A Review of Sustainability Rating Systems

Dr. Robert W. Peters
Overview

• Over the past 10 years, there has been a proliferation of methodologies and tools for rating the sustainability of transportation-related projects both in the United States and internationally.

• These tools provide the ability to evaluate the sustainability of alternative transportation and land development policies, plans and

• The tools therefore facilitate the process of making transportation and land development decisions that contribute to community sustainability in practice.
Overview (cont’d)

• We will review and assess approaches to rating the sustainability of transportation systems and neighborhood developments by highlighting the state of the practice, outlining similarities and differences in the existing approaches; and determining which tools are more appropriate for various contexts and when it is valuable to combine different tools.

• We will also identify opportunities for improving the existing practice.
Introduction

• Over the past 10 years, various methodologies and tools have been created to quantify, compare and rate the sustainability of transportation-related projects both in the United States and internationally.

• The first systems gained recognition towards the end of the last decade.

• These tools have been used by some transportation agencies to evaluate the sustainability of transportation and land development policies, plans, and projects.
Introduction (cont’d)

• We will provide a comprehensive review of systems used to rate the sustainability of transportation and neighborhood-level development improvements.

• It highlights the state of the practice, outlines similarities and differences in the existing approaches and identifies which tools are more appropriate for various contexts and when it is valuable to combine some of them.

• The study also identifies opportunities for improving the existing practice.
Methodology

• An extensive search was conducted to identify tools used to rate the sustainability of transportation and neighborhood-level developments.
• Each of the systems identified was researched to determine how the system was developed and is used.
• Additionally, a literature review on sustainability rating systems was completed to gauge the state of practice.
• Based on the review of the systems, a comparison table was developed to determine the similarities and differences between the systems.
Methodology (cont’d)

• A set of questions guided the research of each system. These questions are found in Figure 1.
• In addition, examples of implementation were identified.
• The information collected was organized in a comparison table. A second comparison table was developed specifically for the rating criteria used in each system.
Figure 1. Guiding concepts for review of rating systems.

**Background and History of Development**
- Definition of sustainability
- Systems used in modeling the rating system
- Motivation for creation
- Goals of the system
- History of development

**Rating Procedure**
- Point scale for levels of certification
- How the scale was determined
- What criteria are used and the associated points
- Level of implementation
- Incorporation into decision making
• Table 1 shows a comprehensive listing of the most prevalent and developed rating systems and a brief description of each of them distilled from the first comparison table.
Table 1: Summary of Transportation System and Neighborhood-Level Development Sustainability Rating System.

- [See Table 1 handout].
Results (cont’d)

• To better understand the different rating systems Tables 2 and 3 were developed to compare and contrast the criteria used in each of the rating systems.

• These tables consider both transportation and neighborhood-level development systems based on the same categories of criteria and identify similarities and differences among the criteria used for evaluating and quantifying the sustainability of a project, program, etc.
Results (cont’d)

• A detailed survey of the various rating systems' criteria led to the development of general categories seen in multiple systems. These categories are listed along the y-axis of the table.
Results (cont’d)

• The various rating systems are listed at the top of the table and if the criteria within the system are related to the general categories, this is indicated with a shaded box.

• The general categories are also separated into one of three types of sustainability: environmental, economic, or social.

• The categories were assigned a type of sustainability that was applicable but it must be noted that some of the categories may fit into more than one of the three types of sustainability.
Table 2. Criteria Comparison Table for Transportation Rating Systems.

<table>
<thead>
<tr>
<th>Criteria Categories</th>
<th>Greenroads</th>
<th>GreenLITES</th>
<th>STARS</th>
<th>BE\textsuperscript{3}ST</th>
<th>Green Pave</th>
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Table 3: Criteria Comparison Table for Neighborhood-Level Development Rating Systems.

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<tr>
<th>Criteria Categories</th>
<th>STAR Communities</th>
<th>OnePlanet Communities</th>
<th>Enterprise Green Communities</th>
<th>LEED-ND</th>
<th>Ecodistricts</th>
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Results (cont’d)

• Additional systems were surveyed but are not included in Tables 2 and 3 due to the fact that they are still under development.

