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International Comparison of Transport Appraisal Practice

Annex 5 US Country Report

Weisbrod, G.
Economic Development Research Group Inc (EDRG), Boston , Mass.

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INTERNATIONAL COMPARISON OF TRANSPORT APPRAISAL PRACTICE

U S C O U N T R Y R E P O R T

Table of Content

1. PREFACE ON MULTI-LEVEL GOVERNMENTAL RESPONSIBILITIES 3
2. HISTORY OF APPRAISAL PRACTICE 4
3. RECENT DEVELOPMENTS 6
4. HOW APPRAISAL IS USED 7
5. KEY FEATURES OF INTEREST 10
6. CONCLUDING OBSERVATIONS 12
BIBLIOGRAPHY 13

List of Tables

Table 1 Economic Development Criteria Identified in Project Rating Systems 11

1. PREFACE ON MULTI-LEVEL GOVERNMENTAL RESPONSIBILITIES

Ownership and Finance Control. In the US, highway facilities, public transportation systems, airports, seaports and rail stations are almost always planned, built, owned and operated by state and local governments. In general, the federal government does not own or operate transportation facilities, but rather serves to distribute funds to the state and local governments. (The main exceptions are inland waterways across the nation, which are controlled by the federal government, along with infrastructure serving the nation's capital city.)

The state governments construct, own and operate highways, including those designated as part of the national highway system. All of the states finance transportation projects through state motor fuel taxes, along with state vehicle registration fees. Some states also collect tolls and vehicle ownership (excise) taxes, and a few also use general funds from other sources. Local governments are responsible for constructing, owning and operating local roads, using their own funds (which may be a combination of sales tax, property tax and occasionally income tax revenues). (Major commercial airports are all either state-owned or city-owned, though they are often run by independent, quasi-governmental authorities. Local general aviation airports are either locally owned or privately owned.)

The federal government also collects money from its own motor fuel taxes. Those funds are distributed to the 50 state Departments of Transportation for state highways and rural transit capital investments, and to the 342 metropolitan organizations for multi-modal urban project planning and urban public transport capital investments.

Federal Formula Funds. Most of the federal money is distributed to state DOTs and MPOs by formulas set by the US Congress to reflect perceived needs and priorities. The funding formulas are based on factors such as population, traffic volumes, etc. For instance, rural states that have significant traffic passing through them get more federal highway funds per capita than other states to make up for the added burden of providing for trips generated elsewhere. The federal formula funds are also segregated into different program areas, such as metropolitan planning, state highway projects, urban congestion mitigation and air quality improvement projects, safety projects, highway/rail crossings, rural transit, transportation alternatives and mobility for seniors and individuals with disabilities. (Federal formula grants can be used for subsidizing the operating expenses only for rural and small transit systems; all others are subsidized by state and local funds.) (For more information about these rules, see FTA (2012) and FHWA (2012)).

The State DOTs and MPOs make their own project prioritization, selection and funding decisions, regardless of whether the project involves use of federal formula funds, state funds or a combination of the two. (All of these situations occur.) The federal government cannot dictate to the state DOTs and MPOs how to evaluate project proposals and make prioritization and selection decisions. However, the federal government does require that the federal formula funds be used in ways consistent with the above-cited program categories. In addition, the federal government requires, as a condition of receiving federal funds, that states and MPOs maintain certain levels of data collection, analysis, planning and public involvement processes. They also require the states to maintain asset management plans, and provide a state airport system plan, a state highway system plan, and a state rail system plan. Some states and MPOs provide an integrated multi-modal plan. (This does not apply to public transit because transit capital funds are distributed by formula to independent local transit agencies.)

Federal Discretionary Grants. Besides the formula funds, the federal government also maintains money for its own "discretionary" grant programs, which provide money to state and local agencies for deserving airport projects, harbour/marine projects and high speed rail projects. They also provide discretionary grants for major highway and transit capital investments that require more funds than available from the formula distributions. (This includes mega projects.) Congress sets the funds available for each of these discretionary grant program categories, and the US DOT then accepts applications from state and local authorities for those grants. In the case of these discretionary grants, US DOT does sets its own application requirements that call for benefit-cost analysis as well as statements on how the projects support various stated social, environmental and economic development goals.

