Envision™ – Helping Deliver the Next Generation of Infrastructure

Patel College of Global Sustainability

Systems Thinking – The Key to Sustainability

David M. Taylor, ENV SP
President

TAYLOR **FUTURE SOLUTIONS,** LLC

Sustainable Community and Transport Strategies

INTRODUCTIONS AND PURPOSE

Introduction

- **David Taylor**, ENV SP
  - Heads a consultancy that offers sustainable community and transport strategies to public and private clients
  - Formerly director of Sustainable Transportation Solutions at HDR
  - Both an Envision Sustainable Professional (ENV SP) and an ISI Verifier
  - Firm is an Envision-Qualified Company
  - Involved with Envision in a variety project types
    - Streetcar, Light Rail and High Speed Rail
    - Highway
    - Wastewater treatment facility
    - Campus parking lot
  - Actively involved with professional associations/conference speaker

Purpose

- Discuss sustainability and your interest
- Understand the importance of infrastructure and rationale for Envision™
- Provide an understanding of Envision™ and how it benefits decision-making
- Offer a means of accessing the suite of tools
- Demonstrate how the tool works
- Show a series of Envision-recognized state-of-the-art projects

Sustainability Defined

- **UN Brundtland Commission** (*Our Common Future, October 1987*)

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

- **Interpreted Corporate Definition**

  Sustainability is the act of balancing the environmental, community, and economic needs of the built and natural environments for present and future generations.

Habitat III Quito

- H I – 1976, Vancouver: 38% of world population was urban
- H II – 1996, Istanbul: 45% of world population was urban
- **H III – 2016, Quito: 55% of world population was urban**
- By 2050, world urban population to double
- 21st century to be one of the most transformative in history
- All parts of the globe will be impacted
- New Urban Agenda – Calls for sustainable cites and human settlements for all https://www2.habitat3.org/the-new-urban-agenda
- There is greater need for infrastructure and sustainable development for all

INFRASTRUCTURE AND THE NEED FOR A PLANNING AND RATING SYSTEM

The Importance of Infrastructure

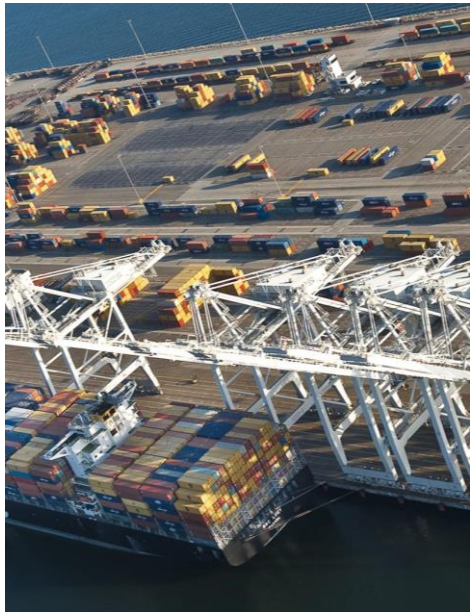
- **World is a fragile place and infrastructure provides:**
  - A basis for public health
  - A quality of life worth living
  - Economic vitality
- **Realities of today's world:**
  - Population growth
  - Diminished resources
  - Climate change
  - Resilience and adaptation
- **The new fact of life:**
  - Not enough that infrastructure works, is constructed on time and within budget, or even that it lasts
  - It must now be ***sustainable***

LEED Transformed the Building Industry

- **Redefined building value**
  - Building customers (owners, tenants, residents, the public) recognize value of building “green”
  - Higher first costs ➔ lower life cycle costs
- **Developed value metrics**
  - System for measuring, assessing and recognizing building performance
  - Better LEED-defined performance = higher value
- **Created the brand**

What About Infrastructure?

- **Infrastructure – A different challenge than buildings**
  - Building design and construction is usually controlled by a single organization
  - Infrastructure projects are more public and affect or benefit macro-ecosystems, communities and regions
  - Infrastructure projects must consider
    - Public stakeholder expectations and support
    - Environmental responsibility
    - Impact on public life
    - Use of public funds – sustainability needs to pay for itself!



The Need for a Rating System

- 900 rating systems are available worldwide
- Current US rating systems are sector-specific
- No US system covers all infrastructure systems
- The state of US infrastructure

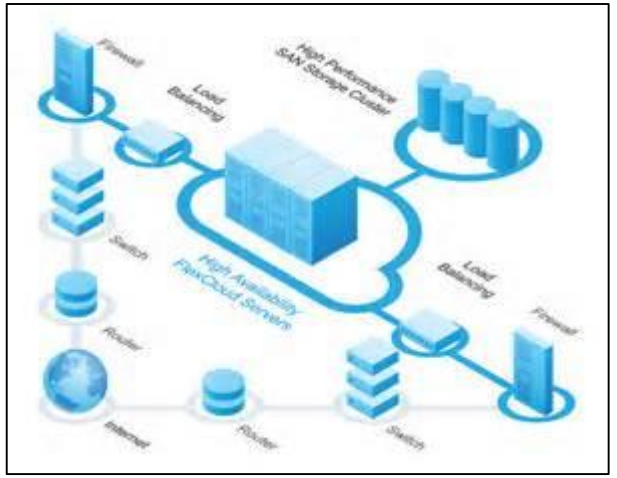
State of Infrastructure

- North American infrastructure in decline and disrepair
- World Economic Forum *Global Competitiveness Report*
  - US ranked 25rd worldwide, just ahead of Qatar
- Many communities have systems at the end of their useful life
- The typical strategy seems to be deferred maintenance, not system enhancement
- Lack of ability keep pace with ever-changing sustainability concepts

America's State of "Bad" Repair

- ASCE's Current Report Card
  - 16 categories rated
  - Overall grade of D+ (Up from "D" in 2012)
  - $3.6 trillion investment needed by 2020 to maintain a state of good repair
- Proposed Solutions
  - Increase leadership for renewal
  - Promote sustainability and resilience
  - Develop funding plans to maintain and enhance infrastructure

Challenge: Delivering Future Sustainable Infrastructure



We Are Building 2070 and Beyond Today!

Highways

20-50 years

Bridges

30-75 years

Pipelines

50-100 years

Dams

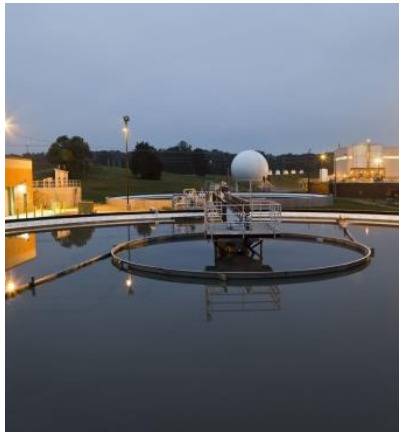
50-100 years

The Need - A System for All Horizontal Infrastructure

ENERGY

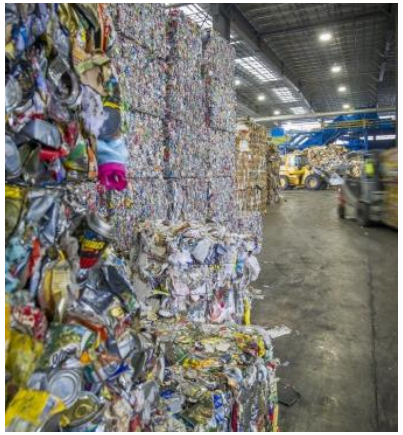
- Geothermal
- Hydroelectric
- Nuclear
- Coal
- Natural Gas
- Oil/refinery
- Wind
- Solar
- Biomass
- Other

