Assessing the Sustainability of Project Alternatives: An Increasing Role for Cumulative Effects Assessment

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Abstract:
Evaluating and comparing development alternatives with respect to sustainability is an important goal for comprehensive project assessment. In the United States, this component has been largely missing from standard environmental impact assessment practice. Sustainability metrics and predictors are being developed as criteria for rating systems and evaluation programs applied to community planning, building design, and transportation infrastructure. Recent federal legislation can make it easier to integrate these sustainability features into development alternatives and increase the value of cumulative effects assessment as a tool for predicting sustainability.

I'd like to share some perspectives I have developed as an environmental impact assessment (EIA) practitioner who spends most of his time in the trenches of consulting for governmental and private-sector clients. My role is primarily as a project manager, and in that capacity I've repeatedly encountered problems in incorporating sustainability metrics and predictors into environmental impact assessment documents at the single-project level. I'll tell you about those problems and some of the ways I've found to solve them.

Sustainability Roadblocks in Environmental impact Assessment

With support from the highest level, my company is devoted to the concept of sustainability, and my colleagues and I are constantly e-mailing and talking with one another about how to incorporate sustainable solutions into environmental planning and engineering design. I encourage my analytic teams to do the same as we prepare environmental impact statements and environmental assessment documents. But as an EIA practitioner working with National Environmental Policy Act (NEPA) and state environmental review procedures in the United States, I consistently encounter two roadblocks that make it difficult to incorporate sustainability appraisals into environmental documents at the single-project level. The first barrier is the lack of an explicit statutory or regulatory mandate to use sustainability as a criterion for evaluating and comparing project alternatives. And

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the second problem is a tendency to over-emphasize the expected direct impacts of building and operating the project, while giving less thorough treatment to indirect and especially cumulative effects. Barry Sadler's talk, and the presentations of Tom Swor and others to follow, demonstrate that there are in fact ways to surmount these roadblocks, particularly at the policy, programmatic, or large-project level. What I will talk about now is a trend toward incorporating sustainability metrics and predictors into environmental impact statements and environmental assessments at the single-project level, and the relationship of this trend to cumulative effects assessment.

Both problems I've mentioned—lack of an official mandate and weak cumulative effects assessments—stem in part from the fact that environmental impact assessment in the United States is almost always conducted at the single-project level. Duinker and Greig (2006) have identified this same problem as a persisting tendency in Canadian EIA practice as well. Canada, the EU, and other nations practice strategic environmental assessment (SEA) at the policy, program, and sector levels. In the U.S. there are also exceptions to the single-project standard, and they are becoming more frequent as programmatic environmental impact statements are conducted in conjunction with policy and planning initiatives. At the federal level, for example, the National Marine Fisheries Services, or NOAA Fisheries, prepared a Programmatic Supplemental EIS for a policy-level examination of approaches to managing the groundfish fisheries of the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska (NMFS 2004). At the state and city level, the City of Seattle's planning agency recently completed a programmatic EIS under Washington's State Environmental Policy Act to evaluate and compare the long-term impacts of alternative neighborhood development scenarios on Seattle's South Downtown District (City of Seattle, 2008). But this growing number of exceptions still leaves the general rule that most U.S. EIA is conducted at the single-project level, and mostly in environmental assessment documents.

The absence of explicit federal and state mandates to consider sustainability as part of NEPA and state-level environmental impact statements and environmental assessments makes sustainability appraisal an add-on dimension to a typical EIA document in the U.S. Some of my clients have asked that any explicit reference to sustainability be removed from the document, as this topic is not specifically identified in the guiding federal or state regulations. Consequently, sustainability appraisal can be viewed as beyond the scope of the contract under which the document is being prepared. Some clients have also identified nebulous legal precedent and weak legal defensibility as a reason to avoid incorporating sustainability as one of the factors used to evaluate, compare, and rank development alternatives.

Cumulative Effects Assessment and Sustainability

Cumulative effects assessment (CEA), on the other hand, is identified in and required by the regulations implementing NEPA in the U.S. and in Canada's Environmental Assessment Act of 1995, as well as by the European Union. CEA is a natural and viable way to appraise sustainability, because it examines the likely environmental consequences of alternative development options on a specific valued ecosystem or other environmental component (VEC) over a long time span and in combination with other relevant past, present, and reasonably foreseeable future actions. Although cumulative effects can be short-term, as for example construction impacts from several developments being built at the same time, most cumulative effects are long-term and may well relate to sustainability across generations, as in the case of transportation or public utility infrastructure. Most important, the cumulative effect assessment, if done well, predicts and approximates what the VEC will actually be exposed to in future years, and how it is likely to respond. This is what actually matters, is the bottom line as to what the public should know, and it speaks directly to—in fact, is the same thing as—sustainability for that VEC.

