The Envision Sustainable Infrastructure Rating System

a Paradigm Shift for the Design of Sustainable Infrastructure
Agenda

1. Sustainable Design & Asset Management
2. The Envision Framework
3. Case Study
4. Summary
1 Sustainable Infrastructure Design and Asset Management

What is the connection?
The Asset Management Cycle

- Plan
- Design
- Build
- Operate and Maintain
- Upgrade / Modify
- Decommission
The Asset Management Cycle

Today we will be focusing on these topics – planning and design of infrastructure assets.
Part of asset management is asset creation.

How sustainable are we making our new investment / assets?

If we cannot afford what we already have in the ground today...how can we sustain our future investment?
We’re Building 2070 Today

- Highways: 0-50 years
- Bridges: 30-75 years
- Pipelines: 50-100 years
- Dams: 50-100 years

What are we committing to long-term?
Key Highlights:

1. One third of national infrastructure rated Very Poor – Fair
2. Reinvestment rates are not keeping up with demand
3. Building for today’s communities and tomorrow’s Canada requires long-term planning to keep up with growth, technological change, and climate-related extreme weather
The Infrastructure Challenge in Canada

Some Indicators of Risk...

- **$10 Billion**
  In lost productivity in Canada due to transportation infrastructure decay

- **~8 Million**
  Expected additional population in Canada by 2050; adding further strain on existing infrastructure

- **$700 million**
  Cost of annual potable water loss in Ontario due to failing infrastructure

- **$2 Billion**
  Infrastructure damages caused by the 2013 flooding in Alberta
Asset Management activities are traditionally focused on operations, maintenance, and renewal - after the infrastructure has been designed, installed and has been operating for some time.

Problem:
Evolution of sustainable design

Where we have been: Multiple Rating Systems Building Scale (e.g. LEED®)

Where we are: Infrastructure Project Scale

Where we are headed: City-Scale sustainable planning

Buildings → Infrastructure → Regional / Urban Planning
What is Sustainable Infrastructure?

Infrastructure that is:

- High Performing
- Cost Effective
- Resource Efficient
- Environmentally Friendly
Barriers to the ‘New Paradigm’ in the Design Process

- Reactive vs. proactive
- Difficulty in measuring/assessing qualitative features
- Focus on upfront capital costs vs. lifecycle
- Cost pressures
- Lack of useful tools
2 The Envision Framework

A tool for infrastructure planning and design
Envision provides a holistic framework for planning, evaluating and rating the community, environmental, and economic benefits of all types and sizes of infrastructure projects…

- Institute for Sustainable Infrastructure

www.sustainableinfrastructure.org
A Joint Collaboration

ISI Founding Organizations

ASCE
American Society of Civil Engineers

APWA
American Public Works Association

ACEC
American Council of Engineering Companies

100 Years of Excellence
Envision: Fast Facts

55 Credits across 5 Categories:

- **Quality of Life**
  - 13 credits

- **Leadership**
  - 10 credits

- **Resource Allocation**
  - 14 credits

- **Natural World**
  - 15 credits

- **Climate + Risk**
  - 8 credits

Envision applies to all sizes and types of infrastructure.
Who is using Envision?

4,200 people in 20 countries

Sample Agencies/Municipalities:
- NYC DDC, MTA, DEP
- Los Angeles County
- Port Metro Vancouver
- Société de Transport de Montréal
- Metro Vancouver
- Kansas City, MO
- Atlanta, GA
- Multiple state DOT's
- Inter-American Development Bank

“The Envision rating system is rapidly gaining acceptance throughout the water industry in North America as well as internationally.” (AWWA)
“With significant investments that are coming in over the next decade through the new Building Canada plan, there is a good opportunity to look at how we assess sustainability. That's why...we refer to sustainability rating tools such as Envision. It gives us some metrics and standards that we may want to look to. That tool in particular our organization looks to adopt and adapt where possible...”

- Ms. Kealy Dedman, CPWA President, Head Engineer City of Guelph

Federal Transportation, Infrastructure, and Communities Committee Testimony

“Project should reference the Envision system... proponents who provide an ENV SP as a key project measure may be assessed more favorably.”

- City of Revelstoke, British Columbia RFP

“Proponent must select design elements for consideration based on application of Envision framework and integrate them into architecture and engineering design.”

- Société de Transport de Montreal RFP
How Can Envision be Used?

**AS A DESIGN FRAMEWORK**

**Inherent to Project:**
- Noise and Odor Control
- Stakeholder Involvement
- Infrastructure Renewal
- Capacity Enhancement
- Flexible Operations
- Resiliency

Identify opportunities for incremental improvements in sustainable performance

- Roof: Vegetated, Solar, Low Reflectance?
- Stormwater: Cistern, Rain Garden?
- Energy: Efficiency, Renewable?
- Materials: Regional, Recycled, Lifecycle Cost?
- Vegetation: Local, Non-invasive, Low Maintenance?

