Outline

1. Study Objectives
2. Methodology
3. Overview of each framework considered
4. Detailed review of selected frameworks and example criteria
5. Applicability of each framework
6. Summary of findings
Study Objectives

- To understand the differences between various environmental rating systems
- To determine whether the implementation of an environmental rating system was appropriate
- To assess how each rating system could be applied to different types of projects
- To evaluate the level of environmental stewardship in selected North American cities
Methodology

- Environmental Scan
- Literature Review
- Internal interviews
- External interviews
- Detailed Review
- Recommendations
Environmental Scan to find Current Practice

• A desktop review identify frameworks to include in the scan

• The resources included:
  • The Canadian Guide for Greener Roads
  • Greenroads
  • Envision
  • INVEST
  • CEEQUAL
  • AASHTO Centre for Environmental Excellence
  • LEED Neighbourhood Development
Internal City Interviews

**Materials**
Sustainability aspects of construction materials

**Construction/ Delivery**
Processes used to plan, design, and build infrastructure

**Environmental Management System**
Regulations and rules in place to guide infrastructure development

**Environmental Practice**
External Peer City Interviews

• Interview cities of similar sizes and climates
## Framework Evaluation

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>Who is responsible for developing / administrating the framework?</td>
</tr>
<tr>
<td>Experience</td>
<td>Canadian / North American used of the framework to evaluate projects?</td>
</tr>
<tr>
<td>Disciplines</td>
<td>Which areas of sustainability does the framework consider?</td>
</tr>
<tr>
<td>Criteria</td>
<td>How many criteria were included within each framework?</td>
</tr>
<tr>
<td>Scoring System</td>
<td>How detailed was the scoring methodology?</td>
</tr>
<tr>
<td>Project Phases</td>
<td>What range of project phases does the framework evaluate?</td>
</tr>
<tr>
<td>Fees</td>
<td>How does the framework assess registration or on-going project costs?</td>
</tr>
</tbody>
</table>
Greenroads

- Produced and administered by Greenroads Foundation
- Several academic and industry partners helped fund the project and the research
- Provides third-party review / rating of the design and construction of transportation projects
- Projects must meet 10 minimum eligibility criteria to qualify for evaluation
- 45 criteria to be scored, each of which must be evaluated
- 5 Canadian projects have been piloted or certified
Canadian Guide for Greener roads

• Developed by the Transportation Association of Canada
• A self-evaluation tool designed to assess the sustainability of road projects
• Completed using 38 questions focused around 12 sustainability criteria
• Intended to be used for any range of road projects
  • i.e. new roads, twinning, realignment, resurfacing
• Can be used for all stages of road projects
  • Road Planning and Design
  • Construction and Operations
  • Maintenance and Decommissioning

Envision

- Developed by the Institute of Sustainable Infrastructure (founded by APWA, ASCE and ACEC)
- Uses third-party review to evaluate sustainability for all types and sizes of infrastructure
- Includes 64 criteria grouped into 5 broad disciplines
- 5 different levels of achievement included within each criteria to help determine rating
- Evaluates projects from planning phase through design & construction, to operations & maintenance, to end-of-life
INVEST

• Developed by the FHWA
• Self-assessment tool for reviewing sustainability within projects, processes, and operations and maintenance
• Used extensively in the United States
• Modular for system planning, project development, and operations & maintenance
• 33 different criteria within the project development module that cover planning, design, and construction
• Uses a flexible scoring system in which only the applicable criteria are taken into consideration

www.sustainablehighways.org
CEEQUAL

• Created by the Building Research Establishment in the United Kingdom
• Intended for assessment, rating, and awards for civil engineering, infrastructure, landscaping, and works in public spaces
• Evaluated through a combination of self-assessment and third-party review
• Includes 226 criteria over 9 broad disciplines
• Can be used for design and construction projects

www.ceequal.com
Centre for Environmental Excellence

- Developed by the American Association of State Highway and Transportation Officials (AASHTO)
- Not a rating system
- Resource developed to promote environmental stewardship in transportation delivery
- Recommends the use of INVEST or Envision if a rating or assessment is required
LEED for Neighbourhood Development

• Developed by the Canada Green Building Council
• Rating system designed to evaluate the sustainability of communities
• Covers 3 broad disciplines:
  • Smart location and linkage
  • Neighbourhood pattern and design
  • Green infrastructure and buildings

https://www.cagbc.org/CAGBC/Programs/LEED/LEED_Canada_Rating_System/Neighbourhood_Development.aspx
## Summary of top 5 rating systems

