



This workshop was prepared by the Kentucky Transportation Center Context-Sensitive Solutions Team: Don Hartman, Jerry Pigman and Ted Hopwood. It is intended to provide transportation agency personnel involved in Construction and Maintenance with information about Context-Sensitive Solutions (CSS) and actions they should take to incorporate it into their routine activities to supplement and support it. Those collective actions comprise Context Sensitive Construction (CSC) and Context Sensitive Maintenance.

The backdrop shows the removal of a rare type of topsoil (Marnie Loam) on the Paris Pike (US 68) project between Lexington and Paris, Kentucky. After the roadway grade was completed, the topsoil was re-deposited along the ROW.

## CSC Workshop Learning Objectives

- CSS and its benefits **30 minutes**
  - Define CSC and explain its importance in implementing CSS
  - Define CSM and explain its importance in continuing context sensitivity after a project is complete
- Construction & Maintenance function on CSS projects **1 hour & 45 minutes**
- How Maintenance can employ CSS principles on projects/facilities **1 hour**

The CSC&M workshop is aimed primarily at transportation agency Construction and Maintenance personnel from both the Central Offices and Districts including resident engineers and their crews along with maintenance personnel.

The first module will provide a basic introduction to the concept of context-sensitivity on highway projects will be presented. Context Sensitive Construction and Context Sensitive Maintenance will be defined along with their roles in fully implementing CSS. A hypothetical case study will be introduced.

The second module will explain the function of Construction and Maintenance on transportation agency CSS projects. Examples will be provided on the roles of Construction and Maintenance personnel in promoting CSS during construction. The case study will be addressed in four parts providing examples of issues that may require decision-making by transportation agency Construction (and possibly Maintenance) personnel.

The third module is for DOT Maintenance personnel that develop projects, oversee in-house or non-project contracts or manage facilities.

## Transition in Project Development

- NEPA (1969)
- ISTEA (1991)
- NHS Act (1995)
- Context Sensitive Design (1998)
- Context Sensitive Solutions (2000)

Over the past 40 years, the Federal government has promoted improved decision making on Federal actions beginning with the National Environmental Policy Act of 1969 (known as NEPA). Since 1969 many laws, presidential orders, and state and Federal policies have been enacted to supplement and enhance NEPA.

Both state and Federal government transportation agencies have sought to better implement NEPA and to promote transportation projects in harmony with communities and the national environment. The most important of these from a national standpoint are the development of Context Sensitive Design and its overarching successor Context Sensitive Solutions. These initiatives are relatively new. Many state transportation agencies have adopted the tenets of Context Sensitivity for various stages of their project development processes.

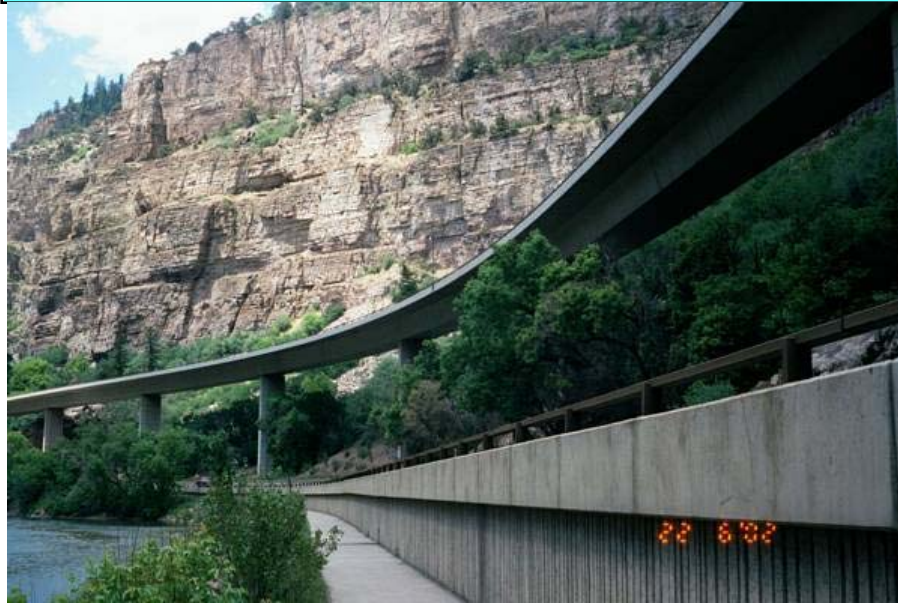
## National Environmental Policy Act of 1969

- Declaration of national environmental policy
- Establishment of action-forcing requirements
  - interdisciplinary approach to planning
  - appropriate consideration of environmental factors
  - preparation of environmental impact statements
- Impact on Federally funded transportation projects

The National Environmental Policy Act of 1969 was passed by Congress to regulate the environmental/community impacts of Federal actions (including Federally funded transportation projects). It required Federal agencies to look beyond the narrow focus of benefits from a proposed action and determine the potential impacts of that action on society, economics and the environment.