WATER



- Potable water distribution
- Capture and storage
- Water reuse
- Storm water management
- Flood control
- Other

WASTE

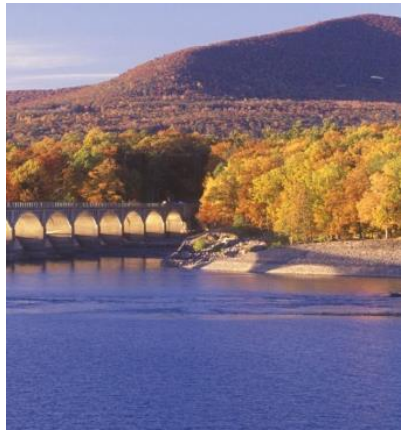


- Solid waste
- Recycling
- Hazardous waste
- Collection and transfer
- Other

TRANSPORTATION

- Airports
- Roads/highways
- Bike/pedestrians
- Railways
- Public transit
- Ports
- Waterways
- Other

LANDSCAPE



- Public realm
- Parks
- Ecosystem services
- Other

INFORMATION

- Telecommunications
- Internet/phones
- Satellites
- Data centers
- Sensors
- Other

THE ENVISION RATING SYSTEM

Envision™ - Collaborative Development

Institute for Sustainable Infrastructure

The Institute for Sustainable Infrastructure is a not-for-profit education and research organization founded by the American Public Works Association, the American Council of Engineering Companies and the American Society of Civil Engineers.

ZOFNASS PROGRAM FOR SUSTAINABLE INFRASTRUCTURE
Graduate School of Design Harvard University

Envision® was developed in joint collaboration between the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design and the Institute for Sustainable Infrastructure.

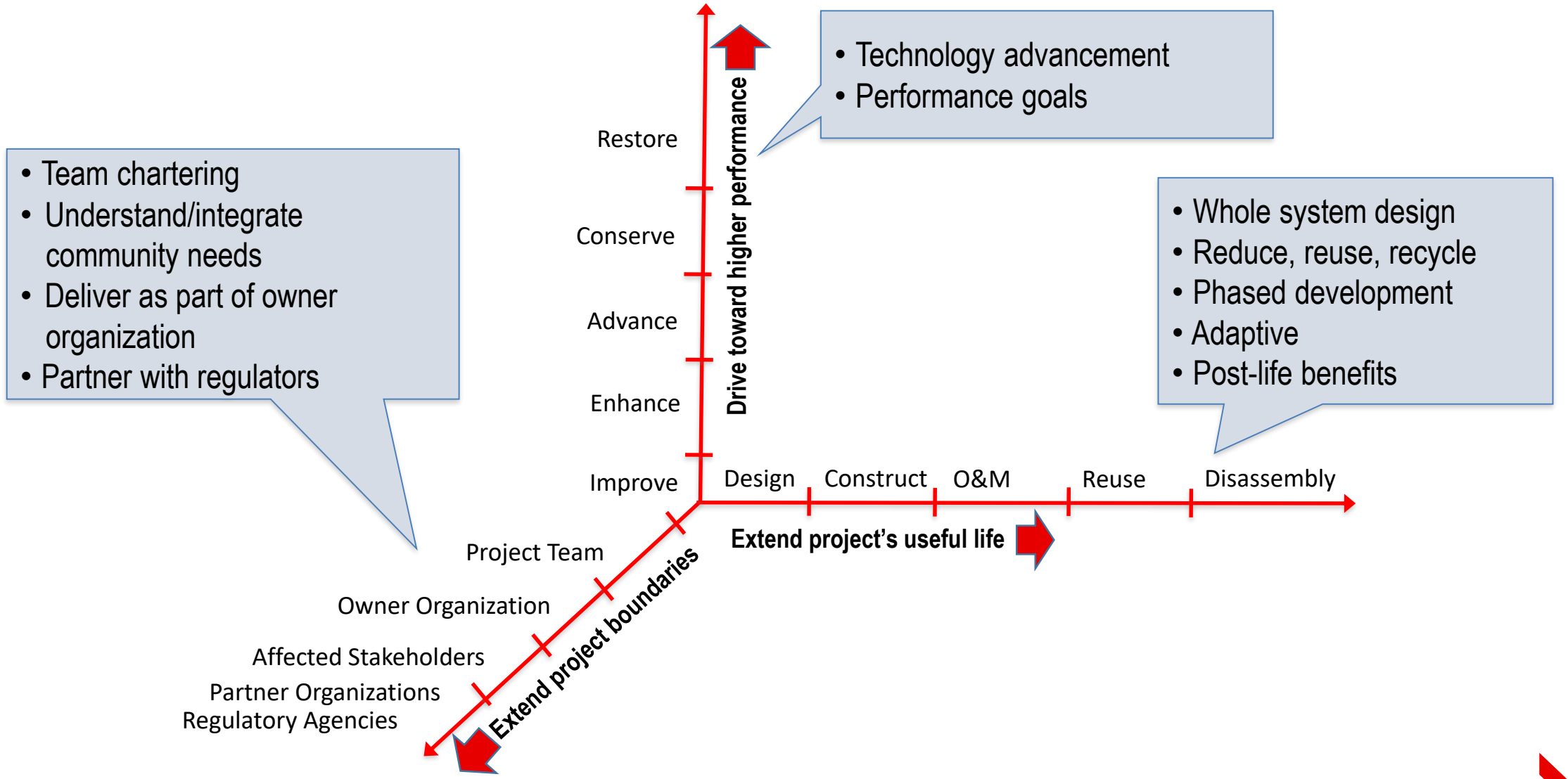
ASCE APWA ACEC

- **To help infrastructure owners make more informed decisions about the sustainability of their infrastructure projects**

- **Envision® is not a decision making tool**
- **A challenging tool – Is it the *RIGHT* project?**
- **It is a planning and decision-making guide**

- **Envision applies to all civil infrastructure**
- **Envision applies to all project phases**
- **Is designed to keep pace with a changing concept of sustainability**