<table>
<thead>
<tr>
<th>Framework</th>
<th>Canadian Applicability</th>
<th>Cost</th>
<th>Depth of Criteria</th>
<th>Depth of Scoring System</th>
<th>Framework Considerations</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenroads</td>
<td>✔</td>
<td>$$$$</td>
<td>High</td>
<td>Medium</td>
<td>Broad</td>
<td>Medium</td>
</tr>
<tr>
<td>Canadian Guide for Greener Roads</td>
<td>✔</td>
<td>N/A</td>
<td>Low</td>
<td>Low</td>
<td>Focused</td>
<td>High</td>
</tr>
<tr>
<td>Envision</td>
<td>✔</td>
<td>$$</td>
<td>High</td>
<td>High</td>
<td>Broad</td>
<td>High</td>
</tr>
<tr>
<td>INVEST</td>
<td>✔</td>
<td>N/A</td>
<td>High</td>
<td>High</td>
<td>Broad/Focused</td>
<td>High</td>
</tr>
<tr>
<td>CEEQUAL</td>
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<td>High</td>
<td>Medium</td>
<td>Broad</td>
<td>Low</td>
</tr>
</tbody>
</table>

Canadian Guide for Greener Roads, Envision, and INVEST were selected for a more-detailed review.
Canadian Guide for Greener Roads Overview

- A municipality is assessed on whether it is involved in the 12 disciplines
- How well a municipality is doing in the discipline is based on a self-graded score of A, B, or C for 38 specific questions
- The rubric for scoring an A, B, or C is up to the assessor
- Framework can be applied by any municipality at any level of environmental sophistication
TAC Sample Criteria (Reduce Virgin Materials Use)

Questions focused around recycling include:

• Has beneficial use been made out of any existing materials, structures, and so on?

• Are reclaimed and/or recycled materials used in the project?

• Is the cut and fill optimized to reduce the quantity of excavated material to be taken off-site?
TAC Sample Criteria (Reduce Virgin Materials Use)

**CGGR OBJECTIVE**

**Reduce Virgin Materials Use**

**Intent:**
To reduce the use of virgin materials and resources and the virgin material content of products used

**Boundary:**
This objective includes the material (both raw and finished) brought onto the site, including water used on the site.

**Notes:**
- Activities that use and reuse materials onsite (both the recycled content of material brought to site and the reuse of native plants, topsoil, pavement materials, etc. already on the site) would help meet this objective
- Virgin materials are raw materials or finished products brought onto the site, excluding reclaimed materials
- Related to *Optimize Waste Stream* objective

**Sustainability dimension:**
ENVIRONMENTAL INTEGRITY
Envision Overview

- The criteria within the 5 broad disciplines all include aspects of decision-making, planning, design, construction practices, and the lifecycle impacts.
- Includes many criteria which pertain to areas of responsibility outside of roadways projects.
- Methodology for scoring criteria is very detailed:
  - Includes detailed questions to help assess the level of implementation of an area of sustainability.
  - Many criteria with quantifiable aspects include metrics which are tied to scoring.
- Every criteria must be evaluated.
Envision Sample Criteria (Use Recycled Materials)

**RA1.2 Use Recycled Materials**

**INTENT**
Reduce the use of virgin natural resources and avoid sending useful materials to landfills by specifying reused materials, including structures, and material with recycled content.

**METRIC**
Percentage of project materials that are reused or recycled. Plants, soil, rock, and water are not included in this credit.

**LEVELS OF ACHIEVEMENT**

<table>
<thead>
<tr>
<th>IMPROVED</th>
<th>ENHANCED</th>
<th>SUPERIOR</th>
<th>CONSERVING</th>
<th>RESTORATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>Not Available</td>
</tr>
<tr>
<td>(4) At Least 5% From Recycled</td>
<td>(6) At Least 15% From Recycled</td>
<td>(9) At Least 25% From Recycled</td>
<td>(16) At Least 50% From Recycled</td>
<td></td>
</tr>
<tr>
<td>(A) At least 5% (by weight, volume, or cost) of recycled materials including materials with recycled content and/or reused existing structures or materials.</td>
<td>(A) At least 15% (by weight, volume, or cost) of recycled materials including materials with recycled content and/or reused existing structures or materials.</td>
<td>(A) At least 25% (by weight, volume, or cost) of recycled materials including materials with recycled content and/or reused existing structures or materials.</td>
<td>(A) At least 50% (by weight, volume, or cost) of recycled materials including materials with recycled content and/or reused existing structures or materials.</td>
<td></td>
</tr>
</tbody>
</table>
Envision Sample Criteria (Use Recycled Materials)

EVALUATION CRITERIA AND DOCUMENTATION GUIDANCE

A. To what extent has the project team used recycled materials, including materials with recycled content and/or reused existing structures or materials?