To ensure compliance with this law, Congress mandated that each Federal agency establish an environmental review process that included multi-disciplinary input, environmental reviews, and a balanced decision making process. Each Federal agency has its own NEPA process. For Federally funded transportation projects, state highway agencies have to address the Federal Highway Administration NEPA. All project-related investigations must have approval of the Federal Highway Administration. Those approvals are based upon NEPA review documents (Environmental Assessments, Environmental Impact Statements, FONSI, and Categorical Exclusions) submitted to the Federal Highway Administration by the state transportation agency.

## The NEPA Era



NEPA had far-ranging effects on Federally funded transportation projects. State transportation agencies created environmental divisions and rigorously prepared the Federally required documentation. The project stakeholders/ public were made more aware of the proposed actions. There was better compliance with environmental regulations of resource agencies.

Some projects such as the well-known I 70 at Glenwood Canyon, CO (above) gained national and international acclaim for balancing transportation, environmental and public interests. Typically, those projects involved state transportation agencies going the “extra mile” in planning and design to ensure that stakeholder/public concerns were addressed. The governor of Maryland issued an official order for state agencies to address stakeholder/public concerns about their actions leading to the Maryland DOT’s “Thinking Beyond the Pavement” initiative. Those efforts had a common thread, but there was no formal nationally recognized procedure that instituted or promoted these actions.

Picture Credit -Matthew Salek at <http://www.mesalek.com/colo/glenwood/index.html>

## “Thinking Beyond the Pavement”

*A National Workshop on Integrating  
Highway Development  
with Communities and the Natural Environment*

- Developed a new approach to project development
  - Identified supporting methods/practices
  - Assembled those into a coherent practice
- Term for new approach:
  - “Context Sensitive Design”

In 1998, a key workshop was held in Baltimore, MD sponsored by the Maryland DOT, the FHWA and AASHTO. The objective of that workshop was to bring together all of the beneficial practices employed by transportation agencies to make transportation projects fit better into communities and the natural environment. Transportation agencies also sought to address the sources of contention that had plagued project development in the NEPA Era.

The meeting participants developed a set of principles with supporting methods and practices that formed the basis for a coherent approach to making transportation projects fit into communities and the natural environment. That approach was termed “Context Sensitive Design” to emphasize the additional efforts needed in stakeholder/public involvement and flexibility in design to identify key issues and provide projects that were sensitive the environment in which they were constructed. Several contributing FHWA documents from that period include:

- *Public Involvement Techniques for Transportation Decision-Making (1996)*
- *Flexibility in Highway Design (1997)*

## Context-Sensitive ??

Definition (adj.) : Depending upon the context/circumstances.

Every transportation project is in a different location with unique contexts.

The term “Context-Sensitive” provides an important insight into the direction of this workshop and the basis for understanding major agency actions incorporating it. Context-sensitivity pertaining to this workshop means the circumstances surrounding a project. The “Context” of a project depends upon its location and potential to impact communities and the natural environment. Each location where a project is to be constructed is different and, as a consequence. In different locations the same action can have dissimilar impacts. The recognition of the varying factors and the actions needed to satisfactorily address the potential impacts of a project (along with the willingness to address them) pertain to the word “Sensitive”.

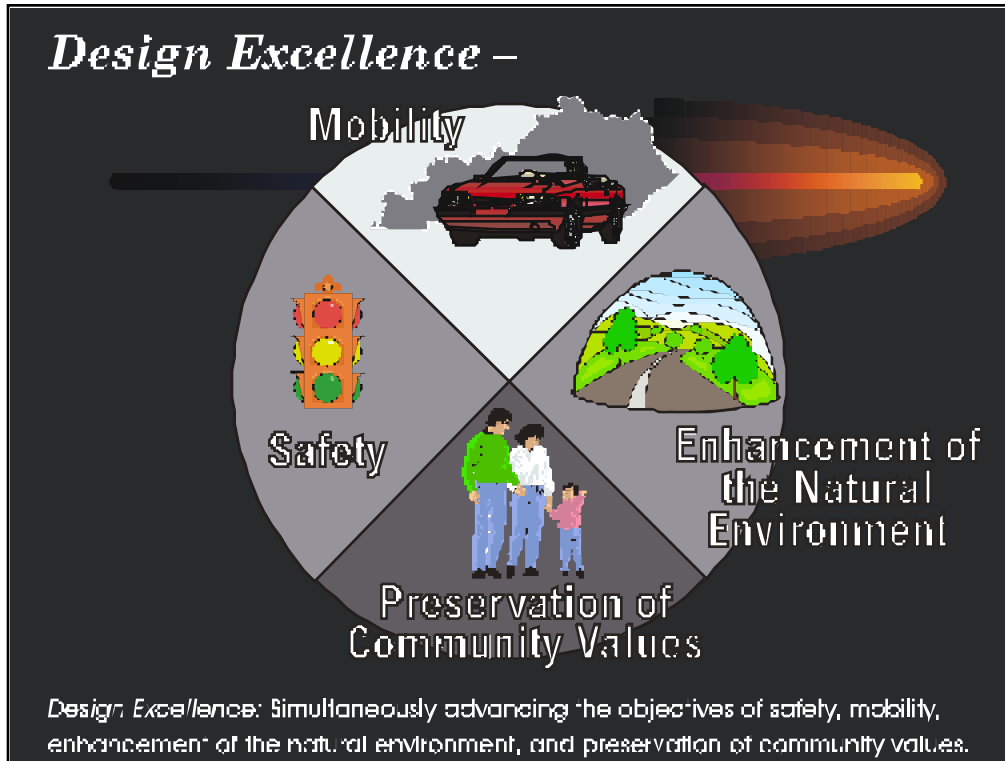
Definition Source: <http://en.wikipedia.org/wiki/Context-sensitive>

