EmX Evaluation Framework Report

Final Report:

Prepared for: Lane Transit District

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INTRODUCTION

As a result of a grant from the Oregon Transportation Research and Education Consortium (OTREC), Lane Transit District (LTD) partnered with the University of Oregon's Community Planning Workshop (CPW) to create a framework for evaluating LTD's bus rapid transit (BRT) system, the Emerald Express (EmX).

Bus rapid transit (BRT) is a transit system that is significantly less expensive than light rail (for a detailed description of BRT characteristics, see Appendix A of this report). Evaluating BRT is important to both improve the systems that already exist and to help transit agencies make good decisions about establishing new bus rapid transit systems in the future.

Recognizing the importance of evaluation, LTD asked CPW to collect information to improve LTD's evaluation of its BRT system. The broader purpose of CPW's study was to examine stakeholder perceptions of BRT in Eugene-Springfield and create a framework for evaluating this system. In that context, the purpose of this report is to provide that framework, which organizes criteria to help LTD prioritize its evaluation program in the future.

To achieve this purpose, CPW conducted interviews with city planners, policy makers, community groups, representatives of the business community, and LTD staff. CPW also conducted surveys and held focus groups with these stakeholders. From these interviews, surveys, and focus groups CPW identified criteria for evaluation. CPW organized these criteria into the framework outlined in this report.

BUS RAPID TRANSIT

BRT is a mass transit option that aims to achieve many of the same goals as light rail, but with a much smaller price tag. Like light rail, most BRT systems have an exclusive right-of-way that allows for faster speeds, congestion avoidance, and a more reliable travel schedule (see Appendix A for a complete list of BRT characteristics). An additional benefit of exclusive BRT travel lanes is that stops made along a route will not affect the flow of other forms of transportation.

BRT vehicles are typically larger than conventional buses, and are designed with several large entryways that facilitate fast boarding. BRT systems are also designed to be quieter, have lower emissions, and offer more wheelchair and bicycle space on board than traditional buses.

Guided by public input, LTD decided that BRT was a good fit for a community that is growing but does not have the travel demand to warrant a light rail system.

BRT distinguishes itself most from light rail and other traditional rapid transit in cost. BRT uses buses instead of light rail trams— tracks, cables, and wires are not needed.

The efficiency and effectiveness of BRT systems is still being determined in smaller cities throughout the United States. While examples of BRT projects exist in large U.S. cities like Seattle, Washington and Boston, Massachusetts, communities with smaller metropolitan areas are now looking to the Eugene-Springfield area to see if BRT can be a successful transportation option in their community.

THE EMERALD EXPRESS

As previously mentioned, the EmX is the BRT system that serves the Eugene-Springfield area. Since its launch in January 2007, the EmX has experienced ridership increases beyond projections. LTD, who operates the EmX, estimates that 6,100 riders use this service every weekday.

The current EmX route (Figure 1) connects the downtown LTD bus stations in Springfield and Eugene using the Franklin Boulevard corridor. Much of this route offers exclusive lanes for the EmX, which allows for a faster ride compared to conventional buses in mixed traffic.

Figure 1: EmX Green Line Route

Source: Lane Transit District

The EmX has a number of features that seek to incorporate accessibility into its operation. Since it began operation, it has been a free service, although LTD plans to implement fare collection by the end of 2009. EmX vehicles have been specially designed for easy wheelchair boarding and bike access, EmX stops at major intersections have audible pedestrian crossing devices to aid the visually impaired, and all EmX users are offered easy access to the service through decreased wait times and faster trips (as compared to standard LTD bus service).

The EmX system allows LTD to extend it incrementally in accordance with demand, available funding, and political will. The EmX was one of a handful of federally funded BRT demonstration projects in medium-sized cities in the United States. Therefore, LTD and its EmX system are setting precedent for other small and medium-sized cities to follow.