In the U.S. at present, there is an interesting set of conditions that could have an important bearing on CEA and sustainability. Despite the Council on Environmental Quality's CEA Handbook (CEQ 1997) and a growing number of federal and state guidance documents, CEA is still not practiced well. While there have been important innovative advances, as Tom Swor and others will demonstrate, the CEA sections of many recent NEPA documents I have seen are, while longer than before, still vague and inconclusive. And most CEA discussions I have seen do not carry forward and differentiate the alternative actions for analysis and comparison, but instead discuss the project in general, presumably on the unstated assumption that the differences among the alternatives would be too small to matter at the cumulative level. Consequently, there is no way to distinguish among the alternatives with respect to expected cumulative effects and, by extension, sustainability.

But here is the interesting situation I alluded to: while the state of CEA practice, while improving, continues to be weak, strong and steady progress is being made in incorporating sustainability features into community planning and engineering design. As just a few examples, the U.S. Environmental Protection Agency's Smart Growth program provides guidance and support to regional and community planners, regional and community jurisdictions, private developers, and stakeholders to enhance ways to build sustainability into communities. The non-profit U.S. Green Building Council's Leadership in Energy and Environmental Design (or LEED) Green Building Rating System™ provides third-party certification of projects, professional accreditation, and a wealth of resources and rating criteria to incorporate sustainable features into building design, construction, and operation. The Context-Sensitive Design program of the Federal Highway Administration (FHWA) provides guidance, criteria, and procedures for working with stakeholders, agencies, and designers to enhance the sustainability of transportation infrastructure developments by making them more functionally and aesthetically acceptable to the people who use them and live near them. Jeon and Amekudzi (2005) have identified and assessed many sustainability definitions, indicators, and metrics for transportation infrastructure. And to mention one last example, my own company is currently working with the University of Washington to develop a Green Roads rating system fashioned after, and analogous to, the LEED program.

These and many other advances in sustainable design, construction, and operation provide a wealth of sustainability criteria and metrics for incorporation at the single-project level. Our engineers are using them every day on projects. The odd situation in the U.S., however, is that there is no generally accepted or legally mandated procedure to incorporate these sustainability metrics into NEPA and state-level EIA documents in substantive ways that could affect the evaluation of project alternatives. And so it becomes, at least for now, the responsibility of the project manager to find ways to accomplish this.

In some cases, the client supports using sustainability criteria and metrics from programs such as those I've mentioned as factors in evaluating and comparing alternatives. But in my own experience, such cases are rare. Increasingly, however, the engineers advancing the design of build alternatives through 15 percent, 30 percent, 60 percent, and beyond are already building sustainability factors into their early design products, where these features—innovative stormwater management solutions, for example—can be highlighted to support permit applications, such as Clean Water Act Section 404 wetland permitting, with long-lead times. Once sustainability factors are actually built into alternatives, they can be identified and used in EIA documents as proactive mitigation measures and even, in some cases such as landscaping for habitat diversity, as the eleventh step in the CEQ sequence: adaptive management.

SAFETEA-LU as a Sustainability Integrator

This approach helps, but it is only a partial solution to the problem, because it is informal and circumstantial, rather than systematic, and depends on the personalities and professional interests of the individuals managing and influencing the particular project. For transportation infrastructure, however, a relatively recent law in the U.S. now provides a formal basis for incorporating sustainability metrics into project alternatives before they even reach the NEPA process. In August 2005, a Congressional bill titled the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, known as SAFETEA-LU, was signed into law. As part of many provisions intended to streamline and expedite the environmental review process, SAFETEA-LU contains a section, 6001, that requires Metropolitan Planning Organizations to conduct early collaboration and integrated planning with agencies and stakeholders when Regional Transportation Plans are being developed. Section 6001 also directs that environmental impact mitigation activity be included in long-range planning. For mitigation to be explicitly incorporated, agencies and stakeholders developing transportation planning documents must first consider the likely environmental impacts of modal and locational transportation infrastructure alternatives. All of this happens well before the NEPA process, including scoping, begins. This removes from NEPA some of the burden of evaluating and disposing of many potential alternatives before they are brought forward for detailed environmental evaluation. Under this framework, the NEPA product no longer serves as a de facto planning document, but instead incorporates the prior actual planning document by reference and summarizes the work that has already been done by the community. The SAFETEA-LU process also helps to incorporate consideration of sustainability into the NEPA process by providing alternatives that have already been crafted into forms which are acceptable to the affected community: a key component of sustainability.

