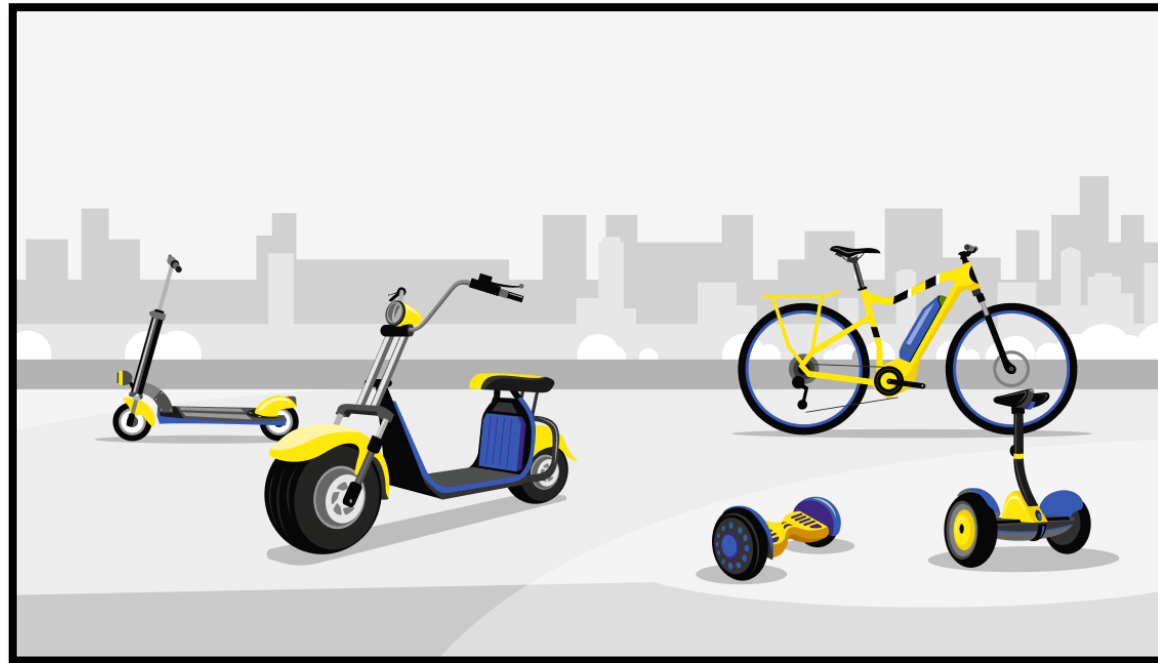
- Nothing speaks louder than cash. Reward employees or shoppers who arrive by bike.



Sustainable sites ➡ Transportation-related strategies

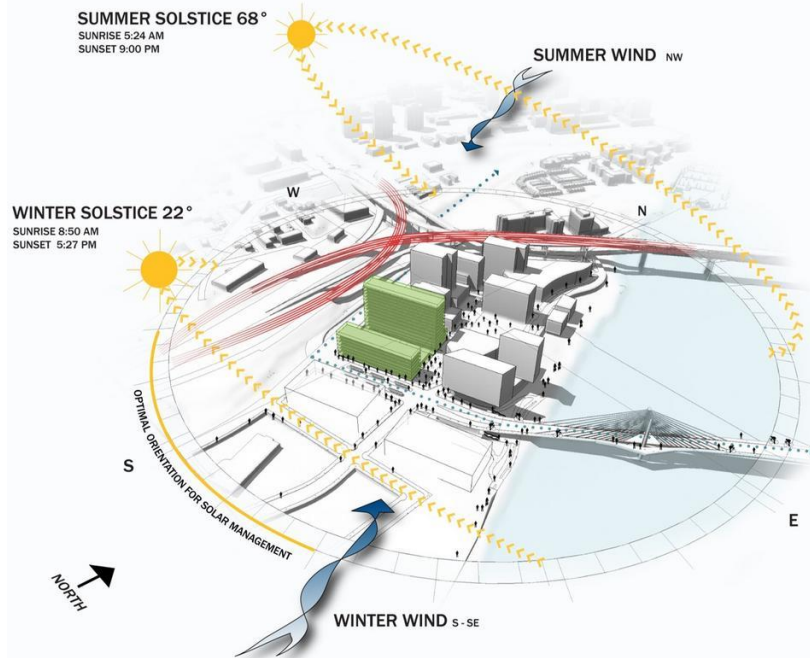
6. Support alternative transportation.