ORGANIZATION OF THIS REPORT

The balance of this report is organized into the following sections:

- **Considerations for Building an Evaluation Framework.** This section discusses the information CPW used to develop an evaluation framework for the EmX
- **Recommended Evaluation Framework.** This section establishes the evaluation categories and criteria that CPW determined through our research. This section also provides suggestions to LTD regarding how it can gather data to conduct measurement of the evaluation criteria**.**
- **Next Steps.** This section describes future actions that LTD can make based on the information provided in this report

CONSIDERATIONS FOR BUILDING AN EVALUATION FRAMEWORK

This framework described in this report organizes criteria to help LTD prioritize its evaluation program. To create the framework, CPW conducted interviews with city planners, policy makers, community groups, representatives of the business community, and LTD staff. CPW also conducted surveys and held focus groups with these stakeholders. From these interviews, surveys, and focus groups CPW identified criteria for evaluation. This section describes additional information CPW considered while designing the evaluation framework for the EmX.

STANDARD FRAMEWORK FOR EVALUATION

The approach CPW used to create the framework described in this report is based on a standard framework for evaluation for transportation projects. CPW's guidance for understanding this standard comes from Appendix A of Terry Moore's *Transportation Land Use Connection* (see Appendix B). This standard framework recognizes that agencies and organizations must balance many objectives. These objectives not only come from multiple stakeholders, but individual stakeholders also often have many objectives that they value. Organizations must prioritize these multiple objectives. Weighing these objectives is a necessary step in deciding which criteria to evaluate first.

Agencies and organizations also face uncertain futures when evaluating projects. Objectives may adjust as priorities, stakeholders, and resources change both within and outside of the organization.

Despite these multiple objectives, prioritization issues, and uncertain futures, the categories for evaluations of transportation projects remain fairly constant. These categories are: transportation system performance, urban form and amenity, environmental quality, economic development, cost, and equity.

SPECIFIC OBJECTIVES FOR BRT

During CPW's research with stakeholder groups, stakeholders discussed specific objectives they have for evaluating the EmX. The objectives match the categories outlined by Moore (see Appendix B). This section provides a brief summary of these objectives organized by category. For a complete report of these findings, please see Appendix C of this report.

Many stakeholders had the same objectives, as shown in the Table 1. CPW used the objectives identified by stakeholders to create the evaluation framework for the EmX.

Table 1 – Stakeholder Objectives for the EmX

	System Performance			Urban Form and Amenity			Environmental Quality		Economic Development	Cost		Equity	
	Ridership	Reliability	Safety	Land Use	Walkability	Auto Access	VMT	Greenhouse Gases	Job Creation	Planned Cost	Actual Cost	Other Modes	Captive Riders
FTA	◆									◆	◆		
LTD	◆	◆	◆	◆		◆	◆			◆	◆		
Planners	◆		◆	◆	◆		◆	◆	◆	◆	◆	◆	◆
Community Groups		◆		◆	◆		◆	◆			◆		◆
Businesses	◆	◆				◆	◆		◆		◆	◆	
Policy Makers	◆		◆	◆	◆		◆	◆				◆	◆

EVALUATION CONSIDERATIONS

Ex Post and Ex Ante Evaluations

There are two types of evaluations, ex ante and ex post. Ex ante evaluations of the EmX are conducted before the system *begins* operations. Therefore, ex ante evaluation occurs during the environmental planning and construction phases. The Small Starts process, required by the FTA, is a type of ex ante evaluation. If the transit agency meets certain evaluation criteria, the FTA awards funding to help construct the system.

This framework document refers to ex post evaluations. Ex post evaluations of the EmX are conducted *after* the system is operational. Therefore, ex post evaluation occurs during the implementation and operations phases. While the EmX system is not yet complete, beginning ex post evaluations of the current system will help inform the development of future routes.

Outcome and Process Evaluations

Another distinction that CPW recognized was the difference between process and outcome evaluations. Process evaluations of the EmX examine the environmental review and design process. This evaluation is discussed in the Stakeholder Perceptions Document. Outcome evaluations examine effects that result from the project. This document creates a framework for outcome evaluation criteria.

Prior EmX Evaluations

Both the FTA and LTD have previously evaluated the EmX system. The FTA completed an ex ante evaluation through its Small Starts funding program. The NEPA process, required by the FTA, evaluates certain urban form an amenity, environmental quality, economic development, cost, and equity criteria. See Appendix E for a description of the NEPA process. The FTA also evaluates system performance through its understanding of the Transportation System Management (TSM) alternative.