## Features of Context Sensitive Design

- Stakeholder/public involvement
  - Establish the contexts in which a project will be placed
- Flexible design
  - Collaborative, interdisciplinary decision-making
  - Exploits range of options in design guides
  - Provides “Design Excellence”

At a 1998 Maryland Conference, federal and state transportation officials along with other key attendees reviewed existing PD practices that provided improved harmony with communities and the natural environment. They merged those into a unified methodology termed CSD.

The then-current focus of that initiative was related primarily to PD actions in Planning and Design in an effort to promote projects that were acceptable to the public and resource agencies based upon : 1) public involvement in decision-making (or some elements thereof) and 2) flexible design that balanced environmental and economic issues with transportation requirements.



At the Maryland conference, “Design Excellence” was defined as designing projects that balanced transportation objectives with those of communities and the natural environment. It embodied the use of transportation planning and design to implement the decision-making process originally envisioned in NEPA.

## Context Sensitive Solutions

- Superseded CSD
- Emphasizes context sensitivity throughout the PD process
  - Including **CONSTRUCTION**

In the early 2000s, CSD began to be commonly replaced with a more inclusive term-Context Sensitive Solutions. The parties that had coined “Context Sensitive Design” were primarily focused on the early phases of project development (i.e. planning and design). Subsequently it was recognized that other vital context sensitive activities occurred within the PD process and that those needed to be recognized. “Context Sensitive Solutions” was applied to address that perceived shortcoming.

The current FHWA definition of CSS is:

*Context Sensitive Solutions* (CSS)— is a collaborative, interdisciplinary approach that involves all stakeholders to **develop a transportation facility** that fits its physical setting preserves scenic, aesthetic, historic and environmental resources while maintaining safety and mobility. CSS considers the total context within which a transportation improvement project will exist.

## What is the goal???

- Find a “best fit” solution for the **context**:



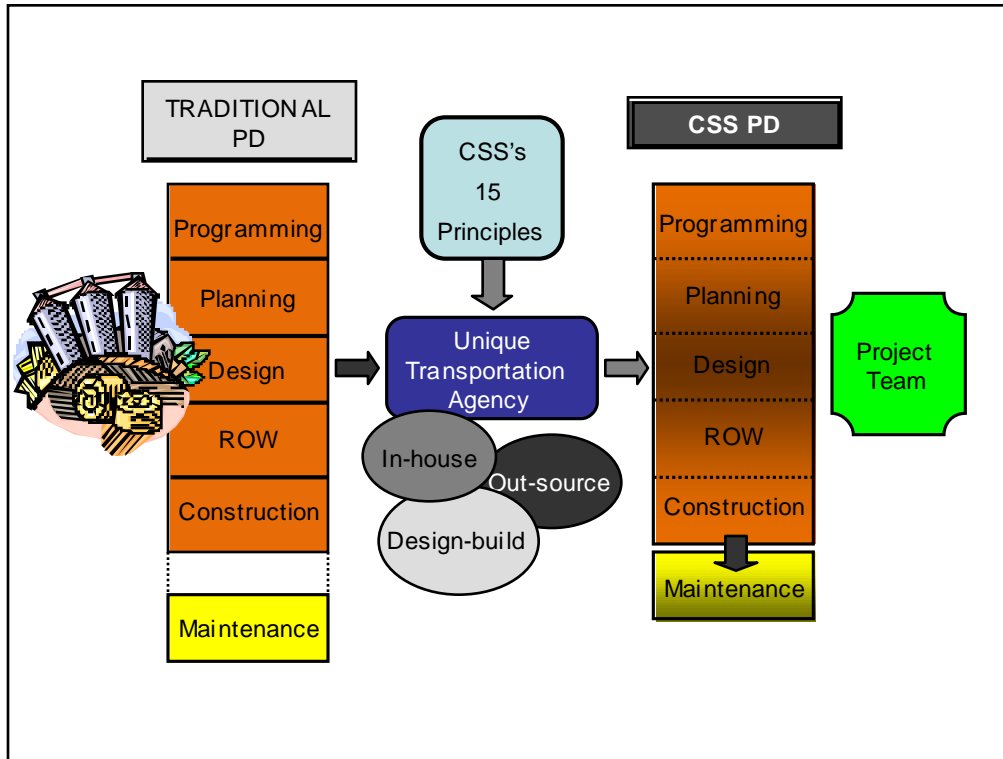
***One that meets the expectations of the transportation agency and stakeholders, as well as the community and natural environment.***

While, many benefits might be attendant to applying the principles of CSS, the question is -- what is the GOAL. The goal centers on finding the “best fit” solution to the transportation problem with full attention to the unique context. That problem with its context should be made explicit in the project’s purpose and need statement.

