NCHRP REPORT 750, VOLUME 4

Sustainability as an Organizing Principle for Transportation Agencies

Transportation as a Means, Not an End

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The author is Principal, McVoy Associates LLC, Slingerlands, New York, and served as chair of the NCHRP project panel for this report. Transportation agencies can find support and direction in their essential service to society by pursuing the goal of triple bottom line (TBL) sustainability. Transportation agencies and organizations routinely face fundamental questions that are difficult to answer under current paradigms:





Interstate 5 cuts through a neighborhood in Portland, Oregon, circa 1973. Environmental concerns were not a high priority at the time many Interstates were originally constructed.

• How should agencies allocate funding among the modes?

• Which assets should agencies maintain and at what level?

• How much should agencies spend on increasing capacity?

• How can agencies streamline environmental approval processes?

• How should agencies organize and staff departments?

• What makes a program or policy sustainable?

Although most of these questions stem from a short-term, localized disconnect between costs and needs, deeper issues are at work. Most transportation agencies struggle with emerging issues of safety, reliability, resilience, freight, access, livability, economic development, environment, and social equity, applying approaches forged during the Interstate era.

Taking the Long View

The National Cooperative Highway Research Program (NCHRP) developed the Foresight Series of reports to provide agencies with a 50-year, strategic perspective for addressing many of these questions.¹ NCHRP Report 750, Volume 4, *Sustainability as an Organizing Principle for Transportation Agencies*, offers a framework that applies TBL sustainability precepts to decision making.²

Sustainability focuses on meeting today's social, environmental, and economic needs while providing for those of future generations; some label these concerns as people, planet, and prosperity. The premise of Volume 4 is that transportation plays a fundamental role in a sustainable society by providing for mobility and the distribution of goods and services. The value of transportation derives from the net value of these services, as measured by the TBL.

¹ www.trb.org/NCHRP750/ForesightReport750Series.aspx.
² http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_750v4.pdf.

Sustainability becomes not "another thing" but "*the* thing."

Agencies can reframe many of the questions in transportation with TBL service to society as the overarching objective and can make a business case for alternative investments in day-to-day decision making. In this context, trade-offs and investment decisions expand beyond life-cycle costs to consider user benefits and environmental and social concerns.

For example, modal investment decisions involve the consideration of regional economic vitality, carbon emissions, access, and safety, along with the traditional concerns of cost and usage. Under a TBL approach, transportation services aim to maximize—and to optimize—societal welfare within practical confines creatively on a larger scale in a businesslike manner.

As business guru Edward Deming wrote in *The New Economics*, "The obligation of any component is to contribute its best to the system, not to maximize its own production, profit, or sales...." In other words, the measure of a transportation agency's performance should be the net benefit contributed across society's TBL instead of life-cycle costs or asset conditions. Transportation can contribute disproportionally to the economy, as long as society has other, more efficient mechanisms to improve social and environmental conditions; nonetheless, transportation should maximize cost-effective contributions to these elements as part of its public mission.

Commitment to Sustainability

The conceptual maturity model in NCHRP Report 750, Volume 4, frames an agency's progression from an internal focus on transportation infrastructure and mobility to an external focus on the sustainability of the larger community (Table 1, below). The distinctions between the levels are illustrative. The premise is that transportation agencies can progress from a narrow focus to a broader perspective necessary for effective support of a sustainable society. Although artificial, the construct can help an agency address sustainability in holistic terms and can provide a standard for assessing processes and performance from a more comprehensive vantage.

The organizational sustainability maturity model parallels the organizational history of transportation agencies:

• Level 0, Mobility, represents the post–World War II Interstate era and the focus on mobility and vehicular throughput.

• Level 1, Compliance, represents the era after the National Environmental Protection Act and the growing appreciation for the costs and impacts of

