SCOPE AND PURPOSE OF ENVISION

Envision® helps users determine the extent to which their proposed infrastructure design truly contributes to conditions of sustainability. The development of Envision is based on the stark reality that society is consuming resources and ecosystem services much faster than they can be replaced or replenished, and that infrastructure is a significant consumer of those resources and services. This level of overconsumption has negative effects not only on environmental systems, but on economic and social systems as well. Strong action is required to dramatically reduce consumption and to restore resources and ecosystem service functions back to sustainable levels. Through Envision, users will be able to measure the degree to which their design improves sustainable performance and how those improvements stack up against the realities of societal needs.

WHAT IS ENVISION?

Envision is a sustainability rating system for a country’s, a nation’s, or community’s infrastructure, specifically the roads, bridges, pipelines, railways, airports, dams, levees, landfill, water treatment systems, and other components that make up civil works. The Envision system is designed to evaluate, grade, and give recognition to infrastructure projects that make exemplary progress and contribute to a more sustainable future. It is intended to foster a necessary and dramatic improvement of physical infrastructure across the full dimensions of sustainability, that is, the economy, the environment, and society. Infrastructure project improvements are graded not only by individual project performance, but by how well those projects contribute to the efficiency and long-term sustainability of the cities or communities they are intended to serve.

Designers, decision-makers, and the public now face a proliferation of additional sustainability rating tools, all of which focus on the performance of a highway or some other mode of transportation best fulfills the mobility and access needs of the community and makes operation of other units of infrastructure more efficient. To be efficient and effective, a new or refurbished infrastructure unit may miss the more important aspects of sustainable performance (e.g., how that element contributes to the overall sustainability of the communities that it serves). Using an example of a highway, the first and most important sustainability question is not how much recycled material was used in constructing the highway. Rather, the most important question is whether a highway or some other mode of transportation best fulfills the mobility and access needs of the community and makes operation of other units of community infrastructure more efficient.

ADDRESSING CRITICAL INFRASTRUCTURE PROBLEMS

The founders of Envision set out to address a number of critical problems in infrastructure design and delivery. A country or nation’s development, and their ability to grow economically and to enhance the quality of life of their citizens, is directly tied to the effectiveness of their infrastructure. Indeed, well-functioning infrastructure is essential for a prosperous and growing economy. Effective transportation systems bring goods to market, workers to jobs, children to schools, and families to stores and recreation areas in a safe and timely manner. Dependable water and wastewater systems bring fresh water to industry, agriculture, and people. Reliable electricity supplies allow businesses and factories to work unimpeded, bringing a high level of convenience and productivity to work and home life across communities. Extensive telecommunication networks connect people and businesses across the globe and enable the fast flow of information essential to commerce.

Development, however, also can create significant problems. For instance, in its quest for economic development and growth, the United States has become the largest consumer of the world’s natural resources and ecosystem functions, operating at a consumption rate that greatly surpasses resource availability. Today, the United States uses about 20% of the world’s energy, 93% of which is supplied by nonrenewable resources. Nearly 70% of that energy is used for infrastructure, mainly transportation and the generation of electric power. Moreover, 95% percent of the fuels used to power transportation are petroleum-based, a percentage that has important strategic and national security implications.

Water presents a similar story. The United States leads the world in per capita water use, with a substantial portion consumed by infrastructure systems. Forty-eight percent of water resources are used for thermo-electric cooling, with another 35% going toward agricultural production. Because of water availability, competing water demands, and changing hydrologic conditions, the U.S. Department of Interior predicts that multiple water conflicts will occur in the western United States by 2025.

In addition, decades of excessive demands on ecological systems have reduced their capacities to absorb and process emissions and wastes. Such demands have been recognized in surface and groundwater systems, where releases of municipal, agricultural, and industrial pollutants often exceed the capacity of these natural systems to process the contamination. While point sources such as end-of-pipe waste discharges are regulated, nonpoint sources such as agricultural runoff are not, often with devastating effects. For instance, upstream agricultural practices in the Mississippi River basin have created a 60,000-square-mile dead zone in the Gulf of Mexico, severely impacting the Gulf’s fishing industry.

