

Making the Case for Sustainable Infrastructure





SKYBAMA

This is how coronavirus will change our cities forever



Cities could undergo a vast transformation after the

US infrastructure funding gap swells to \$2.6 trillion: ASCE

A 'C-' rating across 17 areas of infrastructure is a slight jump from a 'D+' grade in 2017 given by the American Society of Civil Engineers.



Getty Images

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U.S. infrastructure received a mediocre 'C-' grade from the American Society of Civil Engineers (ASCE) in a [report card](#) released Wednesday, prompting leaders to renew their calls for greater investment.

News & Analysis

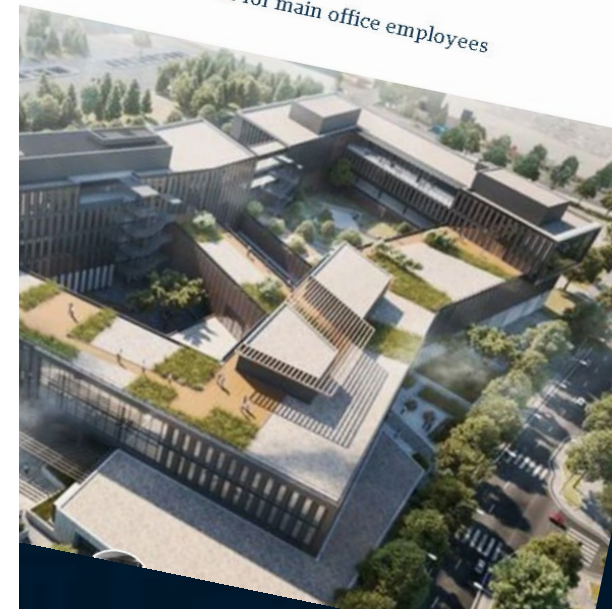
How will covid-19 change infrastructure investment?

We approached 10 leading industry figures to find out what is in store for the asset class as they begin to gradually ease the lockdowns that have been in place in recent



Is Selling Its Brand-New Offices

Planning a remote future for main office employees



Biden, Buttigieg Push Infrastructure Plan

President, transportation secretary meet House lawmakers to discuss proposal for rebuilding aging roads, dams and railroads



THE BIDEN PLAN TO BUILD A MODERN, SUSTAINABLE INFRASTRUCTURE AND AN EQUITABLE CLEAN ENERGY FUTURE

At this moment of profound crisis, we have the opportunity to build a more resilient, sustainable economy – one that will put the United States on an irreversible path to achieve net-zero emissions, economy-wide, by no later than 2050. Joe Biden will seize that opportunity and, in the process, create millions of good-paying jobs that provide workers with the choice to join a union and bargain collectively with their employers.

ASCE urges bold leadership and action, sustained investment, and a focus on resilience to raise the national infrastructure grade over the next four years, so that every American family, community, and business can thrive.



Structure - the basic physical and organizational structures and facilities
for the operation of a society or enterprise

**Sustainable
Infrastructure** -

***“Sustainable development is...
...development that meets the needs
of the present without compromising
the ability of future generations to
meet their own needs.”***

-Brundtland Commission Report 1987



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“If we put off doing right things...”

ASCE on SUSTAINABILITY

“ASCE and its members are dedicated to ensuring a sustainable future in which human society has the capacity and opportunity to maintain and improve its quality of life indefinitely, without degrading the quantity, quality or the availability of natural, economic and social resources.”

“If we put off doing right things...”

ASCE Five-year Roadmap to Sustainable Development

Priority 1 – Do the Right Project

Priority 2 – Do the Project Right

Priority 3 – Expand Technical Capacity

Priority 4 – Communicate and Advocate

CATEGORY	GRADE	TREND
Aviation	D+	Up
Bridges	C	Down
Dams	D	Same
Drinking Water	C-	Up
Energy	C-	Up
Hazardous Waste	D+	Same
Inland Waterways	D+	Up
Levees	D	Same
Ports	B-	Up
Public Parks	D+	Same
Rail	B	Same
Roads	D	Same
Schools	D+	Same
Solid Waste	C+	Same
Stormwater	D	N/A
Transit	D-	Same
Wastewater	D+	Same
Overall Grade	C-	Up

C MEDIOCRE, REQUIRES ATTENTION

D POOR, AT RISK

do
the
project
right

do the right project

in·fra·struc·ture - the basic physical and organizational structures and facilities needed for the operation of a society or enterprise

The benefits people obtain from ecosystems.