The best fit solution is a judgment made by the transportation agency with the benefit of knowledge from various stakeholders and the public that meets (or maybe even exceeds) expectations of all the interests. It usually represents the consensus solution – the one that most can accept for the unique project situation.

A Kentucky project manager has said that CSS is: “just a matter of doing the right thing, in the right place, at the right time.” In Colorado the Chief Engineer has stated in a CSS policy memo that:

Our day-to-day work...should respect community values and should be sensitive to the unique context of each community. **By partnering and collaborating on a multi-disciplinary basis with each community, we will find ways to achieve our transportation objectives while at the same time respecting local values. We will often enhance what makes that community special for the people that live there. Our projects should be seen as having added lasting value to the community. Our end result should exceed our expectations and those of community members, and should achieve a level of excellence in people’s minds.** (emphasis his)



Just as a project's context is unique, the transportation agency has its own uniqueness potential for project delivery (PD) using the principles of CSS. The very process and procedure of project delivery can vary by size and type of project for transportation agencies. Some large projects may be handled out of a central office while smaller projects are delivered through district offices. Different phases may be outsourced or completed by agency personnel. Some projects may even be delivered using design-build "unit" contracting. Even when projects are done in-house some may be carried out by teams while others in the same agency are processed through functionally "siloed" units. At least three core CSS principles impact the process and procedure of project delivery:

- **use of interdisciplinary (project) teams**
- **involve all stakeholders**
- **track and meet all (project) commitments**

Each of these principles contribute to finding and delivering the best fit solution. The uniqueness of the transportation agency may also be seen in which other principles of CSS it chooses to apply and the extent to which they are applied (or pursued).

## Knowing the Principles

1. Use of interdisciplinary teams



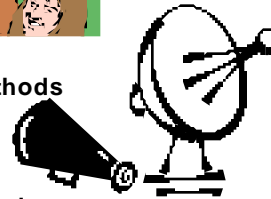
2. Involve stakeholders



3. Seek broad-based public involvement



4. Use full range of communication methods

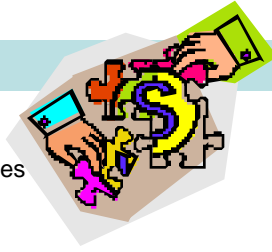


5. Achieve consensus on purpose and need



## Knowing the Principles

6. Utilize full range of design choices



7. Address alternatives and all modes



8. Maintain environmental harmony



9. Address community & social issues



10. Address aesthetic treatments & enhancements



## Knowing the Principles

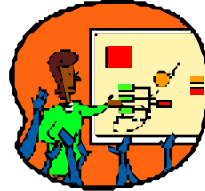
11. Consider a safe facility for users & community