Envision and Project Development

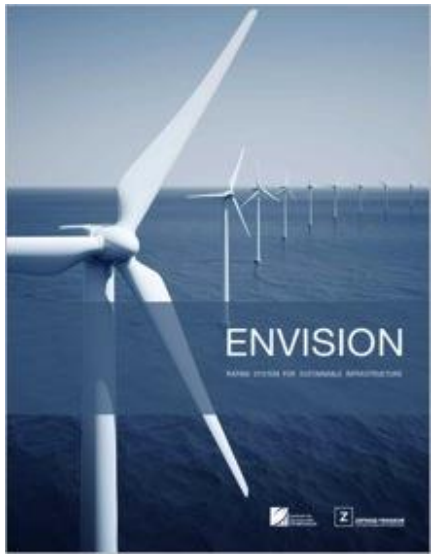


ENVISION COMPONENTS

GUIDANCE MANUAL

PRE-ASSESSMENT CHECKLIST

ONLINE SCORESHEET



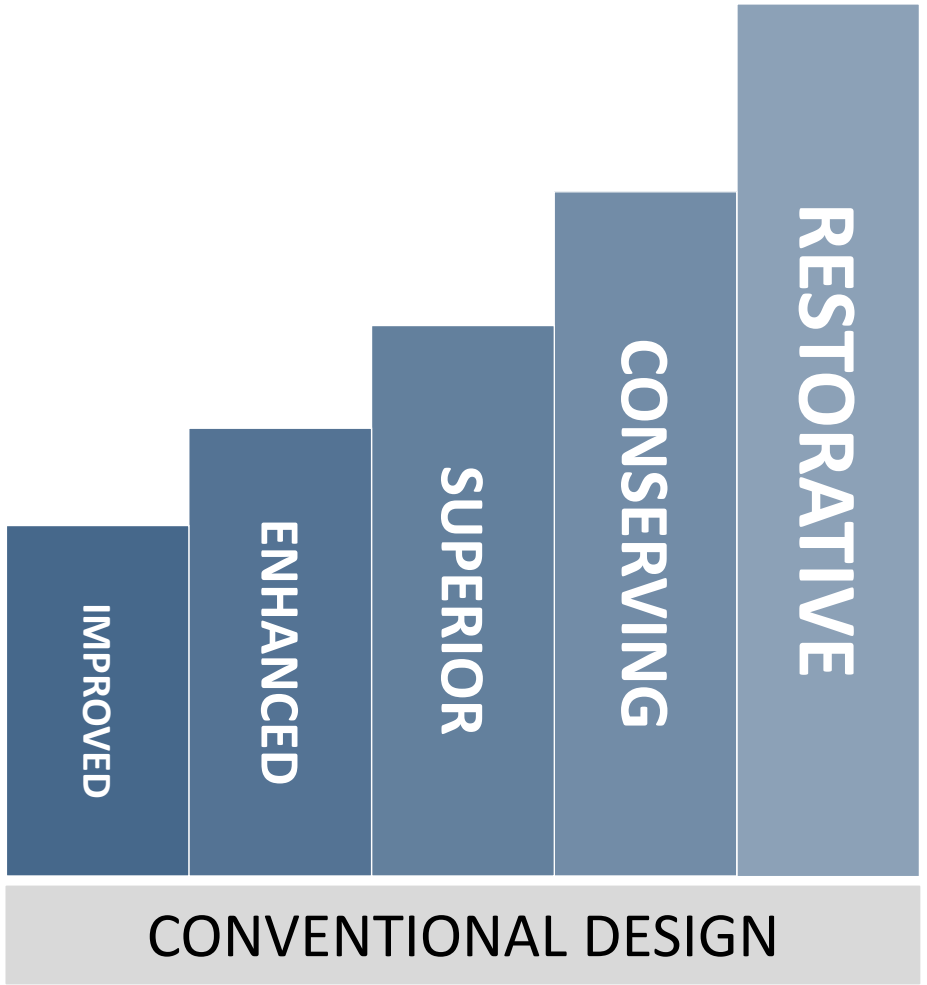
- **A no-cost, downloadable guidance manual**

- **A no-cost, downloadable, self-assessment tool**
- **Familiarizes users with sustainability**
- **Quick alternatives assessment option**

- **A no-cost, comprehensive online Scoresheet**

FIVE CATEGORIES
60 CREDITS

FIVE LEVELS OF ACHIEVEMENT



ENVISION COMPONENTS

PROJECT VERIFICATION AND AWARD PROGRAM

20%

30%

40%

50%

- **Independent third-party review**
- **Optional with associated fee**
- **Easy to use online process**
- **Projects must meet a minimum percentage of points to be eligible**
- **An ENV SP must submit the project application**

Fee Schedule

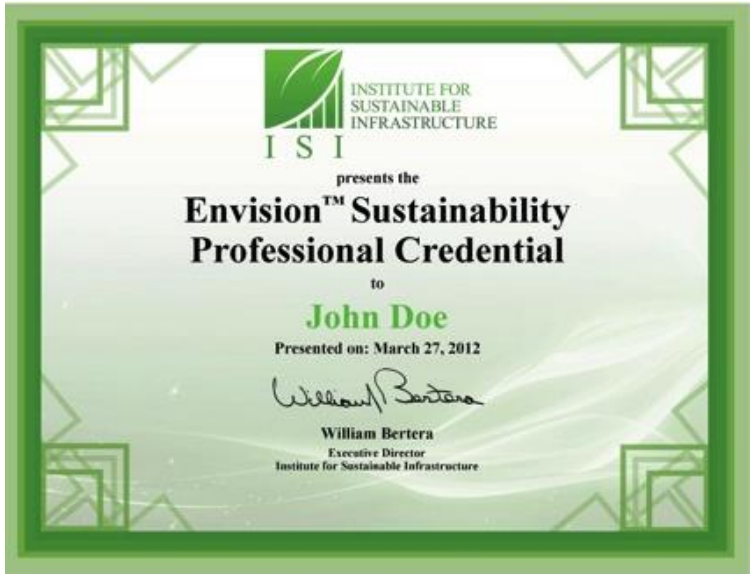
- ✓ Registration Fee: $1000
- ✓ Verification Fee:

Project Size (M)	Non-Member Price	ISI Member Price
Up to $2M	$3,000	$2,400
$2-5M	$8,500	$7,000
$5-25M	$17,000	$14,000
$25-100M	$25,000	$21,000
$100-250M	$33,000	$28,000
Over $250M	Contact ISI for large or multi-phase projects	