Ecosystem Services -

- Provisioning services
- Regulating services
- Cultural services
- Supporting services



The background image shows a wide, ancient stone-paved road leading through ruins of classical buildings. On the right, there are several tall, rectangular stone structures, possibly remnants of temples or public buildings, constructed from large, weathered blocks. The road is made of irregular, flat stones, some of which are missing or uneven. The sky is overcast with grey clouds. A large, semi-transparent white circle is overlaid on the left side of the image, containing text.

do the right project -
CHANGE IS HARD.



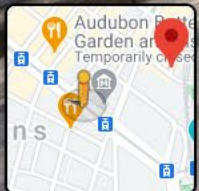
do the right project -

CHANGE HAPPENS.

- ▼ The definition of infrastructure hasn't changed in thousands of years.
- ▼ The face of infrastructure changes with every generation.

in·fra·struc·ture - the basic physical and organizational structures and facilities needed for the operation of a society or enterprise

do the right project



do the right project

Fast and Slow Drivers of Change

- ▼ Fast - Positive and Negative Disruption
 - ▼ actions of humans
 - ▼ events of nature
- ▼ Slow - a Continuous Drift
 - ▼ desire for improved livability
 - ▼ health, safety, security



prioritizing right things...

DO THE RIGHT PROJECT

- ▼ What are the needs of society today?
- ▼ What will the needs of society be in the near future?
- ▼ Is this project merely shovel-ready, or is it actually shovel-worthy?



Do the Project Right

Environmental, economic, social and technological development must be seen as interdependent and complementary concepts, where economic competitiveness and ecological sustainability are complementary aspects of the common goal of improving the quality of life.

– ASCE Policy Statement 418

Key Solutions

Our nation's infrastructure problems are solvable if we have leadership and commit to making good ideas a reality. Raising the grades on our infrastructure will require that we seek and adopt a wide range of solutions.



Leadership & Action

Smart investment will only be possible with strong leadership, decisive action, and a clear vision for our nation's infrastructure.



Investment

If the United States is serious about achieving an infrastructure system fit for the future some specific steps must be taken, beginning with increased, long-term, consistent investment.



Resilience

We must utilize new approaches, materials, and technologies to ensure our infrastructure can withstand or quickly recover from natural or man-made hazards.