Context Sensitive Solutions and Sustainability

The FHWA’s Scenario Planning program provides procedures for interagency collaborative transportation, land use, and environmental planning that are compatible with, and can be integrated into, the SAFETEA-LU process. An important component of this program is Context Sensitive Solutions (CSS). CSS is based on Report 480 of the National Cooperative Highway Research Program (NCHRP), from 2002, titled A Guide to Best Practices for Achieving Context Sensitive Solutions (NCHRP 2002). Report 480 lays out a systematic approach outside of the NEPA and equivalent state-level processes that emphasizes early and continuing work with stakeholders to identify, prioritize, and incorporate context-sensitive solutions (CSS) into the engineering design, construction, and operation of transportation infrastructure projects. Although the CSS procedure can be stand-alone, it can also be integrated into the SAFETEA-LU regional planning process. In this way, CSS can precede, accompany, and inform the NEPA or other environmental review process, particularly as many of the stakeholders and agency representatives actively participating in the SAFETEA-LU procedure will be the same people participating in the NEPA or state-level scoping process.

As regulatory programs go, this relationship is fairly straightforward, as it shifts the planning process forward to precede and anticipate the formal environmental review process. This shifting forward includes the establishment of Purpose and Need; the evaluation, comparison, retention, or elimination of alternative approaches to meet the Purpose and Need; the broad-brush assessment of likely short-term and long-term impacts of concern to the participants; and, through CSS and other optional approaches, the identification and incorporation of measures to enhance the sustainability of development alternatives through design and through the mitigation of adverse effects of particular concern to the community and stakeholders.

Practitioners in my company have built on their authorship of Report 480 and recruited newer people like me into an ongoing effort to move beyond context sensitivity alone to more comprehensive sustainability metrics. For example, we have developed a Sustainable Urban Streets program with five comprehensive goals, as shown in Figure 1:

1. Reduce energy consumption.
2. Reduce consumption of material resources.
3. Reduce impacts to environmental resources.
4. Support healthy urban communities.
5. Support sustainability during implementation.

As shown in Figure 2, these five comprehensive goals are organized into more specific objectives, and for each objective we have developed, with our clients and their stakeholders, many specific options that are tied to best practices and standard operating procedures. Any of these options, in a NEPA context, could be considered proactive mitigation measures that are built early into the design of the project. And like CSS, the Sustainable Urban Streets program is fully compatible with, and capable of enhancing, the SAFETEA-LU Section 6001 process.

Figure 1. Sustainable Urban Streets Options

Five Comprehensive Objectives

1. Reduce Energy Consumption
2. Reduce Consumption of Material Resources
3. Reduce Impacts to Environmental Resources
4. Support Healthy Urban Communities
5. Support Sustainability During Implementation