- ✓ Optional Appeals Fee: $500 per credit

ENVISION COMPONENTS

PROFESSIONAL CREDENTIALING

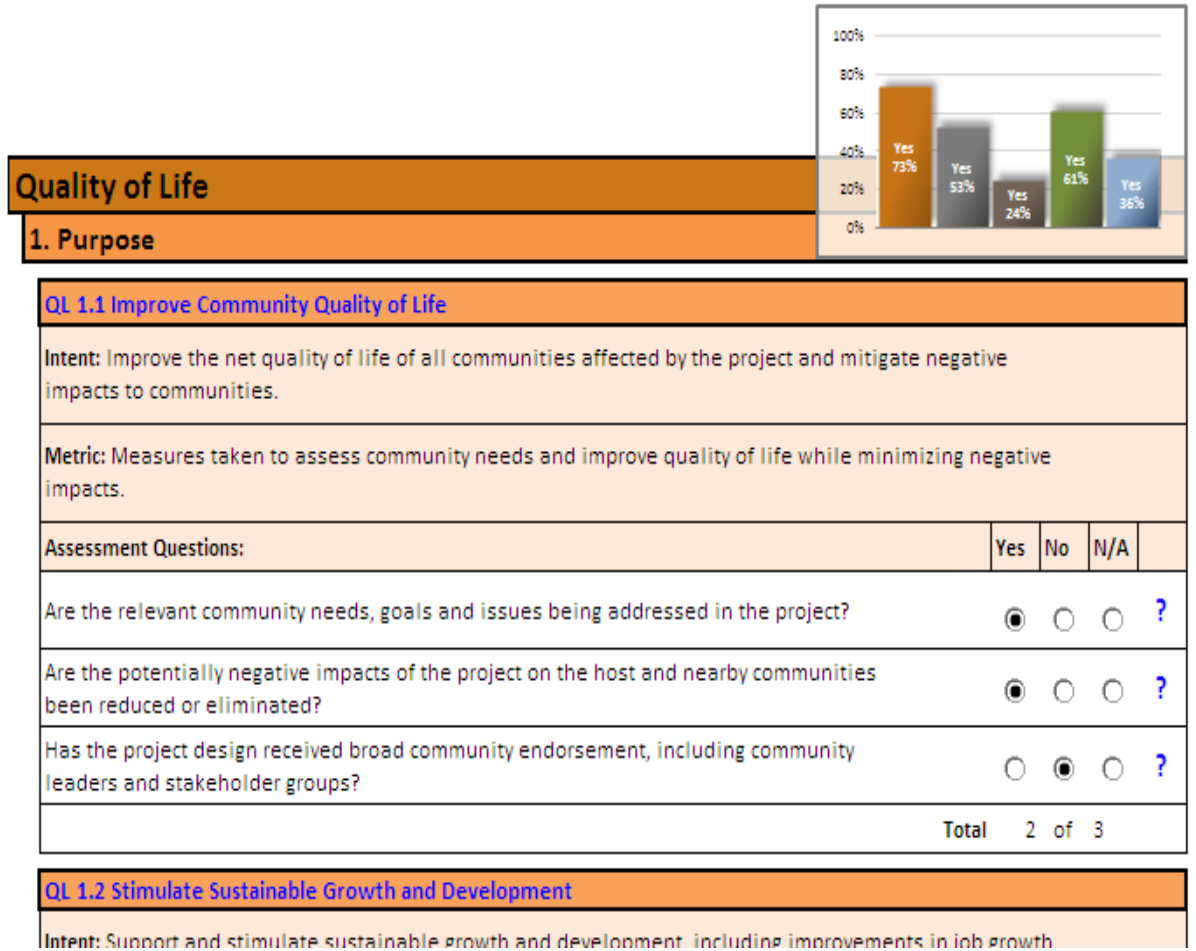


- Envision Sustainability Professional (ENV SP)
- Approx. 4,800 ENV SPs world-wide
- Credentialing costs are discounted for the public sector and members
- Online or in-person training
- Online exam

APPLYING THE SYSTEM

Envision Checklist

- Available for no cost on ISI website
- Contains Yes/No questions
- Used for project self-assessment
  - Introduce concepts of sustainability to infrastructure projects
  - Initial assessment before using Envision rating system
  - Rapidly compare project alternatives



Envision Guidance Manual Structure

- Intent
- Metric
- Levels of Achievement
- Description
- Advancing to higher achievement levels
- Evaluation criteria and documentation
- Sources

QL1.1 IMPROVE COMMUNITY QUALITY OF LIFE

INTENT:

Improve the net quality of life of all communities affected by the project and mitigate negative impacts to communities.

LEVELS OF ACHIEVEMENT

IMPROVED	ENHANCED	SUPERIOR	CONSERVING	RESTORATIVE
(2) Internal focus. The project team has located and reviewed the most recent and relevant community planning information. Some, but not systematic outreach to stakeholders and decision makers has taken place. Some relatively easy, but not particularly important or meaningful changes made to the project. No significant adverse community effects are caused by the project (A, B, C)	**(5) Community linkages.** More substantive efforts to locate, review, assess and incorporate the needs, goals and plans of the host community into the project. Most potential negative adverse impacts of the project on the host community are reduced or eliminated. Key stakeholders are involved the project decision-making process. (A, B, C)	**(10) Broad community alignment.** All relevant community plans are reviewed and verified through stakeholder input. The project team works to achieve good project alignment with community plans, recognizing that the scope of the project is a limiting factor. Potential negative impacts on nearby affected communities are reduced or eliminated. (A, B, C)	**(20) Holistic assessment and collaboration.** The project makes a net positive contribution to the quality of life of the host and nearby affected communities. The project team makes a holistic assessment of community needs, goals and plans, incorporating meaningful stakeholder input. Project meets or exceeds important identified community needs and long-term requirements for sustainability. Remaining adverse impacts are minimal, mostly accepted as reasonable tradeoffs for benefits achieved. The project has broad community endorsement. (A, B, C)	**(25) Community renaissance.** Through rehabilitation of important community assets, upgraded and extended access, increased safety, improved environmental quality and additional infrastructure capacity, the project substantially reinvigorates the host and nearby communities. Working in genuine collaboration with stakeholders and community decision-makers, the project owner and the project team scope the project in a way that elevates community awareness and pride. Overall quality of life in these communities is markedly elevated. (A, B, C, D)

DESCRIPTION

This credit addresses the extent to which the project contributes to the quality of life of the host community: the community in which the constructed works is situated and directly affects. This determination is based on how well the project team has identified and assessed community needs, goals and objectives, and incorporated them into the project. Relevant community plans are assumed to be a viable expression of those needs, goals, objectives and aspirations. In a real sense, they are the community's expression of their desired quality of life.

Communication and interactions with community stakeholders is essential to reaffirm and improve the assessment. The project team works closely with community stakeholders to identify and address issues and concerns. When operational, the constructed works is expected to contribute to the efficiency and effectiveness of community infrastructure, while having minimal impact on the environment. Its benefits should be seen as equitably distributed throughout the community.

A project designed to benefit one community may have adverse effects on others. The purpose of this credit is to recognize projects that provide significant benefits to affected communities, as well as reduce or eliminate negative impacts. Positive effects on all important dimensions of performance may not be practical. Thus the credit seeks a net positive impact.

If the project team can show that the affected community (or communities) has an existing project assessment and approval process that verifies that the project is in concert with community goals and objectives, and that the project has gone through that process successfully, then that success will constitute achievement of this credit. The level of achievement will be determined by the Assessor and Verifier, and is a function of the comprehensiveness of the process, the extent to which community stakeholders are engaged in collaborative dialogue (rather than merely outside input to the process), and the degree to which improvements were made and/or adverse impacts mitigated.

ADVANCING TO HIGHER ACHIEVEMENT LEVELS

Benchmark: The project team may have located and reviewed community plans, looking for possible project fatal flaws. The team complies with local regulations and policies for stakeholder involvement.

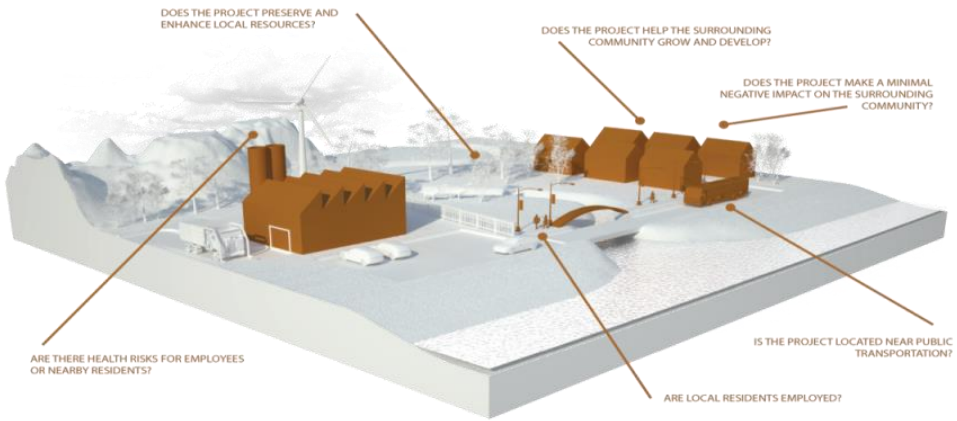
Performance improvement: Give increased attention to community needs, goals, plans and their relation to the project. Increase the thoroughness and participatory engagement by which community goals and plans are incorporated into the project. Give additional consideration to existing conditions and look for opportunities to rehabilitate community assets. Achieve strong endorsement by stakeholders and community leaders.