• Some of the systems are at the pilot stage and are not at the level of maturity where comparison is meaningful or even possible.
Results (cont’d)

• The Saga Sustainability Database was not included in the comparison because of its variations of criteria due to its focus on aviation.

• Several of the more developed and comprehensive systems are discussed in more detail in the following section.
Greenroads Rating System

- Greenroads is a flexible rating system used to rank and score road projects for their overall performance in sustainability as compared to average roadway projects.
- Greenroads originated at the University of Washington as a research project in 2007 and has been developed over the years.
- Succeeding versions of the system were created in collaboration with CH2M HILL and a number of other industry groups and consultants who contributed data and commentary through pilot projects, case studies and public comments.
Greenroads Rating System (cont’d)

• Greenroads is currently in Version 1.5, which was developed in 2011.

• Greenroads is now a voluntary third party rating system under the Greenroads brand, which is a pending trademark of the University of Washington.

• The Greenroads Foundation, a third-party independent non-profit organization incorporated in 2010, is intended to be the sole licensee of the rating system and will maintain and update Greenroads [Muench et al., 2011].
Greenroads Rating System (cont’d)

• Greenroads is designed to recognize roadway projects that surpass public expectations for sustainability based on the system’s capacity to support natural laws and human values.

• Greenroads quantifies the sustainable attributes of a roadway project.
Greenroads Rating System (cont’d)

• Although the Greenroads rating system is not equipped to address the decision whether or not to build a road, it is useful in decision making on the project development and project delivery level to help shape decisions.

• The quantification can be used to:
  1. Define what features contribute to sustainability on the project.
  2. Provide accountability for sustainability on roadway projects.
  3. Measure and track specific sustainability goals over time.
4. Manage and improve roadway sustainability.
5. Encourage new and innovative practices.
6. Promote competitive advantage and other economic or market incentives for sustainability.
7. Communicate sustainable features to stakeholders in an understandable way, especially to the general public [Muench et al., 2011].
Greenroads Rating System (cont’d)

• Greenroads is not intended to be used for design or trade-off decisions but to influence decisions on how sustainability options can be incorporated to encourage sustainable practices [Muench et al., 2010].

• The Greenroads rating system is intended to be implemented in the design and construction phase of roadway development and can be useful in assessing the sustainability of a roadway [Muench et al., 2011].
Greenroads Rating System (cont’d)

Rating Procedure. A Greenroads “certification” correlates to a road project that earns points for sustainable practices above the current standards for environmental compliance, roadway design and construction practice.

• Certified road projects can be denoted with a distinctive sign that communicates substantial achievement [Muench et al., 2011].
Greenroads Rating System (cont’d)

• Greenroads uses a collection of sustainability best practices that apply to roadway design and construction to rate projects.
• These best practices are divided into two types of activities: required and voluntary.
Greenroads Rating System (cont’d)

**Required:** Project Requirements are the minimum activities that must be completed in order to be considered a Greenroad.

- They can be viewed as characteristics common to all Greenroads.
- There are 11 such Project Requirements.
- These activities capture the basic ideas of environmental and economic decision making, public involvement, long-term environmental performance, construction planning, and lifetime monitoring and maintenance.
Greenroads Rating System (cont’d)

• In order to achieve certification, all of the Project Requirements must be met.
• Greenroads activities are not intended to supersede local, state, or federal regulation or other jurisdictional ordinances and many of the Project Requirements coincide with existing federal requirements [Muench et al., 2011].
Greenroads Rating System (cont’d)

• An additional number of Voluntary Credit points may also be earned; however, regardless of how many Voluntary Credit points are achieved.

• If a project does not meet all of the Project Requirements, a Greenroads certification level will not be awarded.
Voluntary: Voluntary Credits are based on best practices that may optionally be included in a roadway project.

- There are 37 Voluntary Credits. Each is given a point value weight of 1 to 5 depending upon the sustainability impact of the credit.
- An additional 10 points can be earned by “Custom Credits,” which allows a project or organization to develop individualized Voluntary Credits.
Greenroads Rating System (cont’d)

• Voluntary Credits can be achieved through actions such as cultural outreach, multimodal access, safety and pavement materials.