Chemical releases in the air also can damage atmospheric systems. High concentrations of chlorofluorocarbons in the air, for instance, have damaged the earth’s ozone layer. Sulfur and nitrogen compounds, byproducts of fossil fuel combustion, mix with water in the atmosphere to form acid rain, harming forests and freshwater aquatic ecosystems. Regulations and international treaties have brought these problems under control. However, perhaps the most insidious and yet to be controlled is the release of massive quantities of carbon dioxide and other greenhouse gases into the atmosphere. Increasing concentrations of greenhouse gases are changing the heat retention properties of the atmosphere, resulting in a change to the earth’s heat balance and climate dynamics. The world is now experiencing the consequences of these changes in the form of more intense storms, record flooding, extended heat waves and droughts, highly variable snowpacks, and rising sea levels.

For infrastructure projects, the consequences of a changing climate are far-reaching. A changing climate means a changing operating environment, new conditions under which units of infrastructure are expected to operate as specified throughout their design life. Previous assumptions for infrastructure design are made obsolete by the appearance of higher mean temperatures, more frequent and intense storms, higher flooding levels and frequencies, longer dry spells, and reduced water supplies. New and more dynamic infrastructure designs are required to cope with continuing change. Designs need to be robust (i.e., operational over a wider range of conditions), adaptive (i.e., adjustable to accommodate new conditions), and resilient (i.e., provide quick and cost-effective recovery from extreme events).

Compounding these problems is the current poor state of infrastructure in the United States. In the past five years, the United States infrastructure effectiveness ranking has dropped from first to fifteenth place, primarily because of an overall state of disrepair and lack of significant and timely infrastructure investment. The American Society of Civil Engineers (ASCE) has also been tracking the operational state of U.S. infrastructure. In 2013, ASCE gave the United States a grade of “D-“ and priced the needed improvements at $3.6 trillion. This degradation makes the United States a significantly less efficient user of resources and, therefore, a less effective competitor in the world’s economy.

Clearly, it is of national and international importance to reverse this degradation, but it must be done in a way that is affordable, technologically sound, and protective of the environment. Addressing these problems as a whole is vital. To maintain development and competitiveness while improving overall quality of life, we need to not only rebuild our infrastructure, but do so in a way that conserves and restores natural resources and ecosystem functions. To be efficient and effective, a new or refurbished infrastructure must integrate with other infrastructure networks, optimized at the city, town, or community level and with an eye toward the future. In effect, we are designing for 2050 today.
ENVISION ORGANIZATION AND STRUCTURE

The Envision system is a family of tools covering all phases of the life cycle of a project: planning and design; construction; operation and maintenance; and deconstruction, demolition, and disposal. This document covers the use of the Envision assessment and recognition tool for the project planning and design phase. It includes objectives and performance levels, a glossary, and additional resources to guide the user through a project assessment. The following sections describe how the Envision rating system is organized and how it functions.

ENVISION RATING SYSTEM

Envision for the planning and design phase is comprised of 60 performance objectives, or credits, that cover the full dimensions of infrastructure sustainability. Each credit in the Envision system includes an intent statement and metric, levels of achievement, a description, ways to advance to higher achievement levels, evaluation criteria and documentation, sources, and related Envision credits. The credits are organized into five categories and 14 subcategories by subject matter.

Performance in each credit is partitioned into five possible levels of achievement: “Improved”, “Enhanced”, “Superior”, “Conserving”, and “Restorative”. Improved, Enhanced, and Superior signify increasing reductions in negative impacts. The Conserving level is defined as having no negative impacts, while the Restorative level signifies significant restoration of social systems and/or natural resources and ecosystems.

Scoring performance for an infrastructure project is done using a point system. Each of the credits and their associated levels of achievement are assigned points weighted in accordance with their estimated contribution to sustainability. Each credit description, guidance is provided on how to determine the level of achievement for a given project. Envision recognizes that some credits may not be applicable to every project. In those cases, applicants can “opt out” of credits, that is, remove them from consideration in the overall project scoring. Such removal requires justification by the applicant as to why the credit should be considered inapplicable to the project and, therefore, not appropriate for scoring.