How the Different Tiers of Government Work. A recent TRB report (NCHRP 02-24, 2013) notes: "The importance of this arrangement is that it gives wide latitude to states and metropolitan planning organizations to decide upon their own procedures for prioritization and selection of projects. And each level of government faces a different set of criteria and considerations for setting transportation investment priorities. Thus, a variety of different forms of benefit-cost analysis, multi-criteria analysis and economic impact analysis are utilized for project prioritization and funding decisions."

A consequence is that the US Department of Transportation (DOT) has set criteria and rules for selecting projects to be federally funded by its discretionary grants, while the state DOTs and MPOs have their own sets of criteria and rules for projects that are funded with state or local money (or a combination of state/local funds and federal formula funds). In this paper, we discuss both federal government practices and state government practices for evaluating and prioritizing proposed transportation projects.

2. HISTORY OF APPRAISAL PRACTICE

Federal Level Requirements. Federal regulations requiring a comparison of the benefits and costs of proposed infrastructure projects dates back to the Federal Navigation Act of 1936 and the Flood Control Act of 1939, which mandated analysis showing that benefits exceed costs for all federally funded waterway and flood control projects. The National Environmental Policy Act of 1969 also called for cost-benefit analysis for regulatory programs. However, BCA was not required for federal transportation decision-making until 1991, when federal surface transportation funding was consolidated into major, multi-year authorizing legislation. The federal sources over the years typically have represented between one-third and one-half of all public funding for highway and transit projects. Following the 1991 law, the distribution of federal funds started being accompanied by requirements for state and local agencies to conduct project appraisal; however it was left to the state and local agencies to decide how to accomplish that analysis. Often, state and local buy-in (agreement) and fund matching would suffice in order for projects to receive federal funds.

The first federal government mandate for the widespread use of BCA was President Clinton's Executive Order (EO) 12893 of January 26, 1994, which required all federal agencies to adopt BCA for the "systematic analysis of benefits and costs." It called for all benefits and costs to be quantified and monetized to the maximum extent possible, including environmental and non-market benefits and costs, for those measures to be discounted for a project's life cycle, for effects of uncertainty to be addressed either quantitatively or qualitatively, and for analysis to compare a comprehensive set of options. Subsequently, the Office of Management (OMB) has mandated the values of discount rates to be used in benefit-cost analyses for federal projects. The real discount rate established for

analyses was originally set at 7 percent. Later guidance indicated that 3 percent could be used alongside 7 percent for comparison purposes.

Federal BCA Guidelines. The elements of BCA were clarified by US DOT guidance originally issued over the 1990's. Following the Federal Highway Administration (FHWA) study "Cost of Highway Crashes" in 1991, the Value of Statistical Life (VSL) measure was adopted to for transportation project safety benefits. Previously, other approaches (e.g., human capital, human capital net of consumption) had been in use. Emissions and air quality effects initially focused on "criteria pollutants" of the Clean Air Act Amendments of 1990. Other guidance on valuation of travel time was issued in 1997 and value of noise reduction was issued in 1998. All of those federal guidance documents have since been updated by US DOT during the 2011-2013 period, and new guidance on valuation of carbon emissions was issued by the US Environmental Protection Agency in 2012.

In the US, federal (as well as state guidelines) for project appraisal do not address historic preservation, biodiversity, noise impacts, water quality impacts, property impacts or equitable treatment of low income and minority populations (referred to as environmental justice) because all of those impacts are covered by laws that require an Environmental Impact Analysis for all major projects, as well as minor projects determined by state or local authorities as having potential impacts on those factors. The National Environmental Policy Act of 1969 requires review of social, environmental and economic impacts on regions, neighbourhoods, communities, and vulnerable populations for federally funded projects. Most states have parallel laws for environmental impact review. All of these laws require public hearings and formal approvals by relevant environmental agencies as a prerequisite for project approval. Hence, failure to pass this hurdle makes further project appraisal unnecessary. However, any project that passes this hurdle will already have most data for further BCA and economic impact appraisal already assembled.