12. Document project decisions



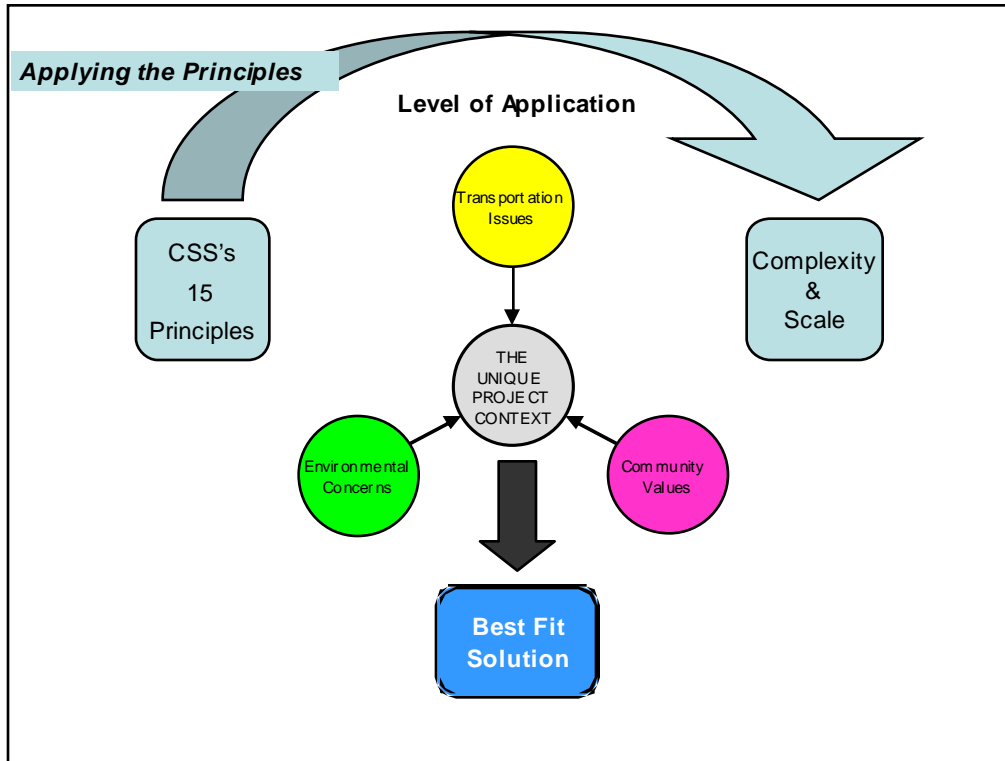
13. Track and meet all commitments



14. Create a lasting value for the community

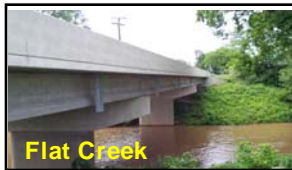


15. Use all resources effectively (time & budget)



While transportation agencies typically select which principles to apply it is the complexity and scale of the unique project (context) that should determine the level of application (or extent needed). Unique contexts are primarily determined by the interplay of transportation issues (such as safety, mobility, connectivity) environmental concerns (social and physical) and community values (sense of place, unique character, settlement pattern) . So if the community is small and compact and the transportation issue is the need for a 2-lane bridge replacement the project will be uniquely different from a 20 mile 4-lane highway through a rural area concerned with maintaining its rural character and historic features. The composition of a project team and the extent and make-up of stakeholder/public involvement should be significantly different – while both endeavors seek to find the best fit solution.

## Levels of Application (stakeholder/public involvement)



### Context

- Linkage KY-IN
- River City
- Waterfront park

### Stakeholders

- Prop. Owners
- Econ. Dev.
- SHPO
- Jurisdictions

### Solution

- Continuous arch structures (selected by stakeholders/public from 30 designs)

- Historic District
- Near Keeneland
- Bluegrass Area

- Prop. Owners
- SHPO

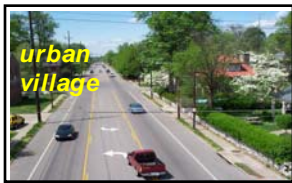
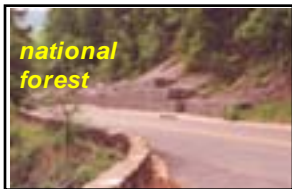
- Scaled down new concrete bridge with "decorative" trusses from old steel bridge

- Rural County
- Historic?
- Low volume

- Prop. Owners
- Design Team

- Concrete bridge with conventional design (no special treatments)

## Levels of Application (environmental harmony)



### Context

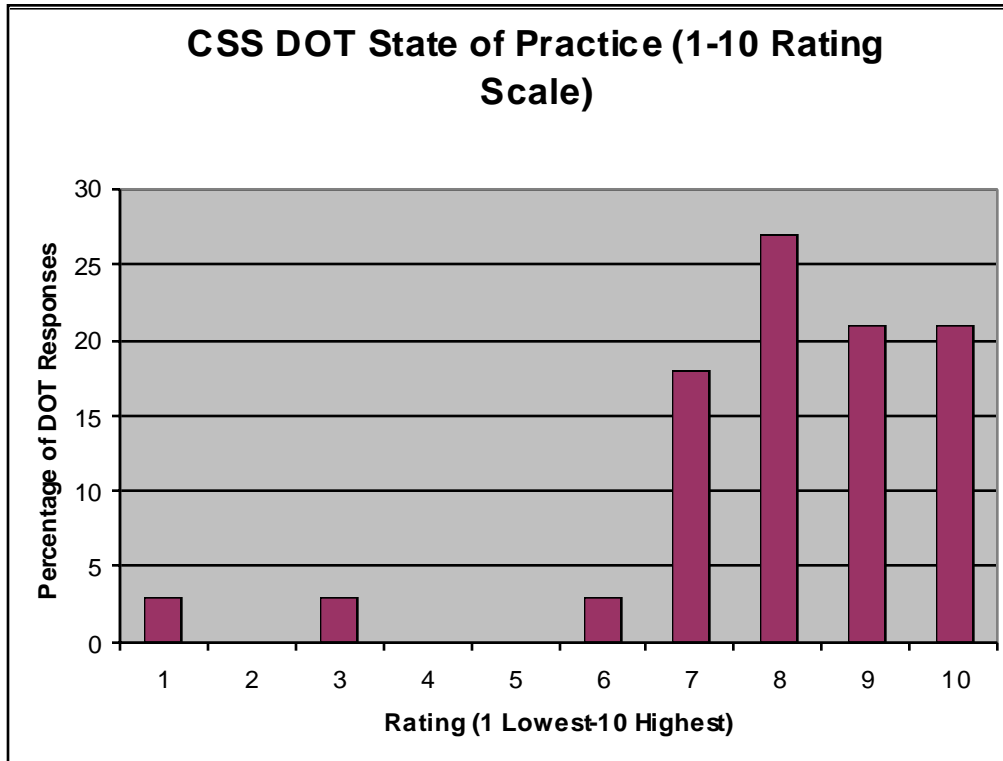
- Ozark Mtns
- Access/Scenic
- Mulberry River
- Gravel Road
- Horse Farms
- Rural Arterial
- High Crash 2-L
- Litigation 20yrs.
- Adj. to Downtown
- Adjacent to UK
- Chevy Chase
- 4-L Re-stripe