- Help organize building occupants so they know their options for commuting.
- Provide a bulletin board with carpool groups and bus schedules.



Sustainable Sites

B. Site Selection



Watch the video

Selecting A Site For A LEED® Project

- Link:

https://www.youtube.com/watch?v=e7kTivCIUJc&ab_channel=GreenCEEducation

(you may also click on the YouTube Logo below)



How does site selection impact the environment, the economy, and the community?

Environment

- Destruction of wildlife habitats for new development displaces native animals, threatening their ability to survive. The loss of land over time to development lessens the biodiversity of both plant and animal species.

Economy

- Appropriate development of sites away from critical natural habitats can also help protect buildings from natural disasters such as landslides and floods, which are extremely costly to project owners.

Community

- Directing development through intentional planning preserves natural areas for enjoyment and recreation. Protecting areas with diverse plant and animal species not only benefits wildlife, but also provides humans the needed opportunity to connect with their natural surroundings.

What do we call a “sustainable site”?

- A sustainable site is one that is located within or near existing development to leverage existing infrastructure and provide basic services to building occupants.
- Additionally, it prioritizes potential sites that have been previously developed, minimizing the degradation of greenfield sites.



Sustainable sites → Site selection-related strategies

1. Increase density.

- Instead of a sprawling one-story development, consider building up instead of out.
- This will maximize the square footage inside your building while minimizing the amount of land that is being used.



Sustainable sites → Site selection-related strategies

2. Choose redevelopment.

- Old buildings offer more than history. They are often well located, with access to existing services and public transportation.
- Reuse is one of the single most important concepts of sustainability.



Sustainable sites → Site selection-related strategies

3. Protect habitat.

- Leave undeveloped areas with critical habitats undamaged and undeveloped.
- Even within a site, consider which portions of it might be best left as open space and focus density in the areas where it makes sense.



Sustainable Sites

C. Site Design and Management



How does site design and management impact the environment, the economy, and the community?

Environment

- The introduction of nonnative plant species can require irrigation and chemicals, both of which threaten the quantity and quality of available water.

Economy

- Maintaining plant species that are not well adapted to an area is costly in terms of watering and the use of fertilizers and pesticides.

Community

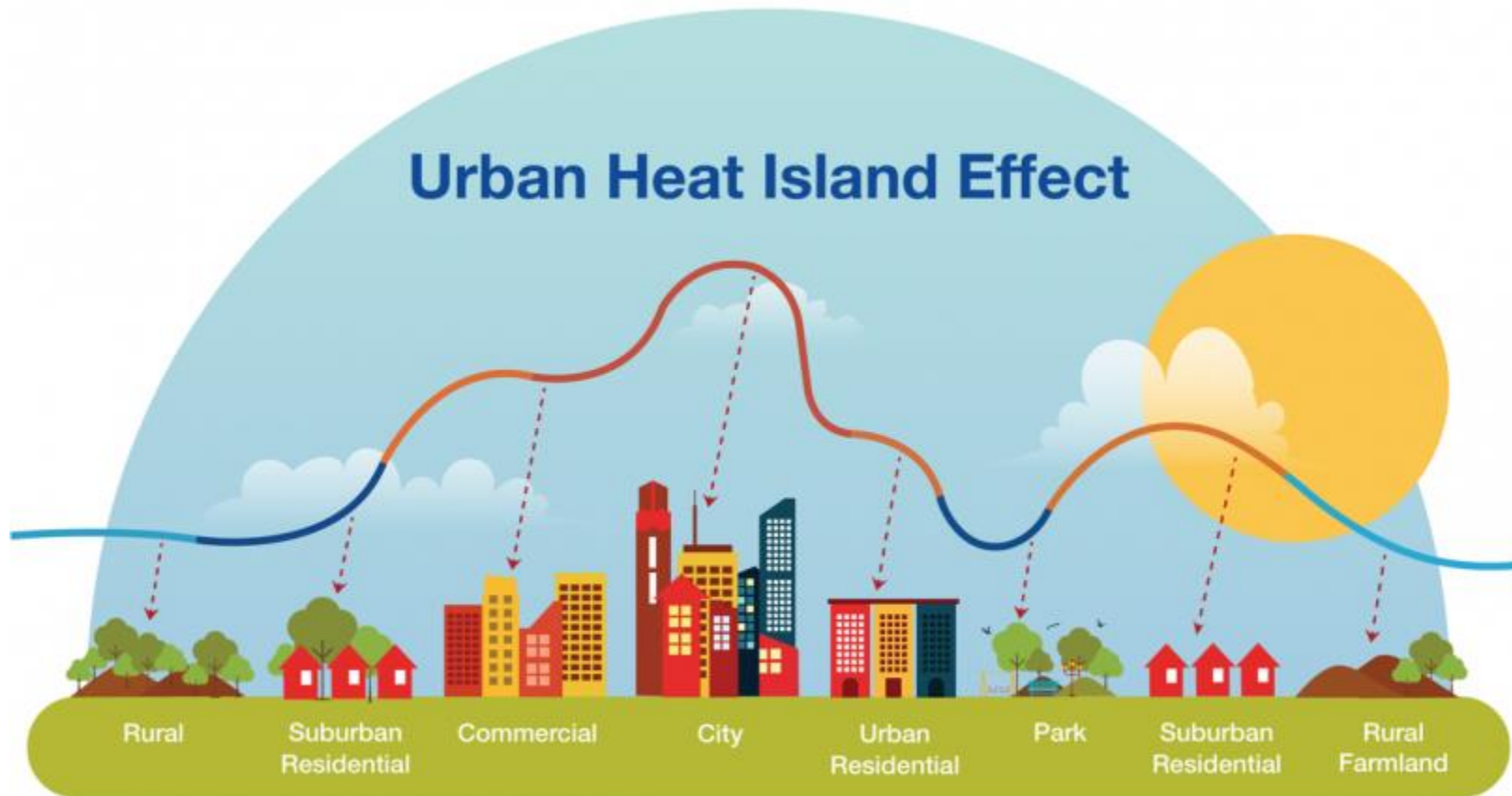
- Place matters, and people seek connections with the natural environment. When projects ignore the context around them, they slowly degrade what makes a place special.