Maturity Level	Objective	Metrics	Year	Characteristics
0. Safe mobility	Build Interstate Reduce fatalities	Miles built Number of crashes	1954–1970	Supports societal mobility Government ownership and control of infrastructure Transportation agency as owner–manager and regulator
1. Compliant transportation	Achieve letting goal Reduce fatalities Reduce congestion	Dollars spent Number of crashes	1970–2000	Supports societal mobility Compliance with environmental, economic, and social legislation Transportation agency as owner–manager and regulator Top-down planning
2. Green transportation	Reduce congestion Reduce fatalities Achieve letting goal Be green	Dollars spent Number of crashes Wetlands preservation CO2 emissions	1985–2015	Supports societal mobility, safety, and environmental, economic, and social needs; emphasis on environment Transportation agency as owner–manager and regulator
3. Sustainable transportation	Improve mobility Reduce congestion Reduce fatalities Achieve letting goal Be green and sustainable	Passenger miles Delay hours Number of crashes CO ₂ emissions Rating score	2010–2030	Supports sustainable transportation Favors partnerships between public and private sectors Transportation agency as infrastructure integrator (some owner–operator and some private) Transportation agency as regulator
4. Triple bottom line (TBL) sustainability	Improve mobility Reduce congestion Reduce fatalities Be green and sustainable Improve society	Passenger miles Delay hours Number of crashes CO ₂ emissions Rating score Public support TBL in dollar equivalents	2025-	Supports societal sustainability Broad agency decision-making partnerships Risk sharing between public and private sectors Transportation agency as infrastructure integrator (some owner, some owner–operator, and some private) Transportation agency as system's steward and regulator

TABLE 1 Transportation Agency Sustainability Maturity Levels

Washington State DOT installed a larger culvert as part of its SR-520 improvement project. The new culvert will allow fish migration and is among several other environmental improvements in the project.



transportation projects.

TABLE 2 National and State Level Sustainability Rating Systems

• Level 2, Green Transportation, includes environmental stewardship and a proactive, positive approach to externalities.

• Level 3, Sustainable Transportation, addresses TBL concerns, including social and economic benefits, yet without the tools and institutional arrangements for effective delivery.

• Level 4, TBL Sustainability, represents a full commitment to transportation services in support of a more sustainable society.

Operationalizing Sustainability

Tools for assessing projects and programs are important for agency decision making and are helpful in assessing organizational capacities and methods. For example, at Level 0, Mobility, an agency needs only basic tools to plan and deliver highway capacity. At Level 1, Compliance, environmental assessments are helpful in avoiding, minimizing, and mitigating adverse environmental impacts.

At the midpoint of maturity, Level 2, Green Transportation, proactive environmental stewardship calls

Sponsor Criteria Review Link System Scope Envision Institute for Checklist includes 60 credits in five Fee-based www.sustainableinfra structure.org/ Infrastructure Sustainable categories: quality of life, leaderrating/ Infrastructure ship, resource allocation, natural world, and climate and risk GreenLITES New York State Highways Checklist includes 180 project Selfhttps://www.dot.ny.gov/programs/ DOT development criteria and assessment greenlites additional tools for planning, operations, and maintenance INVEST Checklist includes 64 criteria, Federal Highway Highways Selfhttps://www.sustain ablehighways.org/ Administration planning through operations and assessment maintenance Checklist includes 48 criteria Greenroads Greenroads Highways Fee based https://www.greenroads.org/ Foundation focused on design and construction STARS North American Multimodal Checklist includes 29 credits, Fee-based www.transportation council.org/ Sustainable transportation planning through operations Transportation Council TIGER U.S. DOT www.dot.gov/policy-initiatives/tiger/ Transportation, Benefit-cost, dollar-based Grant all modes valuation across many aspects of tiger-bca-resource-guide-2014 program the triple bottom line INSTEP Checklist includes 37 criteria U.S. National Park Transportation, Selfhttps://www.nps.gov/articles/ Service all modes, with focused on design and assessment transinstep.htm in park setting construction



Slauson Avenue in Los Angeles, California. L.A. Metro received a \$15 million federal TIGER grant to replace an underused rail corridor with 6.4 miles of pedestrian and bike path.

for more than avoiding negative impacts, applying a systematic method for assessing the sustainability features of projects and programs. A checklist of best practices for increasing TBL benefits can be helpful in awarding points for achievement and can render a score for a project or decision—much like the Leadership in Energy and Environmental Design, or LEED, certification awarded by the U.S. Green Building Council.

Some of the more popular Level 2 sustainability tools are shown in Table 2 (page 34), which provides links to more detailed information about the means and methods. These tools are evolving, becoming more sensitive to a project's context, but still tend to award points on the basis of utilization, without regard to the cost, value, or quantity of the TBL results.