• Because of the wide range of activities, it is unlikely that a project will be able to achieve all of the Voluntary Credits.
Greenroads Rating System (cont’d)

- However, the goal of Greenroads is to provide enough variety in Voluntary Credits that any roadway project could implement enough best practices to obtain relevant credits to achieve at least a minimum certification level.

- This means that Greenroads should work for all roadway projects from basic preservation projects to large construction projects [Muench et al., 2011].
Greenroads Rating System (cont’d)

• Table 4 shows Greenroads’ certification categories and the point levels that must be satisfied to achieve each certification.
Table 4. Greenroads Certification Categories.

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<tr>
<th>Greenroads Certification</th>
<th>Required Points</th>
<th>Voluntary Points</th>
<th>% of total points</th>
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<tbody>
<tr>
<td>Certified Greenroads</td>
<td>All</td>
<td>32-42</td>
<td>30-40</td>
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<td>Silver Greenroads</td>
<td>All</td>
<td>43-53</td>
<td>40-50</td>
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<td>Gold Greenroads</td>
<td>All</td>
<td>54-63</td>
<td>50-60</td>
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<td>Evergreen Greenroads</td>
<td>All</td>
<td>64+</td>
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The green rating system INVEST (Infrastructure Voluntary Evaluation Sustainability Tool) was built by the Federal Highway Administration with input from AASHTO, ASCE, ACEC and APWA to help transportation agencies meet individual sustainability goals and needs.

It is a web-based tool that provides criteria based on best practices to assist transportation agencies in integrating sustainability into their programs.
FHWA Infrastructure Voluntary Evaluation Sustainability Tool [INVEST] (cont’d)

• Initial criteria seen in the 2010 beta version were written by subject matter experts and, through stakeholder feedback, the criteria have since been reviewed, modified, and vetted.

• Consequently, a pilot test version was released for testing and evaluation.

• After several years of research, analysis and development, the feedback was used to adjust the criteria for the official release of INVEST version 1.0 in October 2012 (Federal Highways Administration 2012).
FHWA Infrastructure Voluntary Evaluation Sustainability Tool [INVEST] (cont’d)

• INVEST encourages stewardship, not compliance and to accomplish this, input from a variety of sources including thousands of user comments, was incorporated to make it practical and tangible (Federal Highway Administration, Webinar, October 10, 2012).
FHWA Infrastructure Voluntary Evaluation Sustainability Tool [INVEST] (cont’d)

• The INVEST program defines sustainability using the three principles of the ‘triple bottom line’ and views sustainability as a concept that balances social, economic, and environmental aspects to capture the broad range of transportation goals and objectives in decision making [Federal Highways Administration, 2012].
INVEST can be used throughout the entire life cycle of a project; it can be used as a tool to encourage broad participation, evaluate sustainability tradeoffs, communicate benefits and goals, and reward excellence.

The user can choose to what extent to measure success against the absolute scale of how many overall points are achieved by a given project or set an achievement level to reach and use this tool to meet those goals [Federal Highway Administration, 2012].
Additionally, INVEST can be used to:

• Set goals, provide guidance, and measure the sustainability of an ongoing project.
• Evaluate the sustainability of a portfolio of potential improvement projects at a statewide, regional or local level to facilitate the decision-making process and prioritization.
• Identify programmatic barriers that might be the result of policies, design standards and specifications, or stakeholder agency policies.
FHWA Infrastructure Voluntary Evaluation Sustainability Tool [INVEST] (cont’d)

• Use new technologies and best practices in sustainability to anticipate related requirements. Although, INVEST does not include criteria for meeting current expectations and regulations, like NEPA, many of the criteria include meeting requirements that are above and beyond the normal standard of practice.

• Evaluate the sustainability of a completed project or program of projects [Federal Highway Administration, 2012].
Rating Procedure. The INVEST tool is equipped to rate projects in three phases of the project lifecycle: System Planning, Project Development, and Operations and Maintenance.

- Each of these phases has a separate self-standing module.
- There are a total of 60 specific criteria, based on the best practices for this stage of project.
- The System Planning and Operations and Maintenance modules have one scorecard each (Federal Highways Administration 2012).
The Project Development module evaluates individual projects and has 29 criteria organized into six project scorecards:

- **Paving** – for projects that are devoted exclusively to pavement preservation; restoration projects that extend the service life of existing facilities and enhance safety; or pavement restoration projects that restore pavement structure, ride quality, and spot safety. Use this scorecard for paving projects in both rural and urban locations.