### Stakeholders

- US Forest Ser.
- Scenic Rivers
- Water Quality
- Prop. Owners
- SHPO
- The Judge
- Jurisdictions
- Neighborhood
- Bikers & pedestrians

### Solution

- paved two-lane with low design speed, curb and gutter, terrain following and uses local rock for walls/g abions
- bifurcated hwy using wood guard rails and grass shoulders in rural and curb/gutter with core-10 rail in urban
- striped for bike lanes on both sides and wide center turn lane with only two travel lanes



This chart is from a CSS survey conducted in 2006 by the Kentucky Transportation Center. Thirty-five responding transportation agencies rated their level of implementation of CSS. A rating of 1 indicated a DOT was not interested in CSS. A rating of 6 indicated a transportation agency was planning to adopt CSS. A rating of 10 indicated a transportation agency had implemented CSS for at least a year AND had addressed the practice with increasing proficiency (in terms of having CSS policies/employee training fully developed). Twenty-nine of the responding transportation agencies stated that they had employed CSS on projects for at least one year. Clearly, CSS will be an important practice for all/most transportation agencies in the future. It will play an increasingly more significant roles in many transportation agency activities.

## Benefits of Employing CSS

- Improved project delivery
- Elimination of disruptive problems
- Better overall projects
- Improved relations with resource agencies
- Enhanced public perception of DOT
- Greater credibility of DOT
- Reduced overall project/maintenance costs
  - When coupled with continuous improvement

Transportation agencies realized that CSS entailed additional effort and expense beyond that normally applied to conventional project development. That input is justified by the benefits that can be realized in project development. Some transportation agencies limit the use of CSS to “big ticket” or controversial projects due to the added effort/costs and limited funds to address transportation needs. Others have applied CSS more or less “across the board” on all projects. It is anticipated that if transportation agencies fully institute CSS, they will become more efficient in its application and will derive cost-effective means of addressing context sensitive issues on a routine basis. That will further enhance the benefits of applying CSS by achieving reduced overall project costs. To fully realize those benefits, transportation agencies will probably have to incorporate CSS in continuous improvement initiatives.

## Sustainability

**Sustainability** is meeting the needs of the present generation without compromising the ability of future generations to meet their needs (*Brundtland Report 1987*).

Sustainability is a separate issue from CSS. However, some transportation agencies are linking them to promote stakeholders/public concerns about the impacts of projects/ agency actions.

The Brundtland Report was issued by a committee established by the World Commission on the Environment and Development. It developed guiding principles for sustainable development as it is generally understood today. The Report was later debated in the UN.

## Sustainability

*The 3-legged  
Equity (Social  
to be kept stable  
system.*



*Environment &  
that need  
ainable*

Sustainability addresses three factors related to development: 1) the economy (economic benefits), 2) the environment and 3) equity (social equity). Also known as the “3 E’s of sustainability”, these factors are also to be considered by NEPA reviews. Under NEPA, the benefits of a proposed Federal action (a Federally funded transportation project) must be weighed in relation to its impact on the “3 E’s”.

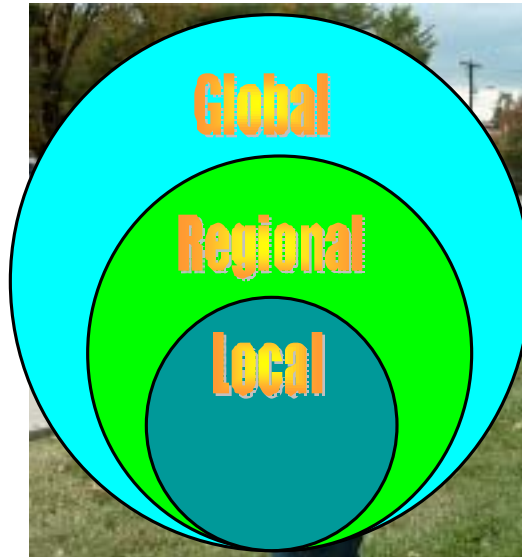
Insert: This is a document prepared by the Ford Motor Company related to that firm’s efforts to adopt sustainability. Many corporations and state governments have adopted sustainability as a corporate/ government policy.