**Barry Fagan, PE/PLS, ENV SP,
CPMSM, CPESC, CESSWI**



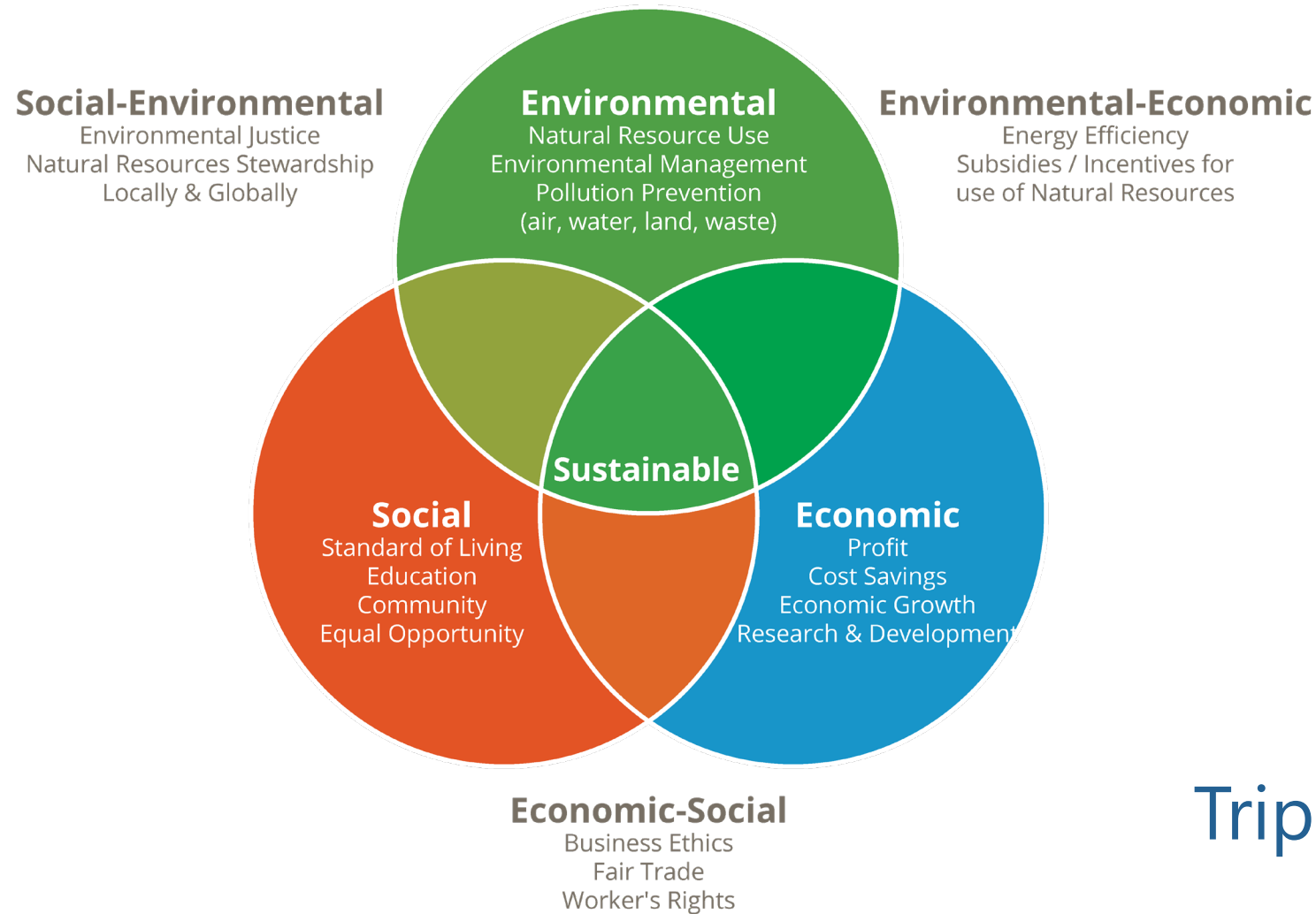
Envision is a Joint Collaboration



ISI Founding Organizations



Envision's Focus - Sustainable Development



Triple Bottom Line

Envision Credits - 64 in 5 Categories



Quality of Life

14 Credits

Wellbeing, Mobility, Community



Leadership

12 Credits

Collaboration, Planning, Economy



Resource Allocation

14 Credits

Materials, Energy, Water



Natural World

14 Credits

Siting, Conservation, Ecology



Climate & Resilience

10 Credits

Emissions, Resilience



The right project done right: Oregon Avenue Reconstruction

Sustainable features that contributed to this project earning Envision Silver include:

- ▼ Improving Safety and Access to Alternative Modes of Transportation
- ▼ Preserving Views and Local Character
- ▼ Providing Ample Opportunities for Stakeholder Involvement



ENVIRONMENTAL IMPACTS ON OREGON AVENUE

NEW PLANTING MATERIAL FOR OREGON AVENUE

Oregon Avenue is a collector road in the middle of an urban environment. Its proximity to Rock Creek Park provides a park like environment, which has attracted residents and visitors to the community.

The new plant material along Oregon Avenue will relate to Rock Creek Park, the dominant landscape feature along the entire corridor. Within Rock Creek Park, the dominant tree species varies by elevation and the surrounding terrain. In Rock Creek's more mature upland areas or slopes, the dominant tree species are oaks and hickories. In lowland areas the dominant tree species are tulip poplars, red maples, and sycamores. Other species might include the green ash, black walnut, holly, black gum, and beech. The

deciduous forest also contains woody understory vegetation including dogwoods, ironwood, mountain laurel, spicebush, and blueberries.

The healthy forest can provide a variety of animal habitats, contain a variety of tree and other plant species (including some rare and/or mature species), have a variety of forest layers (tree canopy, understory trees, shrubs, and smaller plants). Non-native invasive plants are a big problem in Rock Creek. There are dozens of plant species that do not grow here naturally, but were brought to the area by people as ornamental plantings or for food. Some of these plants grow too well and are now taking over our parklands. They out-compete native plants for light,

nutrients, water, and soil. They displace whole plant communities by smothering existing plants, increasing ground-level humidity, and changing soil chemistry and microorganisms. Birds, wildlife, insects, and other living things are adapted to specific plant communities. When plants are lost, the food, nesting sites, and habitats they provide are lost, with resulting damage to the animals that depend on them. Native plants also support the quality and functions of our wetlands and streams, as well as the natural beauty of our parks.