CATEGORIES AND SUBCATEGORIES

To structure the credits and illustrate their interrelatedness, Envision organizes them into five categories and 14 subcategories based on their main area of impact. The five categories are:

1. Leadership: Collaboration, Management, Planning
3. Natural World: Siting, Land and Water, Biodiversity
4. Climate and Risk: Emissions, Resilience
5. Resilience: Emissions, Net Positive Impact

Each of the 60 credits contains a set of evaluation criteria that are necessary for developing sustainable infrastructure and, in some cases, for restoring a nation’s already depleted resources or damaged environment. The degree to which projects meet these evaluation criteria is graded for each credit on a five-step scale called “levels of achievement.”

LEVELS OF ACHIEVEMENT

Each of the Envision credits contains one or more defined levels of achievement: Improved, Enhanced, Superior, Conserving, and Restorative. These levels of achievement define the level and quality of project performance as follows:

- **Improved**: Performance that is above conventional. Slightly exceeds regulatory requirements;
- **Enhanced**: Sustainable performance that is on the right track. There are indications that superior performance is within reach;
- **Superior**: Sustainable performance that is noteworthy, but not conserving. Point scores are designed to provide incentives for achieving sustainable or restorative performance;
- **Conserving**: Performance that has achieved essentially zero negative impact;
- **Restorative**: Performance that restores natural or social systems. Such performance receives the highest award possible, and is celebrated as such. The Restorative level is not applicable to all objectives.

Higher levels of achievement are reached by improving upon a lower level of achievement. For instance, to meet the requirements for Conserving, a project must also meet the requirements for Improved, Enhanced, and Superior. Levels of achievement have an associated point value that varies between credits.

Not all credits have five levels of achievement. The levels are determined by the nature of the credit and the ability to make meaningful distinctions between levels.

EVALUATION CRITERIA

Each Envision credit contains evaluation criteria that explain what documentation is required to reach the various possible levels of achievement for that credit. Evaluation criteria include both qualitative and quantitative requirements. Examples of evaluation criteria are:

- **Yes/No**: An action taken or an outcome achieved
  - Is the project located on a site with no adverse geologic features such as earthquake faults or karst topography?
  - Does the project have a net positive impact on ground and surface water quality and quantity?
- **Target**: A specified outcome with discrete or variable levels
  - Has the project team diverted at least 75% of significant waste streams away from landfills?
  - Was the project designed to obtain 41 to 80% of its energy from renewable energy sources?
- **Execution**: A process conducted or a commitment made to accomplish a stated objective
  - Has the project team conducted an overall assessment of lighting needs?
  - Has the project team made a specific commitment to hire local workers?
- ** Accomplishment**: A process conducted with a general or nonspecified result
  - Has the team assessed street lighting needs and specified the removal of unneeded street lighting?
  - Has the project team reduced the amount of lighting required through the use of nonlighting alternatives?

The documentation required to demonstrate evaluation criteria have been met are also explained in each credit description.

INNOVATION

The Envision rating system strongly encourages innovative methods that advance sustainable infrastructure practices or show exceptional performance beyond the expectations of the credit requirements. Each category includes an “Innovate or Exceed Credit Requirements” credit, indicated by a “*”. If innovation points are awarded, they are added to the project score. The Envision rating system awards up to a maximum of 5% of the total points in each category for innovation or exceeding credit requirements. The “Innovation” points act as bonus points that are added to the category or total score.

Envision identifies and awards bonus points on three types of innovation. The project team may offer one type or bundle two or more types in a single category. The types of innovation are as follows:

- **Achieving exceptional levels of performance.** “Exceptional performance” is defined as performance in one or more key credits that achieves new and remarkable levels of efficiency or effectiveness;
- **Overcoming significant problems, barriers, or limitations.** Demonstration of having reduced or eliminated significant problems, barriers, or limitations that previously hampered the use or implementation of certain resources, technologies, processes, or methodologies that improve the efficiency or sustainability of a project;
- **Creating scalable and/or transferable solutions.** Demonstration that the improved performance achieved or the problems, barriers, or limitations overcome are scalable across a wide range of project sizes and/or are applicable and transferable across multiple kinds of infrastructure projects in multiple sectors.