## The CSS View



CSS entails a transportation agency looking at the human and natural environment to see how a proposed project will best fit in.

## The Sustainability View



Sustainability involves an “outside in” look at transportation projects to see how they will impact the “3 E’s” taking a long-term view.

Insert: Sustainability looks at these issues on a local, regional (national) and global basis.

## The Role Sustainability in the PD Process (and Beyond)

- In developing projects that provide:
  - economic benefits
  - minimize environmental/social impacts
- In constructing projects in a sustainable manner
- In maintaining projects to preserve them with:
  - minimum societal costs
  - limited environmental impacts
- Oregon DOT award-winning CS3 initiative (Context Sensitive Solutions & Sustainability)

Elements of sustainability bear on some CSS PD process actions. However, its full emphasis must be accommodated by transportation agency policies and implemented at the highest levels of state government. In contrast, effective application of CSS can follow all sustainability principles. Such actions include

- The use of environmentally friendly materials/practices
- Reuse or recycling of scrap and wastes
- Providing specific (targeted) economic benefits
- Working with resource agencies to develop cost-effective actions
- Preserving infrastructure elements instead of neglect/failure/replacement (proper asset management = good stewardship)

It does not require an executive branch mandate for full implementation of CSS.

## Definition of Context Sensitive Construction

"**Context Sensitive Construction** is the continuation and advancement of the objectives of safety, mobility, enhancement of the natural environment, and preservation of community values into the construction phase of a project"

CSC can be visualized as extending CSS principles into the construction phase. In many cases, projects that are considered "maintenance" work are functionally assigned to Construction Divisions for oversight during field work. In those cases, A full PD process may not have been employed. Transportation agencies must address public involvement and other CSS issues on a "perceived needs" basis. That work must occur early on in the development of the maintenance project for proper implementation of CSS principles.

## Major Objectives of CSC

- Preserving the human & natural environment
- Engaging stakeholders/public on construction projects/activities
- Minimal disturbance to motorists, the public & businesses
- Improving construction practices to promote sustainability & efficiency

We preserve the human and natural environments while preserving the transportation infrastructure. We reach out to stakeholders/public at every opportunity. We want to be as unobtrusive as possible while carrying out our assigned duties. We want to be “future friendly” and strive to get better at what we are doing by implementing a continuous improvement effort.

## Definition of Context Sensitive Maintenance

"**Context Sensitive Maintenance** is the continuation of safety and mobility, the environment, and community values into the maintenance & operations of a facility"

CSM can be visualized as extending CSS principles into Maintenance (and Operations) of a transportation facility. In many cases, projects that are considered "maintenance" work are functionally assigned to Construction Divisions for oversight during field work. In those cases, the normal PD process may not have been fully employed. Transportation agencies must address public involvement and other CSS issues. That work must occur early on in the development of the Maintenance project for proper implementation of CSS principles. In those cases, CSC and CSM procedures may both be applicable as described later in this presentation. In other cases, transportation agencies may apply context sensitive principles for general maintenance activities and apply them to all facilities and facility elements.

## Major Objectives of CSM

- Preserving the human & natural environment
- Engaging stakeholders/public on maintenance projects/activities
- Minimal disturbance to motorists, the public & businesses
- Improving maintenance practices to promote sustainability & efficiency

The objects of CSM parallel those of CSC. We preserve the natural and human environments while preserving the transportation infrastructure. We reach out to stakeholders/public at every opportunity. We want to be as unobtrusive as possible while carrying out our assigned duties. We want to be “future friendly” and strive to get better at what we are doing by implementing a continuous improvement effort.

## How is CSM Different from CSC?

- CSC applies to CSS projects
- **CSM applies to all maintenance activities**

In project development many years may be spent in planning through construction. If it is a CSS project there may be items that the transportation agency needs to address into the facility operations phase (mostly maintenance actions). We don't stop with considering just new CSS-constructed facilities. We must look beyond those and consider ALL the facilities and actions conducted by the transportation agency. The transportation agency cannot be simply sensitive to communities and the natural environment when it wants to construct a new facility. It must engage the stakeholders throughout the service life of a facility and apply the same care when maintaining it. That concern and care helps all parties cooperate in the future in a constructive manner. In the end, it will result in better relations and even in enhanced efficiency in maintaining the transportation agency's entire infrastructure.