At Level 3, Sustainable Transportation, the focus is on the TBL results—including the social and economic and requires sustainability tools that recognize context and opportunity. Checklist tools continue to be useful, although TBL valuation tools are gaining acceptance, such as those used in the U.S. Department of Transportation (DOT) grants program TIGER—or Transportation Investment Generating Economic Recovery. The TIGER program valuation tools translate a range of project benefits and costs into dollar equivalents, allowing for informed trade-offs between competing factors such as safety, mobility, emissions, and access.

Nevertheless, accepted values are lacking for intangibles such as wildlife habitat, aesthetics, community cohesion, and more. The calculations therefore tend to leave these out, and the analyses must address the considerations separately through weighting factors and other means.

Collaborative decision making assumes critical importance at Level 4, TBL Sustainability. At this point, the agency has a full appreciation of—and commitment to—transportation service in support of a more sustainable society and is working with a range of stakeholders to achieve shared objectives. Outreach tools to define and achieve consensus on outcomes and values become essential.

Consensus Building

The TBL valuation approach is essential for agencies focusing on service to a more sustainable society. For example, the benefits of paratransit service to the general traveling public may seem small because of the number of passengers involved, and the benefits to the agency in terms of net revenue may be negative; but from the societal perspective, if paratransit can help an aging population remain in their homes and avoid the institutional costs of assisted living, the service can benefit residential care, individuals, and families, as well as reduce the cost of publicly provided care.

A TBL approach helps agencies more effectively provide essential services such as paratransit.



Improvements to the southern section of the Robert Moses Parkway in New York State were part of a state-selected GreenLITES project.



A TBL dollar-equivalent approach to the business case for paratransit can illuminate the net benefits and costs for decision makers. Moreover, funding transfers between transportation and the agencies responsible for elder care can be considered on a "level playing field" to optimize society's services for the mobility challenged.

Similarly, at Level 4, the streamlining of discussions and decision making for project-level environmental permitting becomes more tractable. If all of a state's agencies are seeking to contribute to a more sustainable society as a common, unifying objective, the state DOT would be advancing projects that have been publicly vetted and that exhibit a significant longterm, net positive TBL value. Environmental resource agencies accepting this premise would focus the permitting process on determinations of public interest and would participate as partners in the consensus valuation process.

For example, some would argue that resources such as wetlands are irreplaceable and inappropriate for valuation, but from the Level 4 perspective, the larger society is spending public money or forgoing common, long-term TBL net benefits through avoidance; this imputes a value to the wetlands. With a larger purview, the analytics and transparency of the consensus valuation approach would engage all agencies and stakeholders in serving a more sustainable society and would provide a mechanism for more effective environmental permitting.

Transportation agencies can advance this Level 4 consensus building by transparently engaging those who are willing to discuss the issues and by documenting the reasoning in dollar equivalents. The Internet can aid this type of discussion and analysis and

may provide precedents and defensibility in any litigation. Starting with approaches and tools like those of the TIGER projects and embracing the method of successive approximations—familiar to field practitioners—agencies can convey the true value of transportation services to the larger society, as outlined in NCHRP Report 750, Volume 4.

Applying the Model

New York State DOT and California DOT (Caltrans) have field-tested the maturity model. New York State DOT surveyed staff with such questions as "What can be done to further advance sustainability within the agency?" and "What's holding us back?"³ Caltrans applied the maturity model to inform the next steps in developing a strategic management plan⁴ and published a one-page synopsis for internal instruction.⁵

The first meeting of state DOT sustainability directors, hosted by Caltrans and the State Smart Transportation Initiative in June 2015, keynoted both of these tools and the conceptual frameworks.⁶ As a result, additional collaboration is under way using the NCHRP Report 750 sustainability precepts.

Additional material on this topic is available in a presentation from the May 2015 TRB International Conference on Transportation for Sustainability⁷ and on the NCHRP Foresight Series website.⁸

³ https://www.surveymonkey.com/r/Z79993R.

⁴ www.dot.ca.gov/perf/library/pdf/Caltrans_Strategic_ Mgmt_Plan_033015.pdf.

⁵ http://ldrv.ms/lGjKsJb.

⁶ www.ssti.us/Events/dot-sustainability-directors-meeting/.

⁷ http://events.webcastingconferences.com/600_trb_

sustainability/lobby_br2/.

⁸ www.trb.org/NCHRP750/ForesightReport750Series.aspx.