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**QUALITY OF LIFE**

“Quality of Life” addresses a project’s impact on host and affected communities, from the health and wellbeing of individuals to the wellbeing of the larger social fabric as a whole. These impacts may be physical, economic, or social. Quality of Life focuses on assessing whether infrastructure projects align with community goals, are incorporated into existing community networks, and will benefit the community in the long term. Community members affected by the project are considered important stakeholders in the decision-making process. The category is further divided into three subcategories: “Purpose”, “Wellbeing”, and “Community”.

**PURPOSE**
The “Purpose” subcategory addresses the project’s impact on functional aspects of the community, such as growth, development, job creation, and the general improvement of quality of life. Positive results from infrastructure projects can include community education, outreach, knowledge creation, and worker training.

**WELLBEING**

As integral parts of the community, sustainable infrastructure projects address individual comfort, health, and mobility. During construction and operation, physical safety of workers and residents are ensured and nuisances minimized (including light pollution, odors, noise, and vibration). Attention is also given to encouraging alternative modes of transportation and incorporating the project to the larger community mobility network. Infrastructure owners are encouraged to enable access and mobility to enhance community livability.

**COMMUNITY**

It is important that the project respects and maintains or improves its surroundings through context-sensitive design. While infrastructure primarily is driven by engineering parameters, its visual and functional impacts should be considered during design. Depending on whether the project is located in a rural or urban setting, this may include preserving views and natural features or incorporating the local character of the built environment to the design.
RESOURCES ARE THE ASSETS THAT ARE NEEDED TO BUILD INFRASTRUCTURE (CONSTRUCTION) AND KEEP IT RUNNING (OPERATIONS). THIS CATEGORY IS BROADLY CONCERNED WITH THE QUANTITY, SOURCE, AND CHARACTERISTICS OF THESE RESOURCES AND THEIR IMPACTS ON THE OVERALL SUSTAINABILITY OF THE PROJECT. RESOURCES ADDRESSED IN THIS RATING SYSTEM INCLUDE PHYSICAL MATERIALS, BOTH THOSE THAT ARE CONSUMED AND THOSE LEAVE THE PROJECT, ENERGY FOR CONSTRUCTION, OPERATION AND MAINTENANCE, AND WATER. EACH OF THESE MATERIALS IS FINITE IN ITS SOURCE AND SHOULD BE TREATED AS AN ASSET TO USE RESPECTFULLY. MATERIALS, ENERGY, AND WATER COMPREHEND THE THREE SUBCATEGORIES OF RESOURCE ALLOCATION.

MATERIALS

MINIMIZING THE TOTAL AMOUNT OF MATERIALS USED SHOULD BE A PRIMARY CONSIDERATION FOR INFRASTRUCTURE PROJECTS. MINIMIZING MATERIAL USE REDUCES THE AMOUNT OF NATURAL RESOURCES THAT MUST BE EXTRACTION AND PROCESSED AND REDUCES THE ENERGY THAT GOES INTO PRODUCING AND TRANSPORTING THESE MATERIALS. REDUCING MATERIAL USE MUST BE BALANCED WITH SAFETY, STABILITY, AND DURABILITY. THE SOURCE OF MATERIALS MATTERS. MATERIALS OBTAINED FROM SOURCES FAR AWAY SHOULD NOT BE USED IF THE SAME TYPE AND QUALITY OF MATERIAL IS AVAILABLE LOCALLY. CONSIDERATION FOR THE LIFE CYCLE OF THE MATERIALS IS ALSO IMPORTANT. THIS INCLUDES THE PERCENT OF RECYCLED OR REUSED CONTENT, ABILITY TO BE RECYCLED/REUSED AT END OF LIFE, DURABILITY, AND ADAPTABILITY. THESE CHARACTERISTICS HELP TO MINIMIZE THE TOTAL AMOUNT OF NATURAL RESOURCES CONSUMED THROUGH MATERIALS USE.