The FTA also completed an ex post evaluation of the EmX in 2009 based on FTA criteria (this criteria is summarized in Appendix D). Additionally, LTD has completed two origin and destination surveys of EmX riders, most recently in May 2009. The rider surveys provided useful information about origins and destinations of riders, demographics of riders, and whether a rider is new to the transit system.

While these evaluations are useful, they are limited either by perspective (the FTA evaluation) or by criteria measured (rider surveys). This report recommends a more comprehensive evaluation program that organizes evaluation criteria by stakeholder group. This set of evaluations could be used to more comprehensively evaluate the EmX. In addition, there are multiple opportunities throughout the cycle of an EmX project where evaluations could be completed. The following subsections indicate the different types of evaluations that could be used.

RECOMMENDED EVALUATION FRAMEWORK

This section describes potential metrics LTD could use for evaluating current and future routes of the EmX. They are organized by the categories CPW identified through discussions with stakeholders and through CPW's review of the literature. The potential metrics are intended to provide ideas for how to measure various aspects of the BRT system.

CPW does not describe the specific data collection and analysis methods for these metrics; rather we present them as a preliminary list for LTD to consider as it develops its framework for BRT evaluation. These measures represent an evaluation that would go well beyond FTA requirements.

LTD is already gathering some of the information required to measure the criteria discussed in this section. However, numerous additional measures are possible. We note that it would be difficult for LTD to gather all this information without assistance from its local government partners. Working with these partners to gather this information could strengthen these partnerships and improve communication. Moreover, some of the metrics are not only important to LTD in evaluating BRT, but also are indicators of the success of broader metropolitan policies reflected in the Eugene-Springfield Transportation System Plan (TransPlan) and other planning documents.

SYSTEM PERFORMANCE

This evaluation category contains criteria that measure the success or failure of the EmX based on efficiency, safety, and reliability. Usually, the performance of the system is the most important category of evaluation for a transportation project— if a project does not improve the area's transportation, it is not likely to deliver on the remaining goals (unless it is not really a transportation project).

Efficiency

- Change in ridership measured annually
- Ridership change one month pre construction to two years post construction (FTA requirement)
- Percent change in ridership compared to the previous bus route (each year)
- Comparison of EmX travel time and car travel time measured annually
- Baseline vehicle counts during rush hours
- Percent of used EmX capacity (riders per run divided by capacity of bus) measured monthly
- Comparison of actual ridership to projected ridership measured annually

Considerations:

Comparing the annual EmX ridership to the previous bus route can be problematic because the previous bus route had more stops. To allow for a more meaningful comparison, LTD can focus on ridership counts on at Springfield and Eugene stations, rather than other stops along the route. While we believe this comparison is useful to show the utility of bus rapid transit, this measure should not be used to suggest that it meets the needs of all riders previously served by the regular bus line.

When doing baseline vehicle counts, it will be important to carefully determine the timing of these counts both within a day and during the year as a whole. In particular, the Franklin corridor is heavily influenced by university traffic which varies over the course of the year.

Measuring used EmX capacity could easily be misinterpreted. When LTD knows that buses are at full capacity, they may increase the number of buses on that route. This will decrease the proportion measured by riders per run/capacity of the bus, but this decrease should not be seen as reduced efficiency of the EmX.

The measure that compares EmX travel time and car travel time should be examined carefully. The increased efficiency of the EmX over car travel only appears as congestion increases, which may take a long time to increase. Still this is an important measure because it is easily understood by the public and is related to the measurements used by the FTA.

Safety

- Major and non-major incidents (as defined by the FTA) per thousand riders
- EmX collisions (as defined by the FTA) per thousand riders
- Number of other vehicle accidents along the corridor each year
- Survey of safety perceptions

Considerations:

When examining these measurements, we realize there are advantages and disadvantages to organizing this data monthly or annually. While monthly data would be more cumbersome to report, it could reveal useful information. For example, one issue is that initially the number of incidents and collisions is probably higher (less safe) as residents are adjusting to the presence of the EmX. Monthly statistics would allow data from this initial adjustment period to be isolated and considered on their own, rather than influencing year one statistics as a whole. Moreover, monthly statistics would allow for analysis of any seasonal variation.

Another variable related to safety is the presence of on board and station security personnel. While linking their presence to fewer incidents on vehicles or at stations has

not been definitively researched (though this could be an additional area of inquiry), their presence may be another factor that influences incident rates.