Pumping Station

Inherent to Project:
- Noise and Odor Control
- Stakeholder Involvement
- Infrastructure Renewal
- Capacity Enhancement
- Flexible Operations
- Resiliency

Identify opportunities for incremental improvements in sustainable performance
How Can Envision be Used?

METRIC FOR SELF ASSESSMENT OF DESIGN ALTERNATIVE

<table>
<thead>
<tr>
<th>Score</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate &amp; Risk</td>
<td>Natural World</td>
<td>Resource Allocation</td>
<td>Leadership</td>
<td>Quality of Life</td>
</tr>
</tbody>
</table>
How Can Envision be Used?

THIRD PARTY ACCREDITATION

Bronze: 20%
Silver: 30%
Gold: 40%
Platinum: 50%
How does this play out in practice?
Example Envision Verified Project

Grand Bend Area Wastewater Treatment Facility
Project Overview

- Tertiary treatment plant with Biological Nutrient Removal and constructed wetland
- Facility designed to provide a simpler solution with lower capital and operating costs
- Commitments made to restore native wildlife species and to open the facility to public uses as part of broader community strategy

Existing Site
Grand Bend WWTF
Site Context

- Existing facility consisted of 4 sewage lagoons (common in area)
- Site surrounded by productive farmland
- Water quality of paramount importance - region popular with tourist and cottage owners
Goal:
- High quality and efficient treatment that is responsive to demand, financially viable long-term, and a fit for the community

Challenges:
- Community expectations
- Stakeholder engagement
- Redesign process
- Sustainably engineered solution
- Need for flexibility/scalability
- Financial limitations
Grand Bend WWTF

Site Layout

Facility built on 4th existing lagoon

Three existing lagoons retained for storage

Constructed wetland for additional treatment
Grand Bend WWTF

Sewage Flows

Buffering capacity using storage lagoons

Nova Tertiary Disc Filters

Ultimately discharged to Lake Huron
Grand Bend WWTF
Expansion Capacity

screens on pedestals
Grand Bend WWTF

Environmental/Habitat

Tallgrass prairie restoration

Constructed wetland habitat
Grand Bend WWTF
Social and Educational

Public parking and amenities

Natural Walking Path
Grand Bend WWTF
Social and Educational

Outdoor Classroom & Observation Platforms
Key Elements of Sustainability

Purpose, Community, Wellbeing

• Incorporated odor elimination systems to address community concerns
• Minimized negative impacts from noise and vibration in construction and operations
• Created a new amenity for local community
Key Elements of Sustainability

**LEADERSHIP**

**Collaboration, Management, Planning**

- Extensive public consultation and collaboration with stakeholders
- Repurposed waste materials - municipal wood chip trimmings for the trail and reuse of lagoon biosolids as onsite fertilizer
- Selected design options/materials contribute to extended useful life of facility
Key Elements of Sustainability

- Sourced 73% of materials locally
- Eliminated 2,000 m³ of concrete and reduced asphalt requirements from original design
- Sourced fill requirements from existing site
- Designed facility to reuse treated (but non-potable) effluent waters for process requirements, reducing potable water consumption by 98%
Key Elements of Sustainability

Siting, Land & Water, Biodiversity

- Construction entirely within an existing greyfield site, preserving prime farmland
- With guidance from local conservation groups, selected native species that do not require pesticides or fertilizers
- Eliminated onsite invasive species and created new habitat to support four at-risk native species
Key Elements of Sustainability

- Built in flexible features so that the facility may be operated differently in the future
- Redesign contributes to long-term financial sustainability by reducing capital cost burden on municipalities
- Facility designed to work in extreme flood scenarios and to be resilient to seismic risks
Results

Affordable ... Faster ... Sustainable

Key Project Features:

**Performance**
- Flexible facility that can scale to demand - innovation in design

**Cost**
- Affordable. Tender price under budget

**Resources**
- Local sourcing
- Community engagement

**Environment**
- Re-establishing native habitats
- Net value vs. no harm
Summary

- Method for integrating asset management priorities into the design process
- Method to ‘operationalize’ municipal policies
- Mechanism to facilitate cross-discipline collaboration
Questions?
Thank You

Eric Dunford
Consultant
E: eric.dunford@stantec.com
T: (416) 598-7673

Brian Bylhouwer
Environmental Scientist
E: brian.bylhouwer@stantec.com
T: (902) 717-2736