What is “sustainable site design and management”?

- Sustainable site design and management involves the selection of native and/or adaptive plantings, water-efficient irrigation systems, minimal hardscape, and optimal exterior lighting design.
- A sustainable landscape entails not only designing and creating, but also maintaining the landscape in a sustainable manner.

Sustainable landscapes are those that reduce environmental impacts, minimize maintenance costs, and contribute to the restoration and regeneration of an area.

What is “Heat Island Effect”?



Heat Island Effect is caused by the absorption of heat by hardscapes, such as dark, nonreflective pavement and buildings, and its radiation to surrounding areas.

Sustainable sites ➡ Site Design & Management-related strategies

1. Build small.

- Think small; small buildings require less resources than large buildings.
- Efficient spaces are smart and meet people's needs without being excessive.



Sustainable sites ➡ Site Design & Management-related strategies

2. Minimize hardscape.

- Water flows right over hard surfaces like paved parking lots, carrying away a precious resource that is now filled with pollutants.
- Consider using materials that allow water to flow through them, or use the least amount of hard space you can.



Hardscape refers to the non-living, solid elements in landscape architecture and design. These elements are typically constructed or installed to serve a functional purpose and contribute to the overall structure of outdoor spaces. Unlike softscape, which includes living elements like plants and soil, hardscape consists of hard, durable materials. Hard escape is impervious to water runoffs.



Sustainable sites Site Design & Management-related strategies

3. Minimize water usage.

- Not every building needs a green lawn in front of it.
- Landscape designs that use plants that grow naturally in an area add to people's sense of place and cut down on the amount of water needed to keep the landscape looking good.