Accident rates along the corridor could be influenced by factors unrelated to the EmX, such as the anticipated increased congestion along the corridor. This influence could be better understood by examining accident rates per set number of vehicles. While many other factors besides the presence of the EmX could influence the accident rate, knowing about the changes could be useful to LTD if residents or others suggest there is a change in the rate due to the Emx.

Finally, understanding perceptions of safety is important because people will not ride the EmX or will be opposed to its expansion if they perceive the EmX is unsafe. Understanding these perceptions could lead LTD to better publicize the EmX's safety record.

Reliability

- Schedule adherence measured using on board timers
- Time the doors are open at each stop
- Whether drivers wait for passengers arriving at stations
- Perceptions of reliability

Considerations:

Schedule adherence should be measured at all periods of day, including rush hours. Measuring both schedule adherence and the amount of time the doors are open would also be time consuming. These measurements could be a student project or internship.

Whether or not drivers wait for passengers arriving at stations demonstrates two different types of reliability. While drivers are trained not to wait for passengers to ensure schedule adherence within the BRT system, passengers may find a system that waits for passengers to be more reliable.

URBAN FORM AND AMENITY

This evaluation category contains evaluation criteria that address the design of the EmX and the relationship between land use and transportation. This includes criteria related to walkability, land use, and auto accessibility.

Walkability

- Number of dwelling units within a quarter mile of the stations
- Number of residents within a quarter mile of the stations
- Pedestrian infrastructure assessment
- Connectivity audit of routes to stations using travel origin and destination mapping

- Survey concerning safety and comfort of the urban environment around the EmX for users and residents

Considerations:

Most factors related to walkability are outside of LTD's direct control. However, if LTD has good relationships with neighborhood groups and with the cities, LTD can help improve walkability. Understanding current walkability levels may help LTD and the cities find funding to increase walkability around the EmX.

Assessing the number of residents within a quarter mile of the stations requires multiplying the number of dwelling units by a persons per dwelling unit figure. Determining what figure to use is dependent on dwelling type, as well as other factors.

Land Use

- Land use inventory within ¼ mile of corridor and stations, pre-EmX
- Land use inventory within ¼ mile of corridor and station at 5 or 10 year intervals, post EmX
- Building permits issued within ¼ mile of corridor (collected annually)
- Number of dwelling units within ¼ mile of corridor (collected annually)
- Number of businesses within ¼ mile of corridor (collected annually)
- Type of businesses within ¼ mile of the corridor
- Density of structures within ¼ mile of the corridor
- Floor to area ratios of buildings within ¼ mile of the corridor
- Number of mixed use buildings (vertical density of uses) along the corridor
- Average mixture of uses per city block along the corridor

Considerations:

Overall, it is difficult to relate land use changes to evaluations of the EmX because so many other factors besides the EmX influence land use changes. However, understanding what is happening to land use as the EmX develops may be helpful information to communicate to business owners near future lines. In addition, measuring the number of businesses or dwelling units within a quarter mile of the corridor would be difficult. Even if this were possible, it is unclear whether the presence and use of the EmX would spur or hinder new business or housing development or increase business or housing density.

Many of these land use measures many not change enough to demand annual assessment. However, these measures should still be assessed periodically to understand the long term land use changes influenced by transportation.

Auto Accessibility

- Number of curb cuts along the route before construction

- Number of curb cuts along the route after construction
- Effect on left turn options along the route before construction
- Effect on left turn options along the route after construction
- Number of on-street parking spaces along the route before construction
- Number of on-street parking spaces along the route after construction
- Survey of local businesses and residents to see if they are more or less auto accessible after construction

Considerations:

Questions related to auto accessibility relate directly to measures of economic development. Business owners may attribute changes in their business caused by a variety of factors to a change in auto accessibility—in other words, survey data may reflect variables and changes not related to EmX. It is also important to consider that changes in auto accessibility that are beneficial to the EmX (less on street parking, shallower curb cuts) may detrimentally influence other factors such as walkability.

ENVIRONMENTAL QUALITY

This evaluation category contains evaluation criteria that address the impacts and benefits of the EmX on the surrounding environment and on the environment as a whole.