Since the US DOT is comprised of separate modal agencies, and each modal agency controls its own discretionary grant programs, each has also developed its own guidance on benefit-cost analysis. This includes BCA guidance pertaining to highway asset management (Federal Highway Administration, 2003), freight intermodal project investment (FHWA, 2008), rail transit new starts (Federal Transit Administration, 2008), and aviation improvement (Federal Aviation Administration, 1999). The Federal Rail Administration also had a BCA guide (FRA, 1990), but it has become obsolete since FRA no longer issues grants for freight rail projects. In general, each of these guides recognizes user travel time, vehicle operating cost, safety and emissions benefits. The freight, rail and airport guides also allow for inclusion of wider productivity benefits associated with shipper costs and supply chain logistics costs, though they left it to the applicant to develop and apply methods to calculate those effects. These various BCA guidelines issued by the modal agencies of US DOT apply to applications for federal discretionary grants that are filed by state, metropolitan or municipal governments.

In 2011, US DOT initiated a program of federal multi-modal grants to support economic recovery, and those rules added recognition of potential productivity benefits associated with improved labor market access as well as freight logistics, though it did not specify how those elements were to be measured (US DOT, 2011).

State Level Guidelines and Tools. State and local transportation agencies can make use of US DOT guidance on BCA methods, but are not required to do so unless the project involves a federal discretionary grant. Since most state and local transportation projects are funded by a combination of state funds and federally formula funding to the states, they are evaluated, ranked and funded on the basis of state DOT regulations. (For instance, see Minnesota DOT, 2009 and 2012).

The 50 state DOTs collaborate through an organization called AASHTO, the American Association of State Highway and Transportation Officials. In 1977, AASHTO issued its first "Red Book" – The Manual for User Benefit Analysis for Highways. The Red Book was updated in 2003 and 2010. It focuses specifically on the user benefit/cost measurement, including benefits associated with effects of changes in volume, speed, distance, safety and pollution emissions. Considerable effort has gone into specifying vehicle speed / user cost relationships, based on value of time, vehicle occupancy and vehicle operating cost. It also draws from the "Highway Capacity Manual" (first issued in 1950 and last updated in 2010), which has been a foundational source for establishing the speed-flow relationships. While the AASHTO Red Book only presents recommendations for user BCA calculations, they are very widely accepted and are used by most state DOTs.

AASHTO has also funded development of benefit-cost tools through the National Cooperative Highway Research Program (NCHRP), which is operated by the Transportation Research Board. This includes MicroBENCOST in 1989, which was a user cost calculator that captured the speed user cost relationships. It then funded StratBENCOST in 1991, which extended MicroBENCOST to include risk analysis and a lifecycle evaluation framework. Subsequently, FHWA's BCA.net was issued in 2007 as an easier-to-use web-based tool for user benefit/cost analysis that has replaced the earlier tools.

Many but not all state DOTs conduct user benefit/cost analysis to support their evaluation and prioritization of proposed projects. Some states (e.g., Arkansas, Michigan, Connecticut) have adopted BCA.net for evaluation of highway projects. Other states have developed their own BCA spreadsheet tools, including California which has been enhancing its Cal-B/C tool since 1996. (See California DOT, 2007). Indiana uses another BCA tool called NetBC.

At least half of all states conduct BCA for large investment projects, including projects that also require an environmental impact statement. A few states routinely conduct BCA for all projects. Examples of the latter group include California DOT, Minnesota DOT and Vermont DOT. However, multi-criteria rating is the dominant method used by states for prioritizing and selecting projects because it allows consideration of broader definitions of social benefit. Even those states that regularly conduct BCA normally use the results together with their assessment of broader, non-monetized benefits and costs. (These state practices are described in further detail in a later section on current practice.)