- **Basic Rural** – for small, rural reconstruction or rural bridge replacement projects that do not expand capacity of the roadway.
Extended Rural – for rural projects for a new roadway facility; structure projects where nothing of its type currently exists; and major reconstruction projects that add travel lanes to an existing roadway or bridge.

Extended Urban – for urban projects for a new roadway facility; structure projects where nothing of its type currently exists; and major reconstruction projects that add travel lanes to an existing roadway or bridge.
FHWA Infrastructure Voluntary Evaluation Sustainability Tool [INVEST] (cont’d)

• Custom - for projects that do not fit any of the pre-defined scorecard options, the Custom Scorecard will allow the user to develop a unique set of criteria that is most appropriate for the project being evaluated. The Custom Scorecard starts with a core set of 19 that must be included as part of the score. There are not achievement levels associated with the custom scorecard [Federal Highways Administration, 2012].

Robert W. Peters, PhD. PE
EcoDistricts

• EcoDistricts was launched by the Portland Sustainability Institute (PoSI) in 2009. Subsequent versions refined the system based on feedback and results of the pilot programs.

• The EcoDistricts program creates an enabling strategy for neighborhood-scale sustainability that seeks to break down barriers to implementation such as project capital, public policy support, and need for comprehensive assessment tools [EcoDistricts, 2013].
EcoDistricts (cont’d)

• EcoDistricts differs from LEED-ND and other green rating systems in that it works upstream by providing tools and strategies for project implementation in existing neighborhoods.

• These tools and strategies can then help neighborhoods earn green ratings such as LEED-ND [Portland Sustainability Institute, 2010].
EcoDistricts (cont’d)

• A major focus of EcoDistricts is bringing together neighborhood stakeholders, property developers, utilities, and municipalities to form a sustainability plan that leads to real outcomes such as minimizing environmental impact, utilizing and enhancing local technologies, equity in investment, community participation, and economic development [EcoDistricts, 2013].
EcoDistricts (cont’d)

EcoDistricts uses a framework with four phases:

1. District Formation – create a shared vision and governance structure through community engagement.
2. District Assessment – determine priorities and strategies of greatest impact.
EcoDistricts (cont’d)

3. Project Feasibility and Development – determine overall viability and cumulative impact of priority projects; develop implementation and funding strategy; coordinate stakeholders, developers, public agencies, and utilities to assess need for joint ventures, comprehensive financing, new governance models, and level of additional community involvement.

4. District Management – conduct on-going monitoring of social, economic, and environmental impacts [EcoDistricts, 2013].

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EcoDistricts (cont’d)

• PoSI has developed a series of four toolkits for guiding implementation of the program through the four phases. The Organization Toolkit provides a range of options for developing a governance structure and explains various methods for engaging the community.

• The Performance and Assessment Method Toolkit provides assistance in developing a performance baseline, setting targets, identifying strategy opportunities, project screening, feasibility assessment, alternatives analysis, and project prioritization, implementation, and monitoring.
EcoDistricts (cont’d)

• There are eight performance areas, each with a set of objectives as shown in Table 5.
• There is also an EcoDistrict Assessment Method that provides a ten-step process to develop a baseline for the district’s performance.
• The Financing Toolkit describes financing methods for district organization and staffing, feasibility and small-scale project development, and district utilities and large-scale project development.
EcoDistricts (cont’d)

- The Policy Support Toolkit offers policy recommendations for municipality support through regulations, public-private partnerships, financial incentives and assistance, technical assistance, shared ownership of infrastructure, buildings or services, demand management programs, education, third-party certification requirements or incentives for compliance, and infrastructure and project investment [EcoDistricts, 2013].
Table 5. EcoDistrict Performance Areas [EcoDistricts, 2013].