ENERGY

REDUCING OVERALL ENERGY USE IS CRUCIAL, PARTICULARLY FROM NONRENEWABLE FOSSIL FUEL SOURCES. THIS ENERGY SOURCE IS ALREADY BECOMING SCARCE, AND SUSTAINABLE INFRASTRUCTURE PROJECTS SHOULD NOT OVER-CONSUME A FINITE ENERGY SOURCE. THE USE OF RENEWABLE SOURCES OF ENERGY IS ENCOURAGED AS A MEANS TO MINIMIZE FOSSIL FUEL CONSUMPTION, BUT THE IDEAL PROJECT WILL BOTH REDUCE OVERALL ENERGY USAGE AND MEET THE REMAINING ENERGY NEEDS THROUGH RENEWABLE SOURCES WHENEVER POSSIBLE.

WATER

BETWEEN A GROWING POPULATION, INCREASING CONSUMPTION, AND PROJECTIONS OF A CHANGING CLIMATE, THE FUTURE OF WATER AVAILABILITY IS UNCERTAIN. THEREFORE, IT IS CRITICAL THAT INFRASTRUCTURE PROJECTS REDUCE OVERALL WATER USE, PARTICULARLY POTABLE WATER USE. ALTERNATIVE WATER SOURCES, SUCH AS STORMWATER RUNOFF, CAN BE CAPTURED AND REUSED FOR MANY FUNCTIONS WITHOUT REDUCING THE OVERALL WATER RESOURCE. MONITORING AND STUDYING WATER AVAILABILITY IS AN IMPORTANT STEP IN VALIDATING WHETHER A COMMUNITY’S WATER CONSUMPTION IS IN BALANCE.

INFRASTRUCTURE PROJECTS HAVE AN IMPACT ON THE NATURAL WORLD AROUND THEM, INCLUDING HABITATS, SPECIES, AND NONLIVING NATURAL SYSTEMS. THE WAY A PROJECT IS LOCATED WITHIN THESE SYSTEMS AND WHAT NEW ELEMENTS MAY INTRODUCE INTO A SYSTEM CAN CREATE UNWANTED IMPACTS. THIS SECTION ADDRESSES HOW TO UNDERSTAND AND MINIMIZE NEGATIVE IMPACTS WHILE CONSIDERING WAYS IN WHICH THE INFRASTRUCTURE CAN INTERACT WITH NATURAL SYSTEMS IN A SYNERGISTIC POSITIVE WAY. THESE TYPES OF INTERACTIONS AND IMPACTS HAVE BEEN DIVIDED INTO THREE SUBCATEGORIES: SITING, LAND AND WATER, AND BIODIVERSITY.

SITING

INFRASTRUCTURE PROJECTS SHOULD MINIMIZE DIRECT AND INDIRECT IMPACTS ON IMPORTANT ECOCENTRIC AREAS. PROJECTS SHOULD AVOID AREAS OF HIGH ECOSYSTEM VALUE OR DAMAGE AS A DIVERSITY HABITAT, SUCH AS WATER BODIES, WETLANDS, OR TEMPORARY WATERS (VERNAL POOLS, ETC.). PROJECTS SHOULD ALSO SEEK TO PRESERVE AREAS OF GEOGRAPHIC OR HYDROLOGIC VALUE AND AVOID INTERRUPTING NATURAL CYCLES, SUCH AS THE HYDROLOGIC CYCLE. WHEN THE NATURE OR SIGNIFICANCE OF THE INFRASTRUCTURE PROJECT MAKES IT IMPOSSIBLE TO AVOID SENSITIVE SITES, MITIGATION MEASURES SHOULD BE TAKEN TO MINIMIZE DISRUPTION OF SYSTEMS. PREVIOUSLY DEVELOPED OR DISTURBED LAND IS IDEAL FOR PREVENTING FURTHER DAMAGE TO THAT ENVIRONMENT, IMPROVING LAND VALUE, AND REMEDIATING CONTAMINATED BROWNFIELDS.