Metropolitan Planning Organizations. The Federal-Aid Highway Act of 1962 required the formation of an MPO for any urbanized area with over 50,000 residents. Since then, MPOs have been responsible for developing regional transportation plans and for prioritizing federal funding of transportation projects within their jurisdictions. MPOs are governed by representatives of the local municipalities within their regions, and they are required to provide planning and prioritization through a continuing, cooperative, and comprehensive ("3-C") planning process that involves input from the public as well as local governments. Staff of the MPOs typically use some form of multi-criteria assessment to assess projects in terms of their impact on broad social, environmental and economic goals.

3. RECENT DEVELOPMENTS

As part of measures to stimulate the economy following the major economic downturn, Congress passed the American Recovery and Reinvestment Act (ARRA) that made additional funds available for infrastructure projects. From 2010 to 2012, the TIGER (Transportation Investment Generating Economic Recovery) program provided grants from US DOT to state and local governments for multi-

modal surface transportation projects that pass a BCA test and aid the economic development of communities. A key element of the TIGER grant application process was that it specified US government recognition of a newer version of BCA that explicitly included wider economic benefits. The regulations stated that "Priority consideration will be given to projects that: (i) Improve long-term efficiency, reliability or cost competitiveness in the movement of workers or goods (including, but not limited to, projects that have a significant effect on reducing the costs of transporting export cargoes), or (ii) make improvements that increase the economic productivity of land, capital or labor at specific locations" (US DOT, 2012a, 2012b). While there are proposals for the TIGER program to continue, future funding for it is uncertain. Nevertheless, its guidelines are being promoted as a recommended new standard for formalizing BCA analysis for multi-modal transportation projects in the US.

In recent years, AASHTO has funded the National Cooperative Highway Research Program (NCHRP) program to oversee studies on ways to expand the practice of BCA by state DOTs to cover broader social, environmental and economic benefits and costs. The topics are usually suggested by individual state DOTs, and then selected by vote of an AASHTO panel. Recent reports have addressed methods for assessing congestion impacts on productivity, benefits of using freight rail to reduce truck congestion, benefits of rail crossing safety, benefits of multi-modal freight investment, community benefits, benefits of enhanced walkability, benefits of investment in bicycle facilities, benefits of improved access to recreation and measurement of productivity impacts.

The American Public Transit Association, comprised of the nation's local public transit authorities, funds a parallel research program called TCRP – Transit Cooperative Research Program, which has studied ways to improve the measurement of benefits associated with public transit investments. Further research programs for freight and aviation project valuation are funded by US DOT under NCFRP – the National Cooperative Freight Research Program and ACRP – the Aviation Cooperative Research Program.

There is now growing interest among State DOTs in broadening the definition of economic development factors in project ranking and selection processes, primarily those that affect the productivity and economic competitiveness of regions (usually states, but sometimes a multi-state regions or the entire nation). Starting in 2007, a growing number of state DOTs have developed new approaches to project appraisal that combine user benefit forms of BCA together with regional macroeconomic models that calculate expected impact on state GDP and job growth. This includes Indiana DOT's Major Corridor Investment Benefit Analysis System (MCIBAS), Montana DOTs Highway Economic Analysis Tool (HEAT) and Michigan DOT's Benefit Estimation System for Transportation (BEST). Over the last five years, Wisconsin DOT, Kansas DOT, Ohio DOT and North Carolina DOT also have initiated scoring systems for project prioritization that explicitly incorporate both user benefit and GDP or employment impacts derived from a regional macro model (most often REMI or TREDIS). Several other states are now conducting studies to assess the best ways of incorporating these factors.

4. HOW APPRAISAL IS USED

Federal. As a general rule, any state or local project receiving federal funding must undergo analysis of its social, economic and environmental impacts.