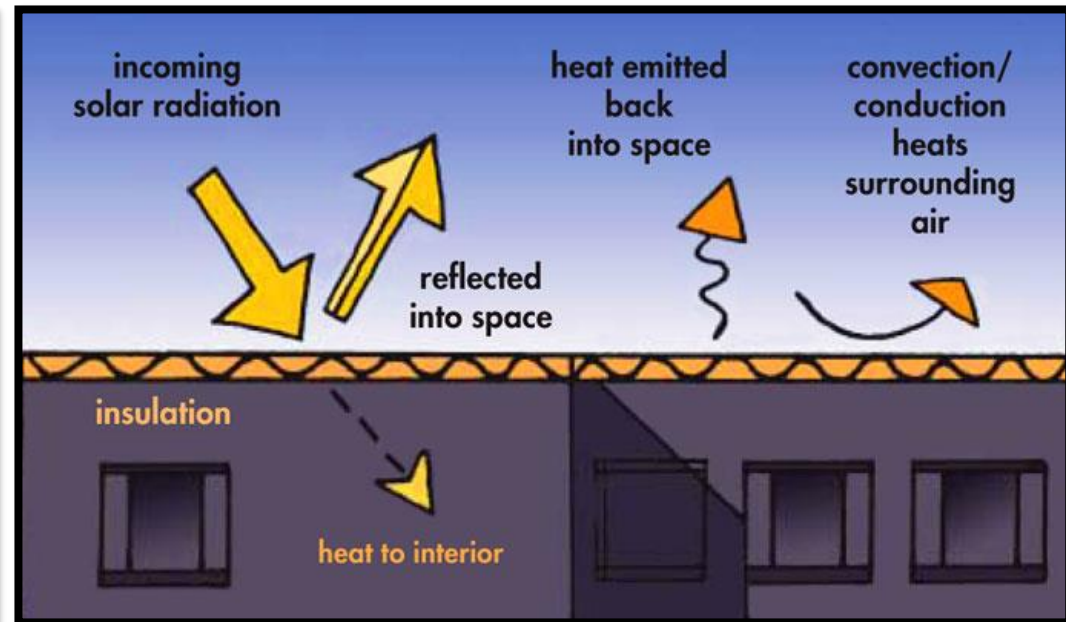


Plants that need very little to no water

Sustainable sites → Site Design & Management-related strategies

4. Use reflective materials.

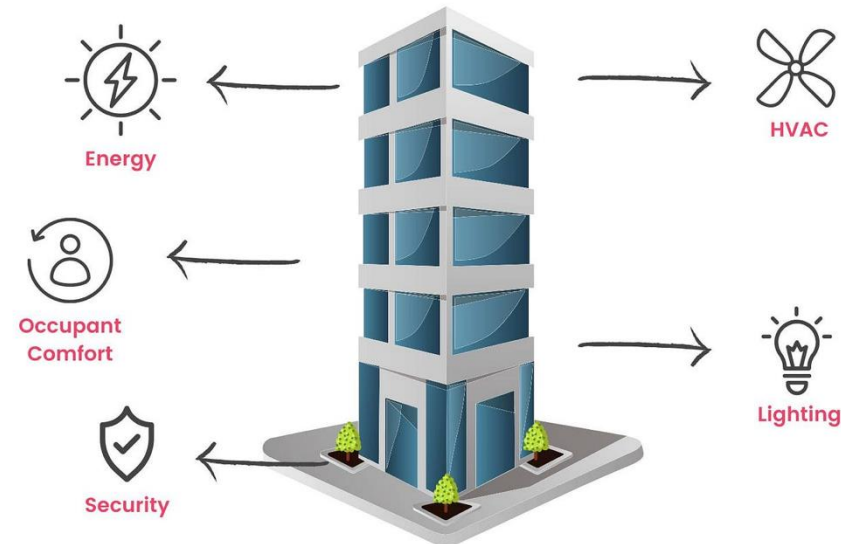
- Black absorbs heat, but light colors reflect heat back into the atmosphere.
- Instead of using a black roof or asphalt, use light-colored materials so that the overall temperature of an area doesn't rise.



Sustainable sites Site Design & Management-related strategies

5. Develop a sustainable management plan.

- There are lots of people involved in taking care of a building.
- Don't leave it up to chance that everyone will understand the importance of green.
- Write a plan for taking care of the building, and share it with those involved in the maintenance of the facility.



Sustainable sites Site Design & Management-related strategies

6. Reduce light pollution.

- Gazing up at the night sky in a major metropolitan area is nothing like pulling over on a country road.
- Lighting from buildings pollutes the night sky, inhibiting not only star gazers but also nocturnal wildlife.
- Make sure that buildings are lit minimally at night and that this lighting is directed downward rather than up into the sky.



Sustainable Sites

D. Stormwater Management



Watch the video

Tour sustainable stormwater management in Princeton with Josh

- Link:

https://www.youtube.com/watch?v=RsbhXcHKzY4&ab_channel=SustainablePrinceton

(you may also click on the YouTube Logo below)



How does stormwater management impact the environment, the economy, and the community?

Environment

- Development frequently disturbs a site's natural ecological system. The loss of existing plants and animals can be devastating, because they provide important ecological services, including effective management of stormwater.

Economy

- The cost of providing man-made infrastructure to handle stormwater is significant. Such systems carry huge up-front installation costs as well as ongoing maintenance costs.