- Change in non-LTD vehicle VMT, determined by rider surveys (How far did you drive before taking the EmX? How far do you ride the EmX now?)
- Change in non-LTD vehicle greenhouse gasses (determined using VMT information)
- Total annual EmX VMT divided by annual ridership
- Total annual EmX greenhouse gasses divided by annual ridership
- Environmental impacts discussed in NEPA findings for each route

Considerations:

Change in non-LTD vehicle VMT may be more closely related to non-EmX factors such as oil prices, rather than the EmX itself. Still, understanding this information could be useful in understanding the role the EmX plays within the broader transportation system.

While total annual EmX VMT will increase as the number of lines increases, using this information as a basis for understanding greenhouse gas emissions would allow for comparisons to auto use.

Environmental impacts will be route specific. Different impacts are discussed in each NEPA document. These impacts on the environment surrounding the EmX route could be either positive or negative but should be monitored.

COSTS

This evaluation category contains criteria dealing with the costs of implementing and maintaining the EmX. The possible benefits measured by the other evaluation categories come at a cost. If the costs are too great (especially if they exceed the estimated value of the benefits) then a new project will not be worth pursuing, or an existing operation needs to be changed.

- Planned and actual capital and operational costs (FTA requirement)
- Actual costs divided by planned costs (for each line)
- Actual costs per mile (for each line)
- Planned costs per mile (for each line)
- Operating cost divided by ridership measured annually
- Compensation for takings

Considerations:

Measuring the annual costs divided by planned costs for each line allows for comparisons between lines.

Measuring the actual and planned costs per mile for each line helps LTD to understand what factors influence costs besides the size of the project. While LTD has some sense of this, being able to more accurately estimate a range of costs per mile could help with future planning. This information would also help planners who are developing BRT systems in other locations better understand the cost of BRT.

Many people speculate about the operating costs of the EmX, so understanding its cost with respect to ridership could be useful for comparisons to regular bus service.

While we believe LTD should keep track of the compensation they give for takings in EmX route development, this measurement should not suggest that the goal is to reduce this amount. Paying less money for takings could mean that fewer landowners are impacted or landowners were paid less for their land. While LTD does not want to take land, sometimes it is necessary to achieve the best route. Reduced takings compensation could suggest poor route placement. It could also simply suggest lower land values in that area. Still, understanding how land owners are compensated is important. In addition, LTD should keep track of non-monetary forms of compensation for takings, such as exceptions to zoning rules. These measures will help paint a more complete picture of the costs and benefits to LTD and the community of the EmX route.

ECONOMIC DEVELOPMENT

This evaluation category contains evaluation criteria that address the economic impacts of the EmX by using various local economic measures.

- Number of jobs within a quarter mile of the corridor before construction
- Number of jobs within a quarter mile of the corridor after development
- Change in property values at 5- or 10-year increments

Considerations:

Measures of economic development are difficult to assess because they are usually reflective of many other factors besides transit. Establishing baseline data is particularly important for measuring economic development.

EQUITY

This category contains evaluation criteria that address the distribution of the impacts of the EmX throughout Eugene, Springfield, and Lane County. Equity also addresses how well information about the EmX projects has been dispersed to the various stakeholders. Because an evaluation of communication is a process evaluation, the Stakeholders Perceptions Report addresses this aspect of equity in more depth.

- Include in rider survey questions about what mode riders used before the EmX
- Include in rider survey questions about what modes riders have access to besides the EmX (Could the rider drive, bicycle, or walk to their destination)
- Surveys of users of other modes (For example, do you walk more or less because of the EmX? What changes have you made in your biking habits due to the EmX?)
- Comparison of average income collected during rider surveys before and after fares were charged for the EmX
- Partner with Lane Independent Living Alliance to survey or interview members to find out whether mobility is easier or harder on the EmX or on the previous route
- Partner with another organization (such as neighborhood associations) to survey or interview members to find out if less frequent stops along a route has reduced the mobility of local residents

Considerations:

Surveying other modes without suggesting that the EmX should be impacting those modes may be difficult.

Comparing incomes indicated by the rider surveys may not be accurate because those of very low income may not have taken the surveys at the same rate as those of higher incomes.

OTHER CRITERIA

The following criteria are important to consider, but it is difficult to develop measures to evaluate them.