Airport projects are usually funded by the Federal Aviation Administration of US DOT, and they require a benefit-cost analysis for all grant applications exceeding $5 million. The BCA guide (FAA,

1999) recognizes that productivity improvements can occur as freight shippers respond to lower transportation costs by adjusting inventories or shuffling logistics activities. The FAA now allows productivity to be included in BCA for grant applications, and that was the basis for approval of a runway extension at Rock County Airport in Wisconsin. The project was justified largely on the basis of a labor and capital productivity gain associated with reducing down-time for just-in-time delivery for the automotive parts supply chain.

For Freight project grants, the Office of Freight within US DOT's Federal Highway Administration recommends procedures for evaluating proposed freight projects. It recognizes that a primary mechanism for productivity improvement occurs as freight shippers respond to changing reliability and transportation costs by adjusting inventories or shuffling logistical activities. It also provides a "Highway Freight Logistics Reorganization Benefits Estimation Tool" (FHWA, 2008).

The US DOT's TIGER grant program for funding of multi-modal projects has required that applicants complete a BCA analysis as well as evidence that the project will fulfill five long-term goals: (1) economic competitiveness, (2) state of good repair, (3) safety, (4) sustainability and (5) livability. Typically, these goals are demonstrated by evidence that the project will provide societal benefits (compared to base case conditions) in terms of factors such as time savings, cost savings, productivity enhancement, maintenance and repair savings, reduction in traffic incidents, emissions reduction and accessibility. Its BCA guidelines also allow monetization of a wider range of non-user benefits, including factors related to the long-term efficiency, reliability or cost competitiveness in the movement of workers or goods." (US DOT, 2012a).

The US DOT has also developed a series of tools to support transportation project decision-making by state DOTs. In particular, FHWA developed a highway performance database called the Highway Performance Measurement System (HPMS), which was the foundation for the Highway Economic Requirements System (HERS). HERS-ST is a tool developed for use by states for the benefit-cost evaluation of statewide highway investment plans. FHWA also developed BCA.Net, a web-based tool for benefit-cost evaluation of highway projects with risk analysis. BCA.Net is based on highway engineering relationships in the Highway Capacity Manual and implements the principles in FHWA's "Economic Analysis Primer". But though it is active in generating user impact measurement tools, US DOT specifically leaves the development of economic impact models to the private sector.

States. Every US State DOT has some process for evaluating and prioritizing proposed projects, including requests for enhancement of individual roads and rail transportation facilities that are submitted by local communities, regional agencies, or district offices of the State DOT. The use of economic analysis in the project appraisal process varies widely among states, ranging from required to voluntary. In some states (e.g., Vermont), there is a statutory requirement to conduct benefit cost analysis to show that all major programs and projects have costs that do not exceed their benefits, though broad definitions of benefit are used for some types of projects. In other states (e.g., Minnesota), all projects must have *either* B/C > 1 *or* a qualitative assessment justifying the project (accompanied by official written approval of that justification). In yet other states (e.g., Wisconsin), large projects and state-to-local grant programs require B/C >1, while the primary prioritization of highway projects is made based on multi-criteria ratings. Sometimes combinations of methods are used, as some states (e.g, North Carolina and Ohio) use both B/C ratios and economic impacts as factors in their multi-criteria ratings, which are used for project prioritization.

At least one-third of the State DOTs also routinely conduct economic impact analysis, sometimes recognizing wider economic growth benefits (particularly insofar as they affect business cost competitiveness). Some use the economic impacts as factors in their multi-criteria rating schemes. A few (e.g., Indiana and Washington State) have started using incremental GDP or income growth

measures as the basis for measuring benefits for BCA applied to the ranking of freight-oriented projects. Economic impacts have been justified for such use based on the desired goals of state legislators and the public to grow jobs and income in the state economy.