## How is CSM Different? Cont'd.

- CSC relates to projects developed using the CSS PD process
- **Maintenance may develop its own projects**
  - CSC may be applied to those projects

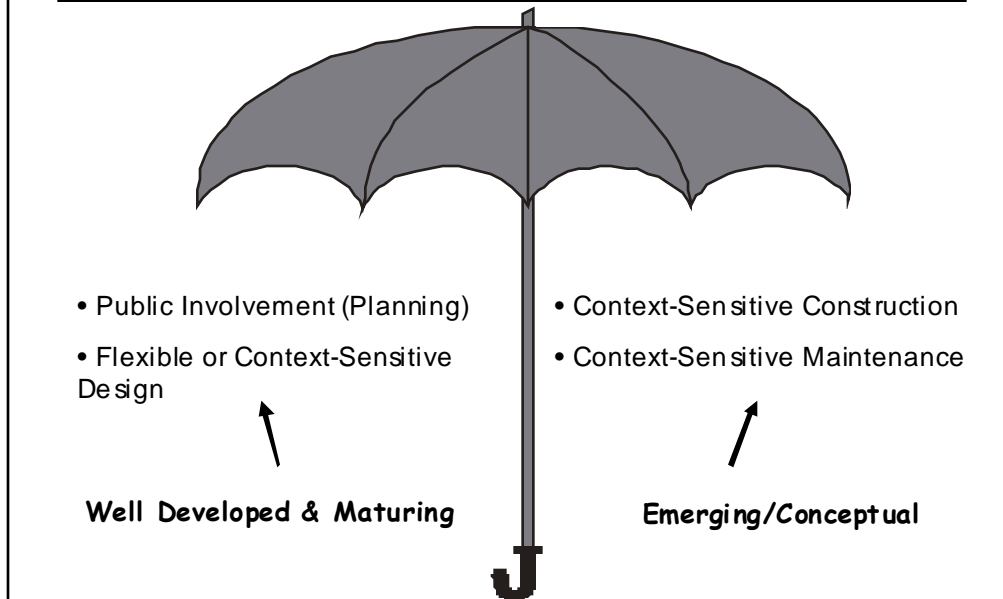
Depending on the transportation agency, CSC may apply to some/all projects that are developed through the normal project development process. Maintenance may develop its own projects that are overseen by Construction. If the transportation agency deems those to be CSS projects, then CSC may apply as well as CSM.

## How is CSM Different? Cont'd.

- CSC is localized
  - Limited to Projects
- CSM applies on ALL DOT facilities

CSC tends to be project-specific. CSM principles can be manifested in actions that include Maintenance projects, routine maintenance (both in-house and contract) and actions taken at transportation agency facilities.

## Context-Sensitive Solutions Umbrella



While some early principles associated with CSD are well developed (due to the initial focus on them by transportation agencies, other CSS-related practices have not received study or have not been developed sufficiently to allow their proper enactment in a structured well-defined manner. This is the purpose of this workshop. In some cases, the factors identified have not widely recognized and are presented for consideration and further development/ refinement.

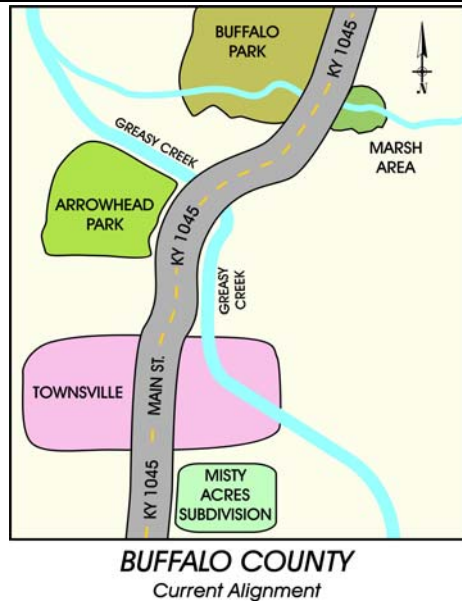
## CSS Principles

1. Use interdisciplinary teams
2. Involve all stakeholders
3. Seek broad-based public involvement
4. Use full range of communication methods
5. Achieve consensus on purpose and need
6. Utilize full range of design choices
7. Consider all alternatives and modes
8. Maintain environmental harmony
9. Consider community and social issues
10. Provide aesthetic treatments & enhancements
11. Provide a safe facility for users & community
12. Document project decisions
13. Track and meet all project commitments
14. Create a lasting value for the community
15. Use all resources effectively (time and budget)

Principles listed in **red** apply to CSS activities in CSC & CSM

This is the comprehensive list of CSS principles with those applicable to CSC and CSM indicated in red. This shows the significant applicability of CSC and CSM in fully implementing CSS on projects and completed facilities throughout their existence.

# Case Study



Townsville is the county seat of Buffalo County. A small city of 15,000, it was first settled in the 1820s. During the 1970s, it lost much of its industry, but throughout the 1980s and 90s its economy expanded and population grew. Much of the latter occurring in its suburban and rural communities.

KY 1045 runs the length of Buffalo County and through the center of Townsville. Along the way, it connects Townsville to its major suburb—Misty Acres Subdivision. The Kentucky Transportation Cabinet has decided that KY1045 needs to be upgraded to handle the rising traffic volume.

The project has been let. The Project Impact Profile and Special Notes detailing all the environmental commitments are attached.