EVALUATION CRITERIA AND DOCUMENTATION

A. Has the project team identified and taken into account community needs, goals, plans and issues?

1. Lists and examples of documents obtained and reviewed, minutes of meetings with key stakeholders, community leaders and decision-makers, letters and memoranda.

QUALITY OF LIFE



PURPOSE

QL1.1 Improve Community Quality of Life

QL1.2 Stimulate Sustainable Growth and Development

QL1.3 Develop Local Skills and Capabilities

WELLBEING

QL2.1 Enhance Public Health and Safety

QL2.2 Minimize Noise and Vibration

QL2.3 Minimize Light Pollution

QL2.4 Improve Community Mobility and Access

QL2.5 Encourage Alternative Modes of Transportation

QL2.6 Improve Accessibility, Safety & Wayfinding

COMMUNITY

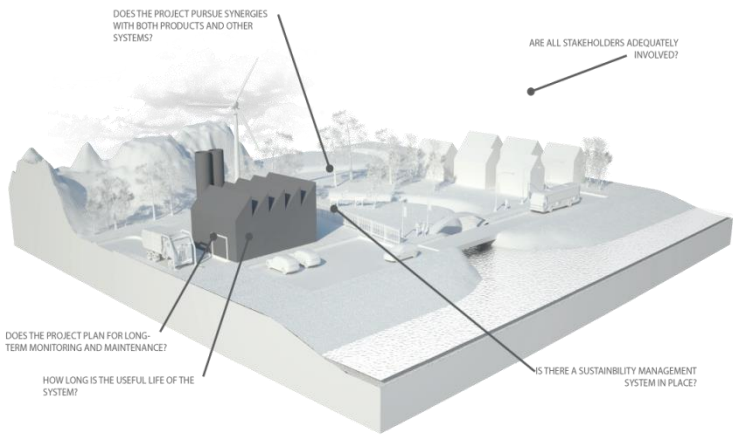
QL3.1 Preserve Historic and Cultural Resources

QL3.2 Preserve Views and Local Character

QL3.3 Enhance Public Space

QL0.0 Innovate or Exceed Credit Requirements

LEADERSHIP



COLLABORATION

LD1.1 Provide Effective Leadership & Commitment

LD1.2 Establish a Sustainability Management System

LD1.3 Foster Collaboration and Teamwork

LD1.4 Provide for Stakeholder Involvement

MANAGEMENT

LD2.1 Pursue By-Product Synergy Opportunities

LD2.2 Improve Infrastructure Integration

PLANNING

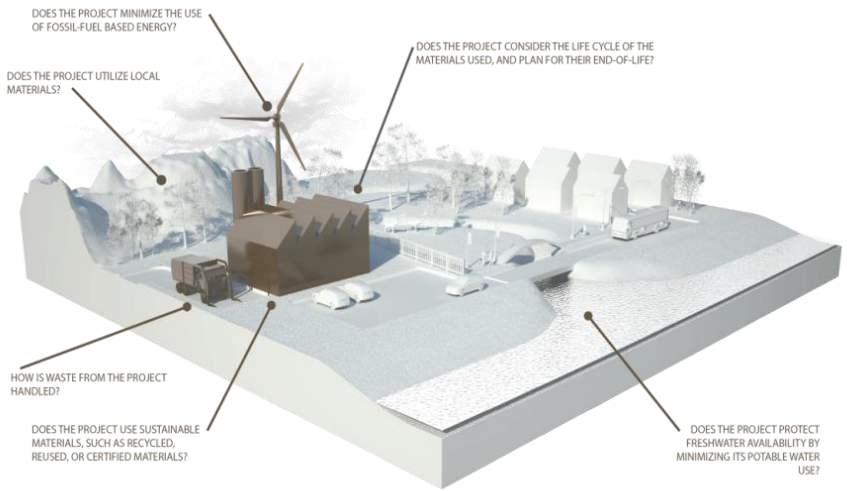
LD3.1 Plan Long-Term Maintenance and Monitoring