Sustainable Urban Street Options

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Reduce Energy Consumption			Reduce Consumption of Material Resources			Reduce Impacts to Environmental Resources			Supports Healthy Urban Communities			Support Sustainability During Implementation	
Support non-motorized travel	Support energy efficient movement of people and goods	Use resources with lower operations and maintenance requirements	Use recycled materials in construction	Require less infrastructure in solution	Increase durability and life of design solution	Minimize impact on natural environment	Encourage and support biodiversity	Reflect historical and cultural context	Incorporate features that support community and livability	Incorporate features that support public services and adjacent land uses	Incorporate features that enhance public health, safety and security	Support local economic, social and resource management needs during construction	Reduce environmental and community impacts during construction
Pedestrian sidewalks	Enhanced bus zones and shelters	Water-appropriate plantings	Recycled base course	Reversible lanes	Higher strength concrete pavements	Storm water infiltration basins in planters	Plantings that support animal species diversity	Preservation and incorporation historic buildings and structures into project	Public drinking fountains	Wireless access	Signalized pedestrian crossings	Reclamation of demolition materials	Minimization of traffic interruptions, including detours
Pedestrian shelters	Transit lanes	Low maintenance pavements	Recycled asphalt	Narrow lanes less than standard width	Portland Cement Concrete pavements	Rain gardens for storm water infiltration	Plantings that attract and support desirable insects	Displays providing information about site	Public art	Fire protection access	Pedestrian refuges in medians	Reuse of top soil	Driveways for access to affected businesses
Pedestrian supportive signals (count down heads & audible signals)	Transit signal												Noise reduction (quieter equipment, reduced working hours)
Bike lanes	ITS/Advanced Information Sy												Erosion and sedimentation control
Bike racks	High Occupan Lanes												Maintenance of utility services
Bike storage lockers	Truck lanes												Safe pedestrian access during construction
Pedestrian refuges in medians	Truck turn accommodati												Reduce air emissions through restrictions on idling, use of low sulfur fuels, etc.
Signalized pedestrian crossings	Traffic signal interconnectio coordination												Encourage carpooling & transit use by construction workers
Bicycle detection at signals	ITS/Advanced Transportation Management												Clean up of existing hazardous materials
Bicycle priority at signals													Minimize construction "footprint"
Bicycle route signage			Recycled utility covers	Combine signs, lights, signals, etc. on same pole	Vandal-resistant designs and materials	Tree pit enhancement	Create pocket green spaces and connectivity		Retention or introduction of tree cover to reduce heat gain on paved areas	Collaborate with property owners for mutual benefit (e.g. frontage inputs)	Surveillance cameras for increased security and/or emergency response		Off-site construction worker parking
Way finding and signage to local/regional trail system			Incorporation of recycled vegetative material	Access Management treatments to enable more efficient traffic flow	Use of structural planting medium	Natural drainage systems			Pedestrian lighting		Traffic calming features including speed humps or tables, traffic circles, chicanes, and chokers to manage traffic speeds		
				Road Diet features									