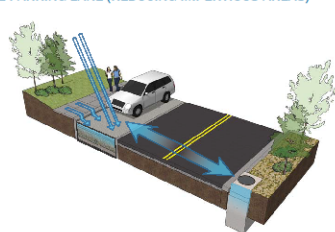
Along the entire length of the Oregon Avenue corridor opportunities exist to plant native naturalizing vegetation. These include the planting strips between the sidewalk and the roadway, areas to be

restored in residential gardens, and areas between the roadway and Rock Creek Park. While a comprehensive planting design for the roadway will be created, homeowners will be able to "adopt" the planting strips and again extend their residential garden to the sidewalk edge.

Please be aware that small actions can have a significant impact on the health of Rock Creek. Non-native plants can spread into the park's edge, eventually expanding into other parts of the forest and worsening the current situation. Consider using native plants to supplement the planting strips and in the residential planting areas near the sidewalk.

STORMWATER MANAGEMENT: PERMEABLE PAVEMENT - PARALLEL PARKING LANE (REDUCING IMPERVIOUS AREAS)

Permeable paving systems provide a hard surface, while allowing water to flow through to the underlying soils instead of into the storm sewer. It is a LID technique in which the space used for the practice can also be used for sidewalks, roads, and parking spaces. The goal is to take rainwater as it falls and quickly move it to the lower layers of the system. Stormwater is stored in an underlying stone layer until it infiltrates into the soil below, aiding in groundwater recharge, or releases slowly to the storm sewer system. Pollutants are filtered through the pavement and base layers.



On Oregon Avenue, the design will include permeable roadway pavements in parallel parking areas between Northampton Street and Rittenhouse Street. Permeable sidewalk pavements will include porous rubber pavement around and near existing trees to remain. Permeable pavements for sidewalks, such as unit pavers, concrete, and asphalt, are also being considered.

STORMWATER MANAGEMENT: PERMEABLE PAVEMENT - SIDEWALK NEAR EXISTING TREES (PROMOTING INFILTRATION AND AVOIDING ROOT DAMAGE)

One of the biggest problems in upgrading and/or installing new sidewalks is meeting the ADA requirements for walkways and preserving existing trees. Trees, especially mature ones, are very sensitive when the upper level of the root system is disturbed. Outing, scraping, or burying roots within the drip-line may cause enough stress to slowly deteriorate the health of trees. Typical practice is to avoid any work near or around an existing tree. In the urban environment, avoiding trees may not be possible. The tree causing the problem is typically removed when cracked or heaved sidewalks are replaced. This practice can now be avoided by installing porous rubber pavements right on top of the tree's root system. This is a highly porous material that allows large amounts of water to drain through. It resists cracking and heaving because of its flexibility and durability.

Roots are exposed, cleaned, and covered with rubber pavement and no longer need to be cut or buried.

The result is a durable sidewalk that complies with accessibility codes and does not damage existing trees. On Oregon Avenue, porous rubber sidewalks will be used near and around existing trees to remain. In some cases, the application will be limited to the tree's drip-line. A significant portion of the project will see porous rubber sidewalks within existing tree stands where the sidewalk meanders through trees. The goal is provide a continuous sidewalk that allows for connectivity and accessibility, while preserving the mature trees that give Oregon Avenue the park-like character everyone enjoys.



URBAN FORESTRY ADMINISTRATION POLICY FOR AVOIDANCE DBH" x 5' = AREA NOT TO BE DISTURBED EXAMPLE: 20" x 5' = 100' (8'-4")



Use of porous rubber at sidewalk locations to preserve tree



Use porous rubber pavement in the area of disturbance

ST. JOHN'S COLLEGE HIGH SCHOOL

UPPER CHEVY CHASE

COMMUNITY GARDENS

REGENERATIVE STORMWATER CONVEYANCE SYSTEM (TYP.)

RELEVANT STORMWATER MANAGEMENT EFFORTS TO HELP HEAL ROCK CREEK PARK REGENERATIVE STORMWATER CONVEYANCE SYSTEMS, BY DDCE

SURVEY OF TREES EAST OF OREGON AVE.