LD3.2 Address Conflicting Regulations and Policies

LD3.3 Extend Useful Life

LD0.0 Innovate or Exceed Credit Requirements

RESOURCE ALLOCATION



MATERIALS

RA1.1 Reduce Net Embodied Energy

RA1.2 Support Sustainable Procurement Practices

RA1.3 Use Recycled Materials

RA1.4 Use Regional Materials

RA1.5 Divert Waste from Landfills

RA1.6 Reduce Excavated Materials Taken Off Site

RA1.7 Provide for Deconstruction and Recycling

ENERGY

RA2.1 Reduce Energy Consumption

RA2.2 Use Renewable Energy

RA2.3 Commission and Monitor Energy Systems

WATER

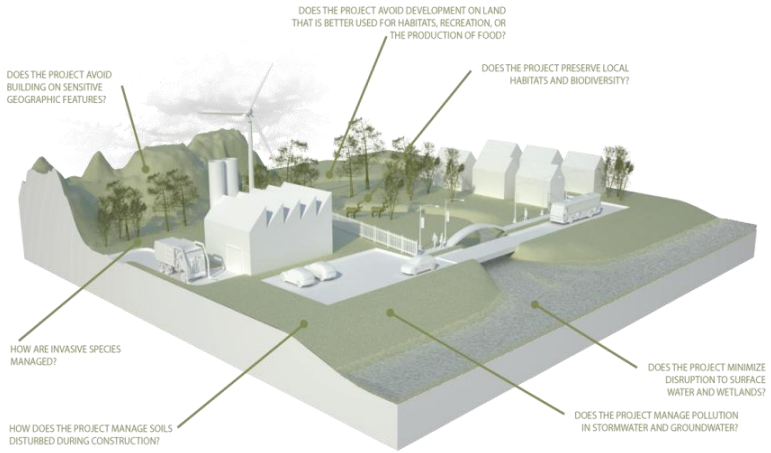
RA3.1 Protect Fresh Water Availability

RA3.2 Reduce Potable Water Consumption

RA3.3 Monitor Water Systems

RA0.0 Innovate or Exceed Credit Requirements

NATURAL WORLD



SITING

NW1.1 Preserve Prime Habitat

NW1.2 Preserve Wetlands and Surface Water

NW1.3 Preserve Prime Farmland

NW1.4 Avoid Adverse Geology

NW1.5 Preserve Floodplain Functions

NW1.6 Avoid Unsuitable Development on Steep Slopes

NW1.7 Preserve Greenfields

LAND+WATER

NW2.1 Manage Stormwater

NW2.2 Reduce Pesticides and Fertilizer Impacts

NW2.3 Prevent Surface and Groundwater Contamination

BIODIVERSITY

NW3.1 Preserve Species Biodiversity

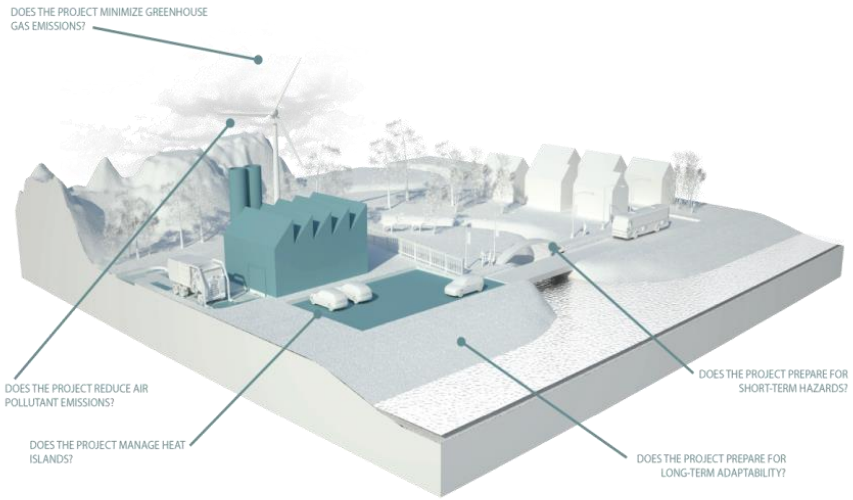
NW3.2 Control Invasive Species

NW3.3 Restore Disturbed Soils

NW3.4 Maintain Wetland and Surface Water Functions

NW0.0 Innovate or Exceed Credit Requirements

CLIMATE AND RISK



EMISSIONS

CR1.1 Reduce Greenhouse Gas Emissions

CR1.2 Reduce Air Pollutant Emissions

RESILIENCE

CR2.1 Assess Climate Threat

CR2.2 Avoid Traps and Vulnerabilities

CR2.3 Prepare For Long-Term Adaptability

CR2.4 Prepare for Short-Term Hazards

CR2.5 Manage Heat Island Effects

CR0.0 Innovate or Exceed Credit Requirements

Envision – Online Scoresheet

Breezy Plains Windmill Project

Score: 104 Max Score: 181

I want to: ---CHOOSE AN OPTION---

Jump to category: QL LD RA NW CR

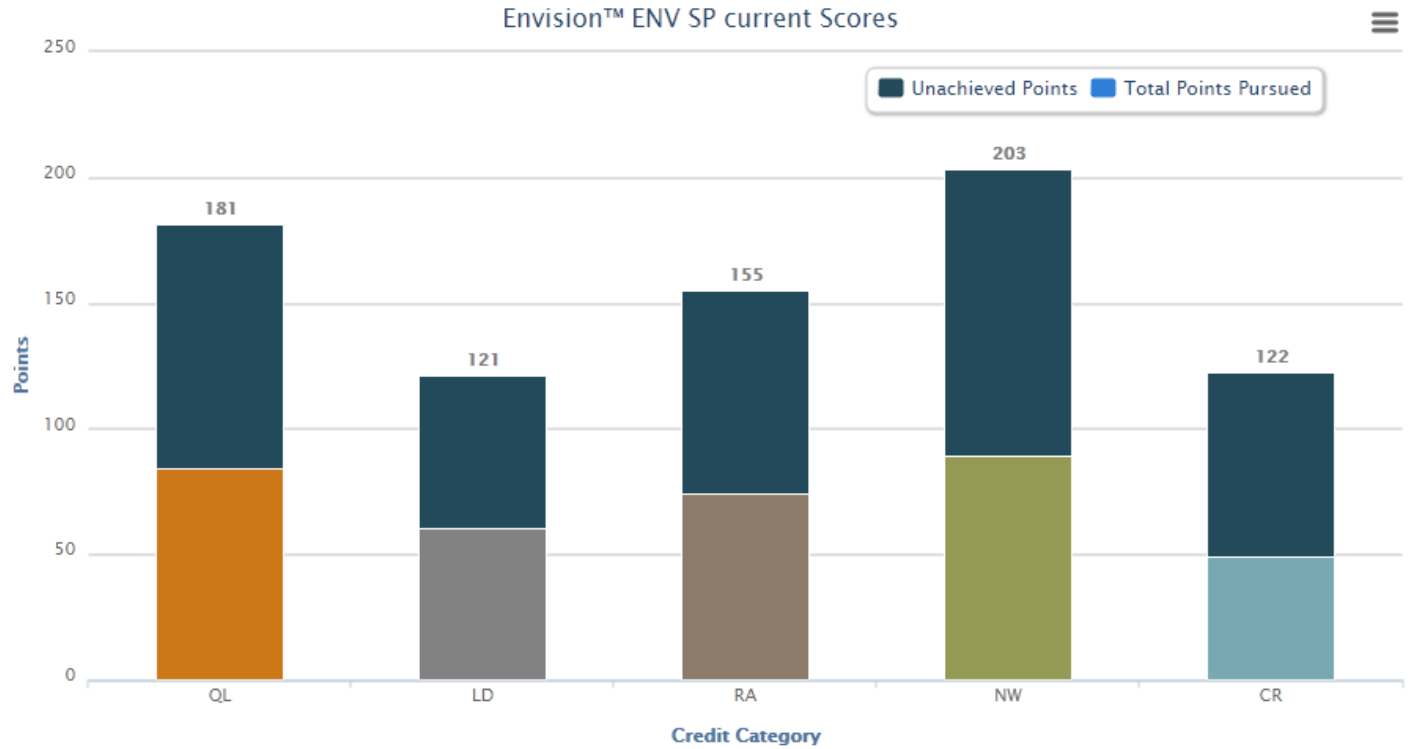
View the Guidance Manual: PDF / HTML

Do You Need Help?

Credit	Credit Intent and Metric	Is this Required for the Project?	Level Of Achievement	Score	Possible Points
QUALITY OF LIFE					
QL1.1	**Improve community quality of life.** Improve the net quality of life of all communities affected by the project and mitigate negative impacts to communities. details / guidance	Applicability: Applicable	Superior	10	25
		Notes:			
QL1.2	**Stimulate sustainable growth and development.** Support and stimulate sustainable growth and development, including improvements in job growth, capacity building, productivity, business attractiveness and livability. details / guidance	Applicability: Applicable	Improved	1	16
		Notes:			

Envision – Summary Score

Credit Category	Applicable Points	Earned Points	Innovation Points	Total Points Pursued	Percentage of Applicable Points
QUALITY OF LIFE	181	84	0	84	46%
LEADERSHIP	121	56	4	60	50%
RESOURCE ALLOCATION	155	74	0	74	48%
NATURAL WORLD	203	89	0	89	44%
CLIMATE AND RISK	122	49	0	49	40%
Total Project Points	782	352	4	356	46%



WHAT IS HAPPENING

Project Status

Envision Sustainable Professionals

- **Projects**
  - Verification and recognition began September, 2012
  - 21 current project awards
  - 15 in verification
  - 25 registered/not submitted

- **ENV SPs**
  - 4900 world-wide
  - 20 countries represented

Project Types

- Airports
- Seaports
- Roads
- Rail
- Pipelines
- Water
- Wastewater
- Stormwater
- Wind
- Hydro