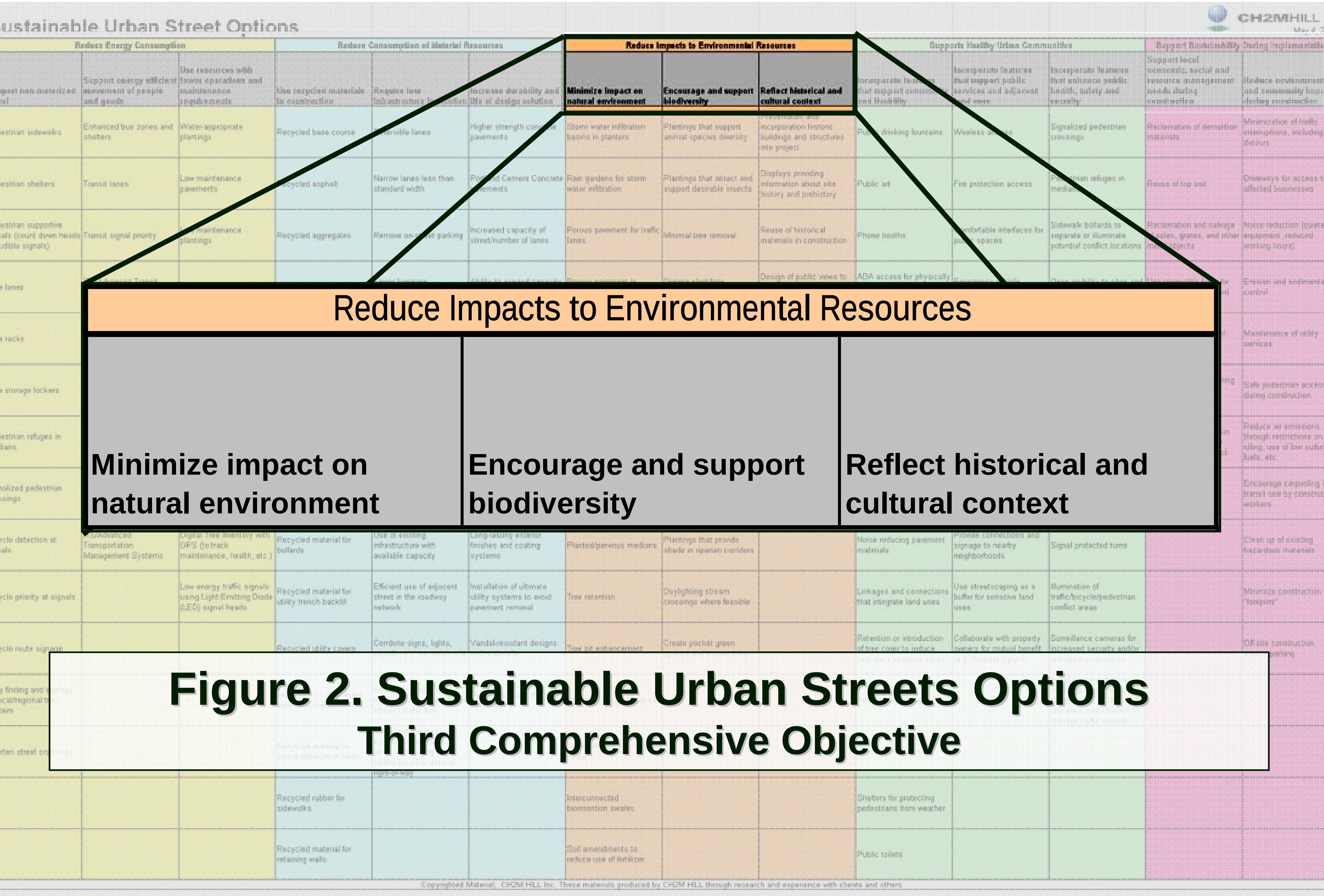

Figure 2. Sustainable Urban Streets Options

Third Comprehensive Objective

Implications for EIA and the Role of CEA

Where does this trend toward the early and collaborative integration of sustainability metrics and features leave EIA and, in particular, the NEPA process? And what role can CEA play? I can see several positive answers. First, a NEPA or state-level EIA document that is preceded by the SAFETEA-LU process can be streamlined, because a preliminary Purpose and Need Statement; the elimination of early alternatives for stated reasons; the identification of issues of concern to the agencies, stakeholders, and general public; and some mitigation measures have already been identified in a formal process that can be summarized and incorporated by reference. This allows the NEPA or equivalent scoping process, and the analysis and documentation that follows, to acknowledge the preceding work and focus more incisively and substantively on those topics that remain as important issues.

Second, programs such as CSS, Smart Growth, LEED, and Sustainable Urban Streets provide a large number and variety of sustainability criteria and metrics that can be applied during the evaluation and comparison of development alternatives. As I noted previously, there can be resistance to the voluntary incorporation of the sustainability dimension into EIA in the absence of a legal mandate or accepted formal process. SAFETEA-LU, however, neutralizes that objection by providing both a legal mandate and a formal process. Once sustainability metrics have been incorporated into development alternatives prior to the environmental review process, they are carried forward through the EIA process as integral features of the alternatives being evaluated and can be identified as proactive mitigation measures. In this way, the NEPA document can specifically identify and emphasize the benefits of sustainability factors already in the alternatives, and in part evaluate, compare, and rank them on that basis.

Third, and finally, a January 2007 final report by the FHWA titled *Integration of Context Sensitive Solutions in the Transportation Process* (FHWA 2007) notes that

> An additional benefit of integrating CSS into transportation planning is that it can help identify potential indirect and cumulative effects (ICEs), an area of rising concern for the transportation industry.[3] Although evidence of this was not found in this project, it seems that a holistic approach and genuine effort to understand the full context of a transportation need may help identify issues that could fuel a challenge based on unacceptable or unmitigated ICEs.

Leaving aside the question of whether, and how, cumulative effects should be mitigated—an important question addressed by others at this conference—there is a crucial relationship between cumulative effects and sustainability. As I noted earlier, the cumulative effect of a development alternative on a VEC is what actually matters to the public, because it is what actually happens to the VEC. The cumulative effect includes the direct and indirect effects of the alternative, but it also includes the direct and indirect effects of other actions. If done well, the CEA should approximate the actual conditions to which the VEC will be exposed in the reasonably foreseeable future. To the extent that sustainability metrics have been used to evaluate the alternative, it should be possible to assess whether they will matter at all. It should also be feasible, to a limited extent, to assess whether sustainability components have been built into other past, present, and especially reasonably foreseeable future actions and, if so, whether the aggregate of the sustainability features in multiple projects might mitigate their adverse cumulative effect on the VEC.

All this is for the future, but at least on the U.S. transportation planning horizon, some of the emerging regulatory relationships might actually sharpen the connection between sustainability and CEA, make CEA more relevant to practitioners, and level the emphasis in EIA from a focus on direct effects to one that includes not only indirect and cumulative effects, but also—by incorporating sustainability metrics—cumulative mitigation.

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