LAND AND WATER

INFRASTRUCTURE PROJECTS SHOULD HAVE MINIMAL IMPACT ON EXISTING HYDROLOGIC AND NUTRIENT CYCLES. SPECIFIC CONSIDERATION SHOULD BE GIVEN TO AVOID THE INTRODUCTION OF CONTAMINANTS, WHETHER THROUGH STORMWATER RUNOFF OR PESTICIDES AND FERTILIZERS. WITH PROPER FORETHOUGHT, INFRASTRUCTURE CAN AVOID THESE HARMFUL DISRUPTIONS. IT IS IMPORTANT TO REMEMBER THAT THE IMPACT OF CONTAMINATION IS OFTEN CUMULATIVE, ESPECIALLY IN WATER BODIES SUCH AS RIVERS AND STREAMS, AND THAT EACH PROJECT AND SITE SHARES THE RESPONSIBILITY FOR PROTECTING THE QUALITY OF THE LARGER SYSTEM.

BIODIVERSITY

INFRASTRUCTURE PROJECTS SHOULD ALSO MINIMIZE NEGATIVE IMPACTS ON NATURAL SPECIES AND THEIR HABITATS ON AND NEAR THE SITE. CARE SHOULD BE TAKEN TO AVOID INTRODUCING INVASIVE SPECIES OR INADVERTENTLY FACILITATING THEIR SPREAD. INFRASTRUCTURE PROJECTS SHOULD MINIMIZE HABITAT Fragmentation and Promote Habitat Connectivity and Animal Movement. SPECIES OF NEW VEGETATION SHOULD BE SELECTED AND APPROPRIATE FOR THE LOCATION. INFRASTRUCTURE SHOULD NOT ADVERSELY IMPACT WETLANDS, WHICH TEND TO PROVIDE ECOSYSTEMS THAT SUPPORT A HIGH DEGREE OF NATURAL BIODIVERSITY.
CLIMATE AND RISK

The general scope of Climate and Risk is two-fold: minimizing emissions that may contribute to increased short- and long-term risks, and ensuring that infrastructure projects are resilient to short-term hazards or can adapt to altered long-term future conditions. The Climate and Risk category is divided into two subcategories: Emissions and Resilience.

EMISSIONS:
The goal of this subcategory is to promote the understanding and reduction of dangerous emissions, including greenhouse gas emissions and other dangerous pollutants, during all stages of a project’s life cycle. These emissions can increase both short- and long-term risk to the project. Minimizing this risk helps to protect against future problems and increases the life cycle of the project. While reducing greenhouse gas emissions may not have a direct impact on the consequences of the particular project, it can help to reduce overall global risk and may contribute far beyond the site borders of the project.

RESILIENCE:
Resilience includes the ability to withstand short-term risks, such as flooding or fires, and the ability to adapt to changing long-term conditions, such as changes in weather patterns, sea-level rise, or changes in climate. Understanding the types of risks and probability of risks allows the project team to deliver an informed project design that anticipates and withstands or adapts to these risks, minimizing its overall vulnerability. Increased adaptability and decreased vulnerability ensure a longer useful life and ensure that the project will be able to meet the future needs of the community.

LEADERSHIP

Successful sustainable projects require a new way of thinking about how projects are developed and delivered. Project teams are most successful if they communicate and collaborate early on, involve a wide variety of people in creating ideas for the project, and understand the long-term, holistic view of the project and its life cycle. This section encourages and rewards these actions under the view that, together with traditional sustainability actions such as reducing energy and water use, effective and collaborative leadership produces a truly sustainable project that contributes positively to the world around it. This category is divided into the three subcategories of “Collaboration”, “Management”, and “Planning”.

COLLABORATION
Sustainable projects must include input from a wide variety of stakeholders to fully capture synergies, savings, and opportunities for innovation. This type of collaboration requires a new level of leadership and commitment from the project team and new ways of managing the process. Rather than each part of the team working alone on their own piece of the project, teams should meet and communicate, allowing stakeholders to contribute ideas and perspectives.

MANAGEMENT
A broader comprehensive understanding of the project can allow the team to see and pursue synergies between systems, either within the project or among larger infrastructure systems. This requires a new way of managing and understanding the project as a whole, but can save money, increase sustainability, expand the useful life of the project, and protect against future problems.

PLANNING
Taking a long-term view of the project can also greatly increase the sustainability of the project. Understanding planning issues, such as the regulatory environment in which the project is being pursued and future growth trends in the area, can lead to a project that avoids pitfalls and plans effectively for its own future. This can save money and streamline the entire project process.