- [See Table 5 handout].
One Planet Communities

• Coordinated by BioRegional in the United Kingdom, the One Planet Communities program is part of the wider One Planet initiative which uses the ten One Planet principles to guide and support local government, companies, organizations and individuals in their efforts to create solutions for sustainable living.
The ten One Planet principles are:

1. Zero carbon – Making buildings more energy efficient and delivering all energy with renewable technologies.

2. Zero waste – Reducing waste, reusing where possible, and ultimately sending zero waste to landfill.

3. Sustainable transport – Encouraging low carbon modes of transportation to reduce emissions, reducing the need to travel.
4. Sustainable materials – Using sustainable healthy products, with low embodied energy, sourced locally, made from renewable or waste resources.

5. Local and sustainable food – Choosing low impact, local, seasonal and organic diets and reducing food waste.

6. Sustainable water – Using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution.

7. Land use and wildlife – Protecting and restoring biodiversity and natural habitats through appropriate land use and integration into the built environment.
8. Culture and heritage – Reviving local identity and wisdom; supporting and participating in the arts.

9. Equity and local economy – Creating bioregional economies that support fair employment, inclusive communities and international fair trade.

10. Health and happiness – Encouraging active, sociable, meaningful lives to promote good health and well being [BioRegional, 2013].
One Planet Communities (cont’d)

• The principles are applied during the design, construction, and long-term management stages of the project to undertake three sustainability challenges of ensuring a sustainable ecological footprint, which is measured as consumption of natural resources in global hectares of land and sea, ensuring a sustainable carbon footprint and ensuring activities are be clean or non-polluting [BioRegional, 2013].
One Planet Communities (cont’d)

• BioRegional is incorporated into the development process and acts as an advisor throughout the lifetime of the project to guide sustainable development.
One Planet Communities (cont’d)

BioRegional assists the project management team to apply the ten principles through five steps:

1. Development of an action plan – This enables the provision of a framework for considering sustainability, identification of specific challenges and opportunities, development of strategies, and resolution of key targets, performance indicators, and process for One Planet Community endorsement.

2. Endorsement – BioRegional reviews and endorses action plan.
One Planet Communities (cont’d)

3. Implementation – BioRegional assigns a Sustainability Integrator who helps team put strategies into practice.
4. Annual Review – Lessons are learned and action plan is updated.
5. Expert Panel – Panel provides support to keep the initiative on track [BioRegional, 2013].
One Planet Communities (cont’d)

• Further assistance in found in two toolkits, BedZED Parts 1 and 2, that provide guidance on carbon neutral developments and green materials sourcing, respectively.

• Communities earn the One Planet designation when they have sufficiently thorough action plans with targets and strategies for each of the ten One Planet principles and have committed to monitoring until 2020 [BioRegional, 2013].
Discussion

• Sustainability rating systems are at various levels of development and implementation.
• Over time they have built upon each other and incorporated components of prior systems.
• Although several transportation rating systems are well known and used in practice, many of the neighborhood-level systems are in the pilot stage.
• More recent systems in transportation are increasingly comprehensive and context sensitive.
One Planet Communities (cont’d)

- Reviewing various rating systems revealed that sustainability is defined differently among them.
- The definition of sustainability ranges from “Reduce, Reuse, Recycle,” to consideration for future generations, to balancing human and natural needs, to the “triple bottom line.”
One Planet Communities (cont’d)

• The review revealed that there is a heavy focus on environmental aspects of sustainability and often social and economic considerations are missing from transportation rating systems.

• Neighborhood-level development rating systems do generally include social factors.
One Planet Communities (cont’d)

- All systems are based on industry best practices in sustainability.
- Systems award points based on some minimum set of criteria that is influenced by best practices.
- Criteria vary among systems; however, there is some overlap. This comparison is depicted graphically in Tables 2 and 3.
- For example, all but one of the systems have criteria related to energy conservation.
One Planet Communities (cont’d)

• Although, the rating processes of all the systems are based on the criteria derived from best practices, the process of rating projects and programs varies.

• Several systems, including Greenroads, require select criteria to be met for each level of certification or for certification in general.

• The classification for certification levels is also derived differently across systems.
One Planet Communities (cont’d)

• The differences in the systems make some more or less applicable in different contexts.
• Tables 2 and 3 can be useful in identifying which types of criteria are evaluated in each system and help an agency, company, etc., in determining which system would be most applicable based on their sustainability goals.
In addition to different criteria, rating systems can be used in different capacities.

Systems are developed to be applied at various stages of the project lifecycle: planning, design, construction, operations, and maintenance.