When a State DOT does a benefit-cost or an economic impact analysis, it may take a state perspective or a national perspective, depending on the nature of the project and its funding. In general, a national perspective is required for all projects that involve federal discretionary grant funds. Most states also take a national perspective when conducting user BCA, based on the idea that even pass-through vehicles are users of the state's highways. However, they usually take a state-level perspective when conducting economic impact analysis for projects involving state funds. And some State DOTs (e.g., Indiana) take the perspective that, for state-funded projects, both user benefits and economic impacts should be calculated only for trips that have at least one trip end inside the state.

Further complicating the situation is the existence of multi-state highway corridors, in which several State DOTs agree to collaborate on a project. For instance, they may pool some of their federal formula funds and add in some of their state funds to enable a new toll road or freeway (or improvement to an existing highway) to be built. In those cases, BCA and economic impacts would likely be calculated for a combination of state, multi-state regional and national perspectives. That would be necessary to show the value of the overall corridor project, and to get funding approval from each of the individual state DOTs. Projects of that scale also invoke the environmental impact process, which requires extensive public hearings and state/federal agency reviews in order to secure planning, land acquisition and construction approvals.

The technical methods used by State DOTs for project prioritization fall into three main classes. They are described below, drawing from text in the NCHRP 02-24 (2013) report.

- *"Multi-Criteria Analysis (MCA),* which involves of rating projects along a variety of factors. MCA allows for qualitative and quantitative factor ratings to be considered together in a summary table. Ohio DOT (2011), Wisconsin DOT (2007), Missouri DOT (2004) and Virginia DOT use variants of this method, with formally specified weights applied to each factor so that an overall total score can be computed for each project. These DOTs all calculate GDP or employment impacts from a regional economic impact model (REMI or TREDIS) that directly calculates productivity and economic growth impacts. The states then assign a weight to that predicted benefit. They also add weight to other factors affecting local productivity, such as connectivity (to intermodal terminals, key state-wide corridors and export gateways) and spatial development (supporting regeneration, cluster and in-fill development)." (Sample weights for five states are shown at the end of this document.)
- *"Benefit Cost Analysis.* This is typically done through a two-step process of quantitative BCA calculation and qualitative factor ratings. First, BCA is calculated considering only user benefits and costs, following guidelines of the Association of State Highway and Transportation Organizations (AASHTO, 2003). Then qualitative factors are considered that reflect non-user benefit categories including regional and local economic competitiveness and development, environmental and social impacts. Minnesota DOT (2009, 2012) and California DOT (2007) adopt this approach."
- *"Composite Scoring Systems.* Kansas DOT (2010) developed a composite scoring method, which calculates GDP impact using the TREDIS economic analysis framework to account for labor market and freight market access impacts. The GDP impact rating is then combined with engineering BCA rating and a "local consultation" rating (from community meetings) to provide a composite score. (Environmental factors enter only insofar as they ar raised by the local community consultation.) The Vermont Agency of Transportation (Vtrans) has a different point

system for rail and aviation projects. The rail rating gives points to projects that increase use of the mode and reduce transport costs for the state's industries. The aviation rating considers effects on job creation as well as activity levels and percentage of surrounding population served. There is also a rating for highway projects, which gives extra weight to projects that recognize impacts on productivity for the state's trucking industry, which will in turn also reduce overall costs of doing business for Vermont manufacturers. "

- *"Informal Systems.* Some State DOTs (e.g., Virginia DOT) provide lists of criteria and then rely on experts to review proposed projects and rate them on the basis of stated program goals." This approach allows for consideration of trade-offs among project impact and benefit factors without set explicit weighting factors."

It appears that in a majority of the states (and possibly all of them), project rankings developed by staff of the State DOT are reviewed and can be overridden by the State Transportation Commission (an appointed board) or the state's Secretary of Transportation. That represents an "escape valve" allowing for additional considerations not captured by the standard prioritization process to be brought into decision-making.

Metropolitan Planning. The MPOs are also required to set priorities for the funding of proposed highway, transit and bicycle projects within their areas. These organizations generally rely on multi-criteria ratings to accomplish this. The rating schemes typically judge how each project succeeds or fails to support specified land use and development goals, social/ community and quality-of-life goals, social goals and economic development goals. Typically, all ratings are qualitative and subjective, because of the qualitative nature of the stated goals .