Agencies

- Nearly 40 agencies have policies or RFP requirements for Envision
  - Los Angeles County DPW
  - NYC Dept. of Environmental Protection
  - NYC Dept. of Design and Construction
  - Port of Long Beach
  - CA Dept. of Water Resources
  - MassDOT, DelDOT, KCMO, Chicago

- Tarrant Regional Water District Pipeline

- Historic Fourth Ward Park
- Tucannon River Wind Farm

- Kansas City Streetcar
- South LA Wetland Park
- Sun Valley Watershed Multi-Benefit Project
- Placer County Snow Creek Restoration
- Port of Vancouver - Low Level Road

Tarrant Regional Water District Pipeline

Institute for Sustainable Infrastructure
ENVISION™
SILVER

26th Ward Wastewater Treatment Plant

Institute for Sustainable Infrastructure

ENVISION™

SILVER

Historic Fourth Ward Park, Atlanta

Institute for Sustainable Infrastructure
ENVISION™
GOLD

Tucannon River Wind Farm

Institute for Sustainable Infrastructure

ENVISION™

GOLD

PGE

Find more information online:

PortlandGeneral.com/Tucannon

Kansas City Streetcar

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PLATINUM

Sun Valley Watershed Multi-Benefit Project

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PLATINUM

Port of Vancouver - Low Level Road

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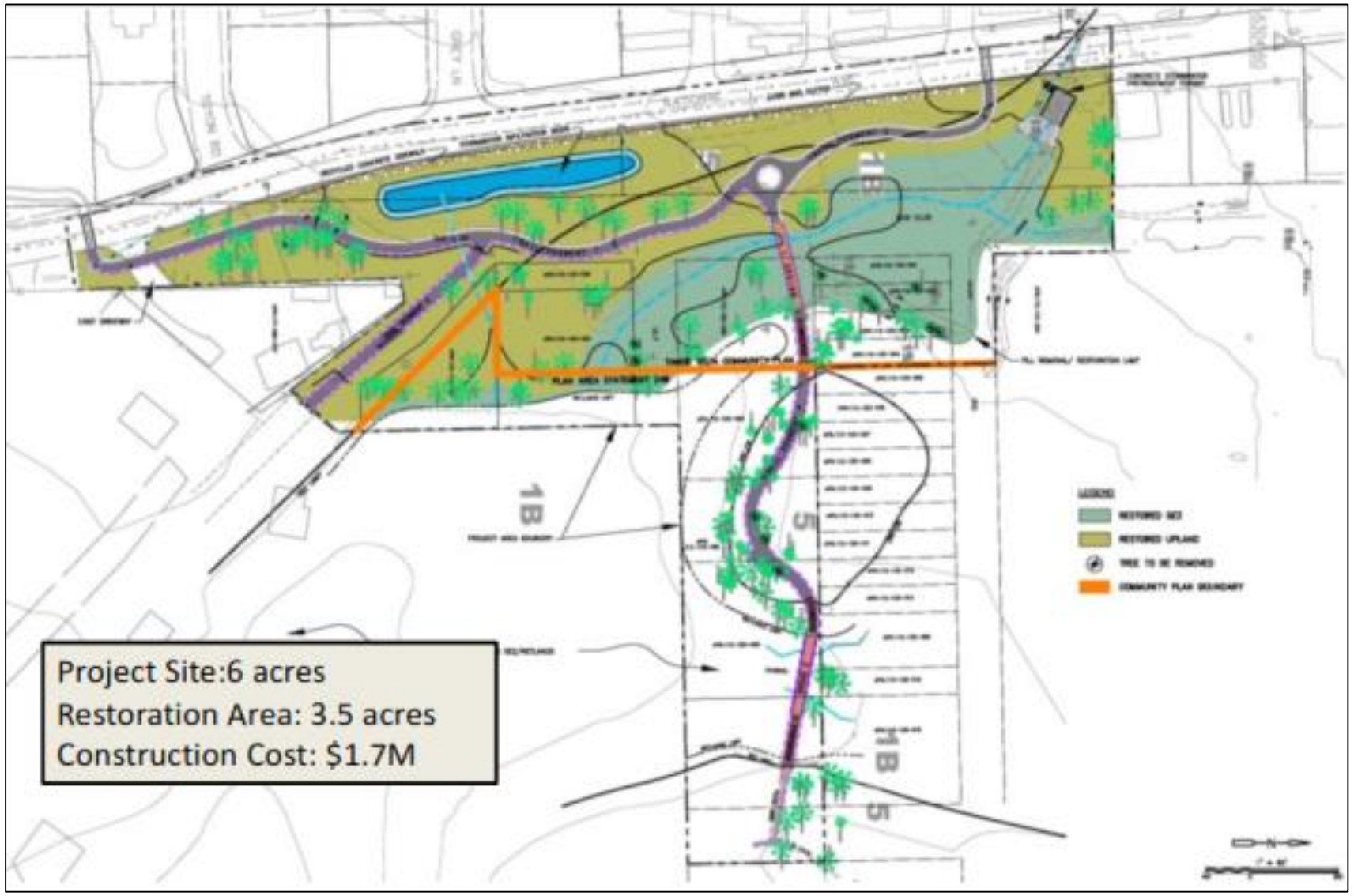
PLATINUM