Systems may be useful at one or more of these stages.

Along the same grain, rating systems can be used for ex post evaluation or ex ante planning.
One Planet Communities (cont’d)

• Neighborhood systems exhibit this: some are more like planning frameworks than rating systems.
• For both types of rating systems, the use of these tools in an ex ante manner to incorporate sustainability considerations in the planning stages (rather than in solely an ex post manner), is potentially more valuable in enabling identification and inclusion of sustainability-oriented features.
One Planet Communities (cont’d)

• In both cases rating systems can be used in the decision making process, whether they provide a sustainability-oriented planning process or allows evaluation of alternatives based on sustainability ratings.
One Planet Communities (cont’d)

• The review also showed that rating systems take two different approaches to evaluating improvements: Project-based or Systems-based.
• Transportation systems typically had a focus on projects.
• Systems designed for rating road construction were very project-based; however, some transportation rating systems did incorporate land use considerations.
One Planet Communities (cont’d)

• Generally, neighborhood development systems have a holistic approach, evaluating sustainability at a systems level and including transportation components.
It is conceivable that project-based rating systems could give a high rating to projects that may not be rated quite as highly on a systems level; for example, a project-level transportation rating system without land use criteria may rate a roadway project more highly than if a more comprehensive system was used.

Table 1 provides an overview of each system identifying its most applicable uses.
The use of sustainability rating systems encourages improvement in sustainable practices in transportation and neighborhood-level development; however, a very pressing concern is measuring sustainability in light of tradeoffs.
One Planet Communities (cont’d)

• For example, a project may be rated very high on many criteria but low in environmental protection and still receive a gold rating.
• If this project is in the vicinity of a wetland and vulnerable species, is it still deserving of a gold rating?
• These complications are not necessarily accounted in the rating systems.
Conclusions

- Reviewing the range of rating systems reveals some of the comparisons discussed in the previous section.
- Specifically, these differences and similarities are presented in Tables 2 and 3.
Conclusions (cont’d)

• As mentioned previously, most systems focus on environmental impacts such as water and energy conservation, climate change and other ecological concerns.
• The two categories of rating systems, transportation and neighborhood-level development, do however, have some clear differences.
• For instance, Food Sustainability and Health/Well-being are not included in any transportation systems.
Conclusions (cont’d)

• Additional areas of human impacts that may be considered social sustainability are also absent in many transportation rating systems.

• Equity/Inclusion was included in several systems with a focus on inclusionary participation and criteria relating to Economy/Jobs was not included in any of the transportation systems.

• Still, where some of the transportation systems focus, the neighborhood-level development systems overlook.
Conclusions (cont’d)

• Areas like, Waste Management and Cost Effectiveness are not clearly accounted for in any of the neighborhood-level systems.
• Innovation and Design is another area missing in the neighborhood-level systems.
• Transportation systems include this area to encourage and spur creative solutions to sustainability issues.
Conclusions (cont’d)

• The lack of it at the neighborhood development level is curious as one would see value in encouraging innovative solutions, especially within the development community.

• The area of Safety was only included in two of the transportation systems and in none of the neighborhood-level systems.
Conclusions (cont’d)

• An area where the two types of systems overlap but do not necessarily cover are Sustainable Land Use and Transportation Impact.

• The landuse transportation interaction is commonly accepted; however, in these rating systems, it is not commonly included.
Conclusions (cont’d)

• While most systems have some measure of sustainable land use, neighborhood-level systems do not incorporate the area of Transportation Impact.
• Most do have criteria in the area of Access but do not explicitly focus on Transportation Impact.
Conclusions (cont’d)

• In conclusion, there is a range of rating systems that can be applied to transportation and neighborhood development projects.
• These systems all are used to quantify or provide a measure of sustainability for the finished project; however, this is done in a variety of different ways accounting for a variety of criteria.
• Some systems are specific to certain types of projects while others are more comprehensive.
Conclusions (cont’d)

• All the systems, however, are based on best practices in sustainability.
• Because of their differences, but also because of their fundamental similarities, one might conclude that these systems are most useful for identifying, streamlining, simplifying and enabling sustainable practices and not only in rating and evaluating the sustainability of projects.
Questions, Comments, Concerns
Final Thought...