5. KEY FEATURES OF INTEREST

Alternative Rating Schemes. One feature that distinguishes the US context is the proliferation of different ways of developing rating and ranking systems. While all are fundamentally similar to the WebTag's CBA and Appraisal Table elements, they show different ways of weighting and scoring projects. A recent paper compared some of the different scoring systems used in the US with UK guidance, and showed that tend to incorporate similar factors, but the comparisons are implemented in ways that can lead to different project selection outcomes. A summary from Weisbrod and Simmonds (2011) is shown below.

Table 1 Economic Development Criteria Identified in Project Rating Systems

	CBA	MCA			Rating	Appraisal	
Rating Criteria	**USDOT**	**OH**	**WI**	**MO**	**KS**	**DfT**	**Scot**
Traveller Benefit and Environment							
Efficiency: Travel time, cost, level of service	X	X	X	X	X	X	X
Safety (accident rate)	X	X	X	-	X	X	X
Pollution emissions/air quality/greenhouse gas	X	X	X	X	-	X	X
Transportation Drivers of Business Productivity							
Intermodal facilities, access & interchange	*(x)*	X	*(a)*	X	*(a)*	X	X
Reduce localized congestion bottlenecks	*(x)*	X	X	X	X	*(b)*	*(b)*
Connectivity to key corridors or global gateways	*(x)*	-	X	X	*(a)*	-	-
Labour market access	*(x)*	-	*(a)*	-	*(a)*	*(a)*	*(a)*
Reliability of travel times	*(x)*	-	*(a)*	-	*(a)*	X	*(b)*
Truck freight route, supply chain impact	*(x)*	X	*(a)*	X	X	-	-
Transport Drivers of Localized Economic Growth							
Location: regeneration of distressed area	-	X	-	X	-	X	X
Land use: supports cluster or in-fill development	-	X	-	X	X	X	X
Econ Policy: support target industry growth	-	-	-	X	X	-	-
Local public support	-	-	X	-	X	-	-
Leveraging private investment	-	X	-	-	-	-	-
Macroeconomic Outcomes							
Jobs(support job growth/reduce unemployment)	-	X	X	-	-	-	-
Gross Regional Product or Value Added	-	-	-	-	X	-	-

X = factor explicitly included as an element of the rating system;
(x) = factor implicitly allowed via calculation of additional productivity benefit in CBA
(a) =factor implicitly included as a component of the macroeconomic productivity calculation (using TREDIS in US and agglomeration benefit guidance for DfT and Transport Scotland);
(b) = factor included in travel efficiency benefit shown above
" - " = factor not formally recognized as a separate element of the rating system, but may still be considered through other elements of the project appraisal and selection process
Abbreviations and Sources: CBA = Cost-Benefit Analysis; MCA =Multi-Criteria Analysis; USDOT =US Dept. of Transportation, OH =Ohio, WI = Wisconsin, MO = Missouri, KS = Kansas, DfT=Dept. for Transport, UK, Scot = Transport Scotland.

Appraisal Ratings vs. Regulations. Another notable feature of the US context is the fact that many elements of environmental and community impact are effectively covered by binding constraints under environmental impact review processes, so negative impacts can lead to outright disapproval of projects. For that reason, factors such as noise, biodiversity and heritage are commonly left out of BCA calculations, and often also multi-criteria ratings. That does not mean that they have been left out of consideration. Rather, it means that they are being considered in other ways. Or it may be said that they are implicitly given such value that they may be part of the reason for outright rejection of a project.