Community

- Surface water provides recreational opportunities in the form of swimming, fishing, and other activities, but only if it's clean. Surface-water quality can be improved by properly managing stormwater runoff.



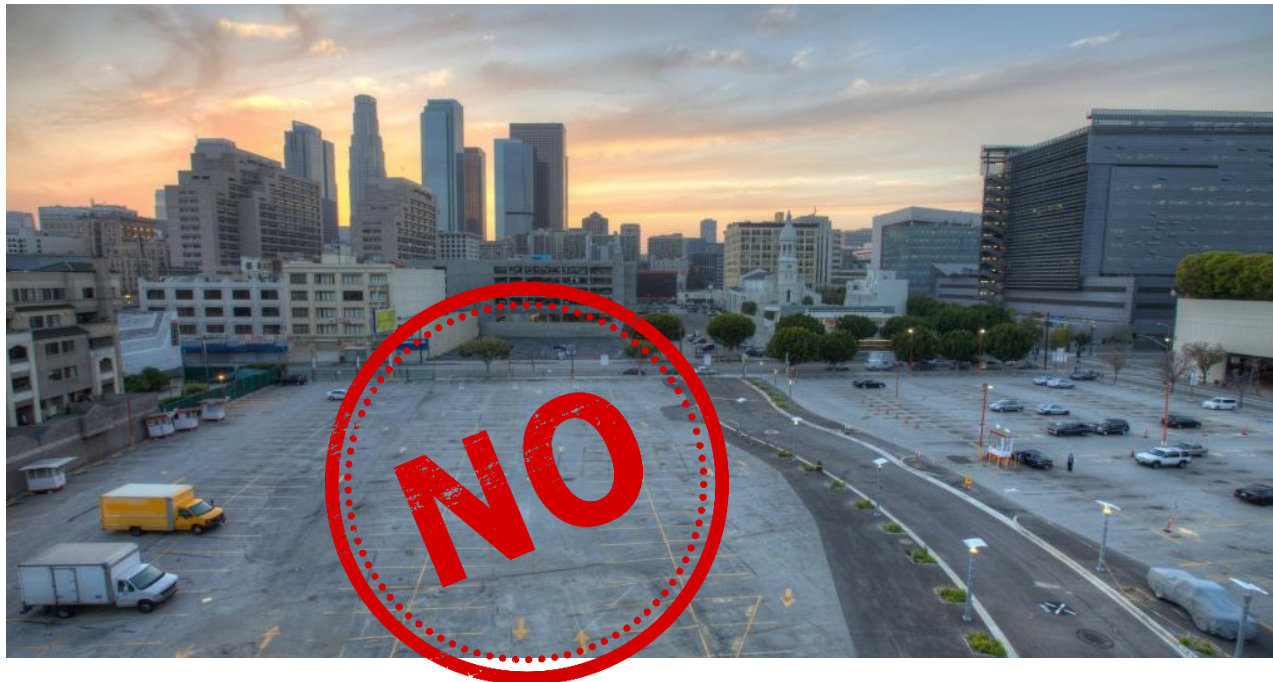
How does urban development affect stormwater flow?

- The fastest-growing source of surface-water degradation is the expansion of impervious surfaces. This is due to both a decrease in filtration and the buildup on hardscape areas of contaminants that are concentrated in surface runoff during heavy rainfall.
- Increased urbanization and development lead to more hardscapes and impervious surfaces. These, in turn, increase stormwater runoff which can accelerate erosion, thereby carrying particulates and chemicals into nearby water bodies, such as rivers and streams. Ultimately, this can jeopardize water quality, aquatic life, and recreation opportunities in nearby rivers and streams (which often provide local water supplies).

Sustainable sites Stormwater Management-related strategies

1. Minimize impervious areas.

- Think of ways to get stormwater to stay on your site rather than directing it away.
- Green roofs and pervious pavers are good ways to get water to infiltrate a site.



Sustainable sites ➡ Stormwater Management-related strategies

2. Control stormwater.

- Another way to improve the quality of water leaving your site is to slow it down.
- Rain gardens and bioswales are simply technical terms for landscape features that are designed to capture and slow down water leaving the site after a big storm.
- Nature knows best, and plants essentially clean the water of pollutants.



Sustainable sites Stormwater Management-related strategies

3. Harvest rainwater.

- Depending on the size of your project, harvesting rainwater can be as simple as connecting a barrel to a downspout or as advanced as tying the collected rainwater into the plumbing system to provide water to flush toilets.