1. Total quantity of materials used on the project by weight, volume, or cost.

2. Inventory of specifications for materials containing recycled content. Inventory should include the name of the product, the name of the manufacturer, the weight, volume, or cost of the material, and the percentage of recycled content (either post-industrial or post-consumer recycled content).

3. Calculations of percentage of reused or recycled materials by weight, volume, or cost.

   To calculate materials with recycled content, multiply the material weight, volume, or cost by the percentage of recycled content.

   Mechanical, electrical, water equipment, and their components may be excluded from the calculations. In these instances, the most efficient equipment should be specified.

Calculations do not include plants, soils, rocks, or water.

4. Inventory of existing materials or structures that have been reused.

   Design documents showing the location and weight, volume, or cost of reused structures or materials. In determining weight, volume, or cost, the project team may refer to standard equivalents.

   In order to meet the intent of this credit, the project team must be able to demonstrate an intentional choice to salvage materials or structures that might otherwise have been sent to landfills and/or replaced. In addition, they must demonstrate that such action is within the scope of the project. For example, a project to resurface an airport runway cannot claim the entirety of the surrounding airport as “reused” materials. However, a project that intentionally chooses to refurbish an existing bridge, rather than replace it, may count the retained components of the existing bridge as “reused.”

RELATED ENVISION CREDITS

LD1.4 Pursue Byproduct Synergies
NW1.4 Preserve Undeveloped Land
CR1.1 Reduce Net Embodied Carbon
INVEST Overview

• Only the Project Development module was selected for a detailed review

• Project development included aspects of decision-making, planning, design, and construction

• The methodology for scoring included points assigned to certain levels of completion for certain tasks
  • Some criteria’s scoring is tied to whether a certain sustainability aspect is being completed
  • Scoring for many criteria is tied to how well an activity is being done, based on metrics

• The criteria to be included in a project’s evaluation can be selected based on applicability
  • This flexibility allows for comparisons of different types of projects in their class, rather than one large list
  • For example, scores for resurfacing would differ considerably from scores for new roadway construction
INVEST Sample Criteria
(Recycle Materials)

1.5 points. Recycled Asphalt Pavement or Recycled Concrete Aggregate

Use RAP or RCA in new pavement lifts or granular base course or embankments. The recycled materials can
going from the project and be recycled onsite or offsite and returned or recycled materials can originate from
an offsite source. However, no points are awarded for removing paving materials from the project and sending
them offsite to be recycled for another project(s).

Points are awarded based on the origin of the source material and location of recycling activities as well as the
Average Recycled Content (ARC) per the following calculation and using Tables PD-20.1.A or PD-20.1.B (on the next
page) as follows below.

\[
ARC (\%) = \frac{\sum r_n}{\sum W_n} \times 100\% 
\]

Where:

- \( r_n \) is the total weight or volume of RAP or RCA.
- \( W_n \) is the total weight or volume of either all existing pavement materials or all bedding, backfill,
  and granular embankment materials per the method of recycling used.
- \( n \) represents the number of materials considered in accordance with the method used.

### TABLE PD-20.1.A. POINTS FOR AVERAGE RECycled CONTENT (PERCENT BY WEIGHT OR VOLUME OF MATERIALS) WHEN ORIGINATING FROM PROJECT AND RECYCLED ONSITE

<table>
<thead>
<tr>
<th>Recycling Method Used</th>
<th>Points Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Percent average recycled material (ARC) required for recycling in pavements (onsite recycling)</td>
<td>10%</td>
</tr>
<tr>
<td>Percent average recycled material (ARC) required for granular base course or embankments (onsite recycling)</td>
<td>20%</td>
</tr>
</tbody>
</table>
INVEST Sample Criteria
Applicability of each framework

• **Canadian Guide for Greener Roads:**
  - Municipalities considering the most common areas of sustainability
  - Suitable for the construction phase of projects
  - Self-evaluation for benchmarking and improvement

• **Envision:**
  - Municipalities wishing to consider many different areas of sustainability
  - More suitable for evaluating projects from planning phase all the way through operations and maintenance
  - Ideal for large multi-disciplinary projects

• **INVEST:**
  - Municipalities wishing to self-assess standing in environmental stewardship
  - Ideal for roadway projects of all type as the scoring methodology is flexible
Summary of the Findings

• Ideal framework depends on:
  • Areas of sustainability that a municipality wishes to consider
  • Phases of a project that a municipality wishes to evaluate
  • How the municipality wishes to score projects
  • Cost of registration or on-going fees

• Municipalities could also adapt portions of different frameworks and create their own guide
  • This would offer more context-sensitive assessments
Thank you.

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