Who is the User of Transportation Infrastructure? The BCA guidance documents issued by aviation and freight agencies of US DOT also highlight the importance of clarifying the definition of what is a "user" of "beneficiary." Several reports of the US DOT Office of Freight make the case that the traditional BCA methodology does not distinguish empty and full trucks, and that it is the shipper

rather than the carrier who is the true "user" of freight transportation facilities and services. The problem is even worse for general aviation airports. As noted in a comparison of US benefit-cost guidance documents (Landau et al, 2009), "In the case of general aviation airports, there are uses for medical emergency (e.g., organ transport), military and civilian flight training, and recreation (including commercial air shows) that require some form of valuation or consideration in decision-making. Some general aviation airports also serve as support centers for industry clusters, handling emergency replacement shipments for just-in-time production processes, which typically involve charter and private industry aircraft. In all of these cases, the benefit may be quite different from the traveler time and cost savings factors that are commonly used for ground transportation. And in all of these cases, it may be argued that the true user of the aviation services is the medical center, educational institution or industry that chartered or paid for use of air service, rather than the pilot and passenger. The possible need to consider wider definitions of airport users and beneficiaries can raise additional challenges for the application of BCA to airport projects."

Distinguishing Value of time. In the US, it is accepted practice to differentiate values of time for business and leisure travellers, and by mode. The US DOT guidance for BCA assigns a higher value of time to airplane and high speed rail passengers than to local car, bus and rail and transit passengers, in recognition of the higher average wage and higher value of time savings associated with those who pay a premium price for the faster modal options. Some states develop their own values of time based on their own average wage rates in lieu of the US-wide average assumed in USDOT guidance. In the US economic impact models, the value of time savings for business travel is typically interpreted as having an impact on labour productivity, and sometimes a portion of the time savings for commuting to work is also recognized as affecting business operating cost.

There are a number of new trends emerging in the valuation of travel time delay. A growing number of states are now recognizing truck values of time that vary by commodity being carried. The differentiation of time values for toll roads has also been a topic of recent research, though there are not yet any guidelines on that matter.

Importance of Safety. The USDOT value of a statistical life (VSL) changed from roughly $6 million as of 2012 to over $9 million in 2013. And since all non-fatal crash costs are defined as fractions of VSL, the effect was to also raise those costs. Clearly, this type of adjustment can have an effect on overall appraisal. Yet similar changes have occurred in the past in the valuation of pollution and greenhouse gases too. So care must be taken in comparing across states or nations for a single year when all factors are subject to year-by-year revisions of this sort.

6. CONCLUDING OBSERVATIONS

The US practice of project prioritization illustrates a wide range of different techniques being used (BCA, economic impact analysis, multi-criteria ratings and hybrid combinations of the preceding techniques). Yet all of these techniques can all be viewed a representing variations on the same concept of identifying different elements of benefit and then assigning weights to them to enable comparison to overall costs and calculation of a prioritization rank. While many State DOTs embrace BCA for its rigor, some also employ economic impact analysis for its clear meaning, and most ultimately depend on a multi-criteria rating approach because of its inclusiveness. And in a very real sense, the most important lesson to be learned from the US experience is the value of multiple perspectives, which are enabled when multiple analytic techniques are employed. The State DOTs, faced with a complex combinations of federal, state and local funding and decision-making roles, have tended to embrace multiple approaches to the appraisal of project proposals.

There is no doubt that the project appraisal process plays a strong in federal discretionary grants and in State DOT project prioritization, and while those rankings can be overridden, they seldom are. In fact, politicians often point to the existence of formal ranking and selection processes to defend and legitimize the funding decisions that are made. When large amounts of money are at stake for proposed large-scale and mega projects, there is also a very strong and nearly universal recognition that BCA has an important role to play in the funding approval process. And so it is the case that even when state and federal agencies do not require BCA, it is typically applied as a test of the defensibility of spending money on large, complex and often controversial projects. Of course, the analysis is only as good as the base of data available regarding expected effects on transportation system performance and levels of use. And so, when proposals for high speed rail projects have been criticized in recent years, it was not the BCA or economic impact analysis that was attacked, but rather the fare collection and ridership projections upon which the economic analysis was based. In other words, the quality of underlying transportation analysis becomes of paramount importance for backing the economic analysis and appraisal outcomes.

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