KNOLLWOOD

EXISTING BIORETENTION CELLS TO REMAIN

National Park Service 1 to 1 Policy for Tree Replacement 1" Removed = 1" Replaced

Example: 20" DBH is replaced (4) 5" dia. trees or (10) 2" dia. trees or (20) 1" dia. trees or similar



URBAN FORESTRY ADMINISTRATION POLICY FOR AVOIDANCE DBH" x 5' = AREA NOT TO BE DISTURBED EXAMPLE: 20" x 5' = 100' (8'-4")



KNOLLWOOD

EXISTING BOX CULVERT OPENING

Upstream (East Side): 14' - 5" wide, 4'-9 3/4" high
Downstream (West Side): 14'-10" wide, 5'-7" high

Currently storms over the 5 year storm overlap the box culvert.



Option 1 - Most Functionally Efficient

PROS

- Least impact to the immediate physical surroundings
- Shortest length necessary
- Least likely to get debris buildup
- Least expensive
- Shortest construction time

CONS

- Aesthetic limitations



Option 2 - The Compromise

PROS

- Compromise on both aesthetics and functionality

CONS

- Similar issues as Option 3 but less severe



Option 3 - Least Functionally Efficient

PROS

- Blends in well with the natural surroundings

CONS

- Most impact to the immediate physical surroundings
- Will require raising the roadway to allow the 50 year storm to pass
- Longer bridge span will cause damage to nearby trees and landforms
- Debris accumulation likely causing further flooding and maintenance
- More expensive
- Longer construction period

BARNABY WOODS

STORMWATER MANAGEMENT OVERVIEW

The District Department of Transportation (DDOT) is installing Low Impact Development (LID) practices in the public right-of-way to capture stormwater runoff from city streets. Stormwater runoff carries pollutants from rooftops, roadways, alleys, and parking lots to the District's storm drain system and into streams and rivers.

The pollutants impair the health of small streams and contribute to problems in the Anacostia River, the Potomac River, and the Chesapeake Bay. The significant volumes of water erode stream banks and create poor conditions for aquatic life. The U.S. Environmental Protection Agency has issued a Municipal Separated Storm Sewer System (MS4) Permit to the District that requires stormwater runoff volume reduction and retrofits to existing buildings and streets to reduce stormwater runoff.

The District is using green infrastructure and low impact development (LID) practices to meet the requirements of the MS4 permit by capturing and filtering stormwater runoff. LID practices, such as bioretention and permeable paving, manage stormwater in small areas to reduce the surge of water flowing into streams, prevent trash and

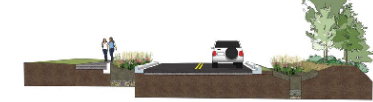
pollutants from entering streams, and improve overall water quality of streams and rivers.

Mature trees not only provide natural character and wildlife habitat, but also help reduce rainfall from reaching the ground and become runoff. Tree preservation includes avoiding construction near the root zone and/or preparing trees for upcoming disturbances. In situations where work near and around trees is unavoidable, innovative porous paving material made of recycled products can be installed without damaging the tree and compromising ADA compliance.

Bioretention cells use the natural functions of plants and soils to remove pollutants from stormwater runoff. The strategy uses storage, sediment capture, and biological processes to clean the water. These mimic processes that occur in nature before water reaches waterways. The layers of plant material, mulch, planting media (a mix of soil, sand, and compost), and stone capture metals, nutrients, and bacteria that flow into the surrounding rivers. The rainwater is held in the planting bed until it infiltrates into the ground or evaporates. The entire system can fit into small spaces, making it adaptable to curb extensions, tree spaces along the road, medians, terraced slopes, and planter boxes.

On Oregon Avenue, the design will integrate Bioretention Cells between the sidewalk and the roadway curb (on the west side) and between the roadway curb and Rock Creek Park (on the east side). Potential design challenges to overcome include space, utilities, horizontal roadway grades, driveways, existing trees, and nearby topography.

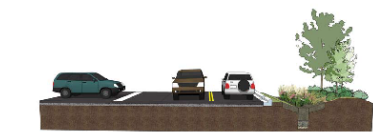
BIORETENTION CELLS (A PLANT-BASED STORMWATER MANAGEMENT DEVICE)



SECTION A-A Near Western Ave.