Snow Creek Stream Environment Zone Restoration



Institute for Sustainable Infrastructure
ENVISION™
PLATINUM

South Los Angeles Wetland Park

Grand Bend Area Wastewater Treatment Facility

Institute for Sustainable Infrastructure

ENVISION™

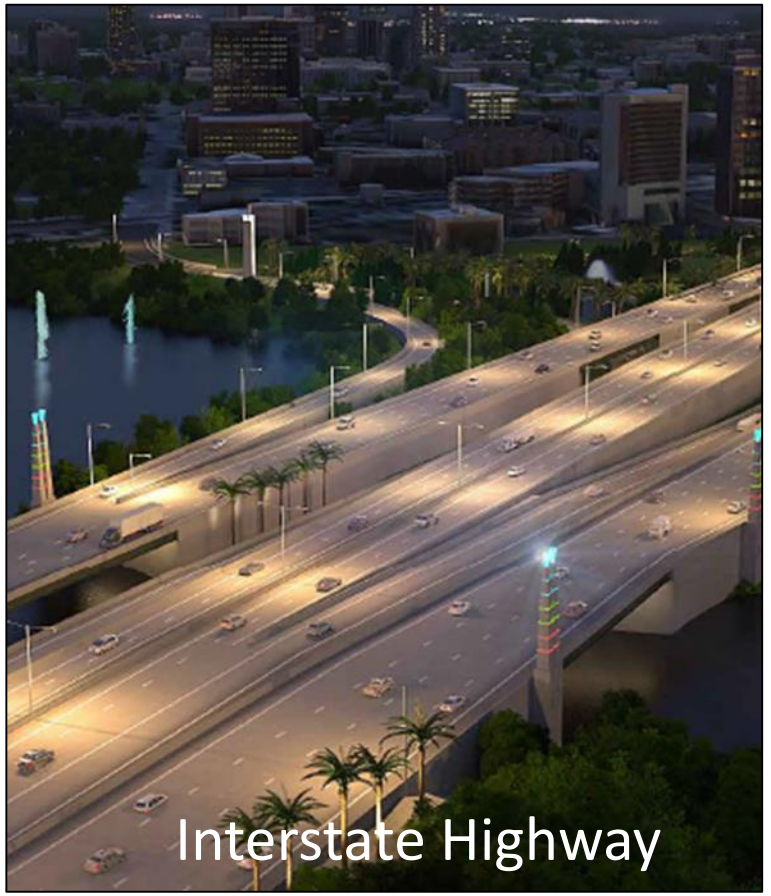
PLATINUM

Type of Projects in the Envision Pipeline

Light Rail

Streetcar

High Speed Rail


Interstate Highway

A FINAL NOTE

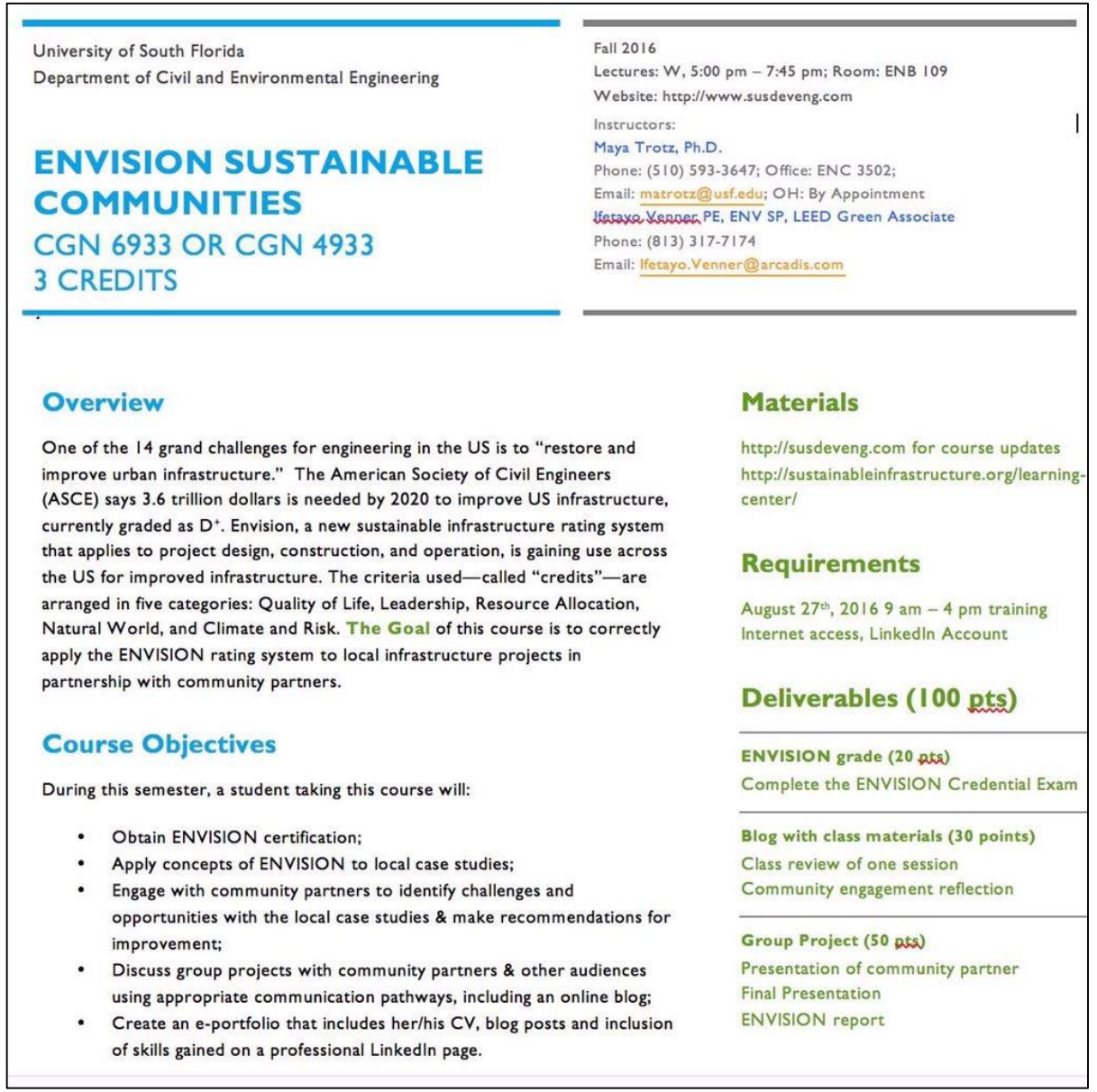
At Least Remember that:

- Envision is NOT a “rear view mirror” tool – design, then look back and check
- Envision’s power is guiding the FRONT-END of project development
- Use Envision to help define the project
- The project will be properly delivered and *sustainable* – without having to define it that way
- If the owner decides to certify the project, the technical work is largely complete
- www.sustainableinfrastructure.org

USF Envision Course

Maya Trotz, PhD

Dept. of Civil and Environmental Engineering



University of South Florida
Department of Civil and Environmental Engineering

ENVISION SUSTAINABLE COMMUNITIES
CGN 6933 OR CGN 4933
3 CREDITS

Fall 2016
Lectures: W, 5:00 pm – 7:45 pm; Room: ENB 109
Website: http://www.susdeveng.com

Instructors:
Maya Trotz, Ph.D.
Phone: (510) 593-3647; Office: ENC 3502;
Email: matrotz@usf.edu; OH: By Appointment
Ifetayo Venner, PE, ENV SP, LEED Green Associate
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Overview

One of the 14 grand challenges for engineering in the US is to "restore and improve urban infrastructure." The American Society of Civil Engineers (ASCE) says 3.6 trillion dollars is needed by 2020 to improve US infrastructure, currently graded as D+. Envision, a new sustainable infrastructure rating system that applies to project design, construction, and operation, is gaining use across the US for improved infrastructure. The criteria used—called "credits"—are arranged in five categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. **The Goal** of this course is to correctly apply the ENVISION rating system to local infrastructure projects in partnership with community partners.

Course Objectives

During this semester, a student taking this course will:

- Obtain ENVISION certification;
- Apply concepts of ENVISION to local case studies;
- Engage with community partners to identify challenges and opportunities with the local case studies & make recommendations for improvement;
- Discuss group projects with community partners & other audiences using appropriate communication pathways, including an online blog;
- Create an e-portfolio that includes her/his CV, blog posts and inclusion of skills gained on a professional LinkedIn page.

Materials

http://susdeveng.com for course updates
http://sustainableinfrastructure.org/learning-center/

Requirements

August 27th, 2016 9 am – 4 pm training
Internet access, LinkedIn Account

Deliverables (100 pts)

ENVISION grade (20 pts)
Complete the ENVISION Credential Exam

Blog with class materials (30 points)
Class review of one session
Community engagement reflection

Group Project (50 pts)
Presentation of community partner
Final Presentation
ENVISION report

Taylor 2811.pdf

Envision™ Overview for

Patel College of Global Sustainability

Systems Thinking – The Key to Sustainability

Q&A

TAYLOR **FUTURE SOLUTIONS,** LLC

Sustainable Community and Transport Strategies