SECTION A-A Near Daniel Lane



SECTION B-B Thru Daniel Lane

HAWTHORNE

PINEHURST PARKWAY PARK



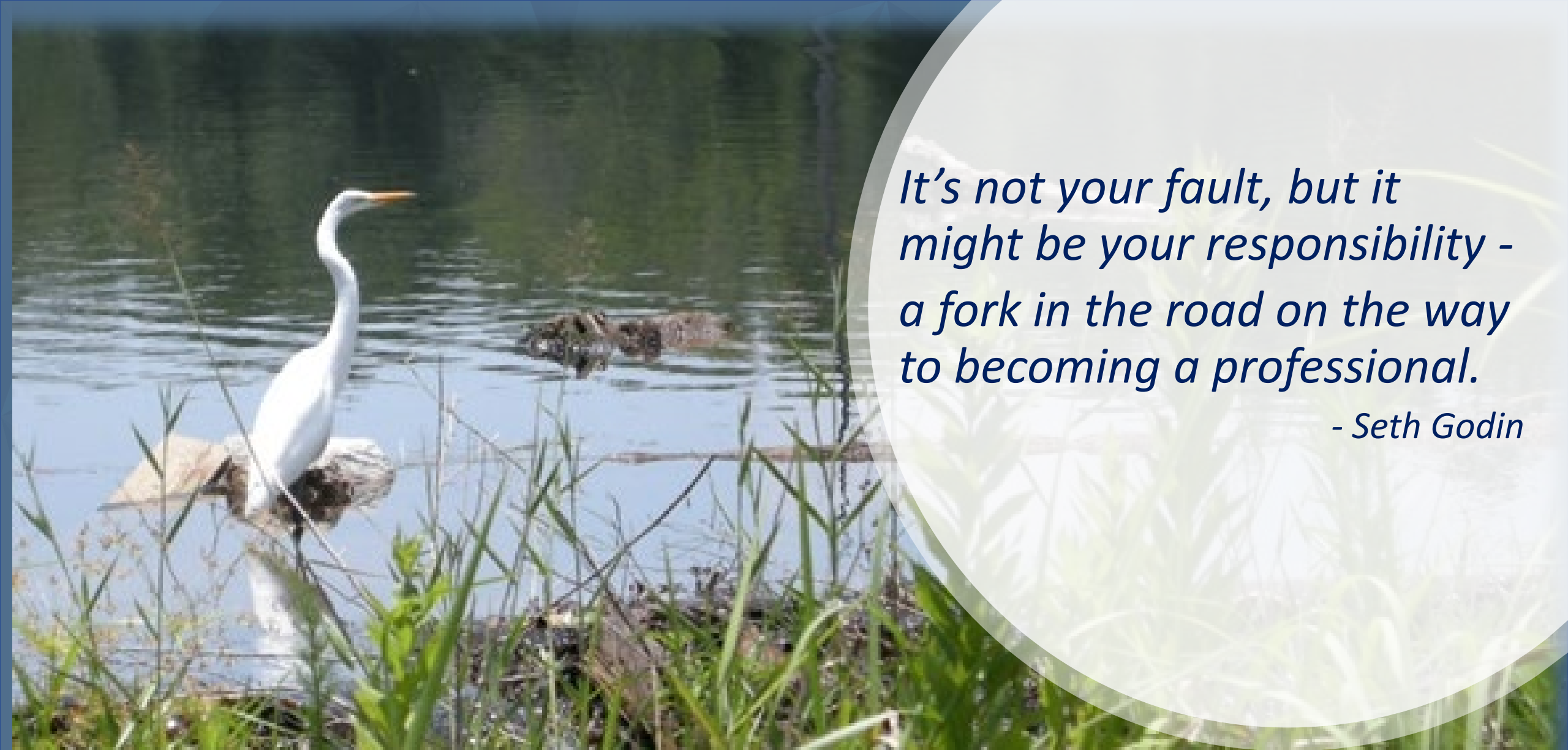


Oregon Avenue Reconstruction: the right project, done right to maximize the return investment to the community and environment

Strategies For Delivering Livable, Sustainable, Resilient Infrastructure -

Sustainable Infrastructure -

- ▼ Take care of our stuff
- ▼ Invest in things of value
- ▼ Consider the needs of all stakeholders
- ▼ Maximize the return on our investment



*It's not your fault, but it
might be your responsibility -
a fork in the road on the way
to becoming a professional.*

- Seth Godin