- Loss of future land use flexibility due to EmX development
- Benefits of increased transportation choices for the community
- Equitable placement of routes

NEXT STEPS

CPW did not prioritize these measures. Prioritizing these measures requires knowledge about LTD resources. Some of the measures will cost more than others to assess, others require partnerships with other agencies, and some measures are required for FTA evaluations. Also, different measures are important to different stakeholders. To evaluate the EmX, LTD will need to prioritize these measures. LTD should examine all of these issues when prioritizing these evaluation measures.

Appendix A

Bus Rapid Transit Characteristics

INTRODUCTION

Bus rapid transit (BRT) is a hybrid transportation system in that it uses buses in a way that is traditionally characteristic of a light rail system. To supplement the definition of BRT in our documents, we are including this appendix.

While there are many sources on the Internet regarding the characteristics of BRT, the following link is to a report written by the Federal Transit Administration together with the United States Department of Transportation: http://www.nbrti.org/CBRT.html. The report was written in February 2009 and is entitled Characteristics of Bus Rapid Transit for Decision-Making.

The following is an abstract of the report:

> The Characteristics of Bus Rapid Transit for Decision-Making (CBRT) report was prepared to provide transportation planners and decision makers with basic information and data to support the development and evaluation of bus rapid transit concepts as one of many options during alternatives analyses and subsequent project planning. This report provides information on BRT systems in a single, easy to use reference tool for transportation planners in selecting from the large array of BRT elements and integrating them into comprehensive systems.
>
> The CBRT report explores BRT through a progression of three different perspectives. First, seven major elements of BRT are presented along with their respective features and attributes. Second, the BRT elements are related to attributes of system performance. Finally, the benefits of BRT systems are discussed. This order of the discussion suggests the relationship between BRT elements, system performance and system benefits. BRT systems are constructed by choosing and integrating among BRT elements. The integration of elements improves system performance and improves the experience for customers. Improvements to system performance (in combination with features of BRT elements) generate benefits to transit agencies and communities.

ELEMENTS OF BRT

The list below describes the elements of BRT as set out in the CBRT report. However, to answer specific questions or for more detailed information, please refer to the CBRT at the link provided above.

- Running Way—This major element includes running way type and running way marking.
- Stations—The report lists seven primary characteristics of stations: station location, station type, passenger amenities, curb design, platform layout, passing capability, and station access.
- Vehicles—The report lists four primary attributes of BRT vehicles: vehicle configuration, aesthetic enhancement, passenger circulation enhancement, and propulsion/fuel.
- Fare Collection—There are three primary design characteristics of fare collection: fare collection process, fare media and payment options, and fare structure.

- Intelligent Transportation Systems (ITS)—There are various ITS applications that could be implemented in a BRT system. The report categorizes the various systems into six groups: transit vehicle prioritization, intelligent vehicle systems, operations management systems, passenger information systems, safety and security systems, and electronic fare collection systems.

- Service and Operating Plans—The characteristics of service and operating plans are route length, route structure, and service span, service frequency, station spacing, and methods of schedule control.

- Branding Elements—The report cites at least two characteristics or elements of branding: marketing classification of BRT service and branding devices.

Appendix B

Standard Framework for Evaluating Public Policy and Investment

APPENDIX A

Framework for Evaluating Public Policy[1]

Policy makers and analysts agree, in theory, that good evaluation of public policy[2] requires identifying and measuring significant benefits and costs. In practice, however, they disagree about how and how well those benefits and costs can be identified, measured, and summed.

Just identifying the potential effects of a large project is difficult. Estimating the *direction* of an effect (positive or negative) gets harder. Estimating the *magnitude* of an effect (how big is that positive or negative impact?) harder yet. Consolidating the many effects into a summary measure of net impacts is beyond the capabilities of almost any impact analysis—although that is often not recognized in the analysis.

The point is not that public policy decisions cannot be made without a thorough and reliable evaluation: such decisions are made daily. Rather, the point is that if a community (local, regional, state, or national) is serious about basing a decision on an assessment of likely impacts, it should accept some well-supported principles about the structure of such an impact analysis.

This appendix discusses principles fundamental to the evaluation of *any* large public investment decision (not just decisions about transportation projects and programs). It has three sections, plus a summary at the end:

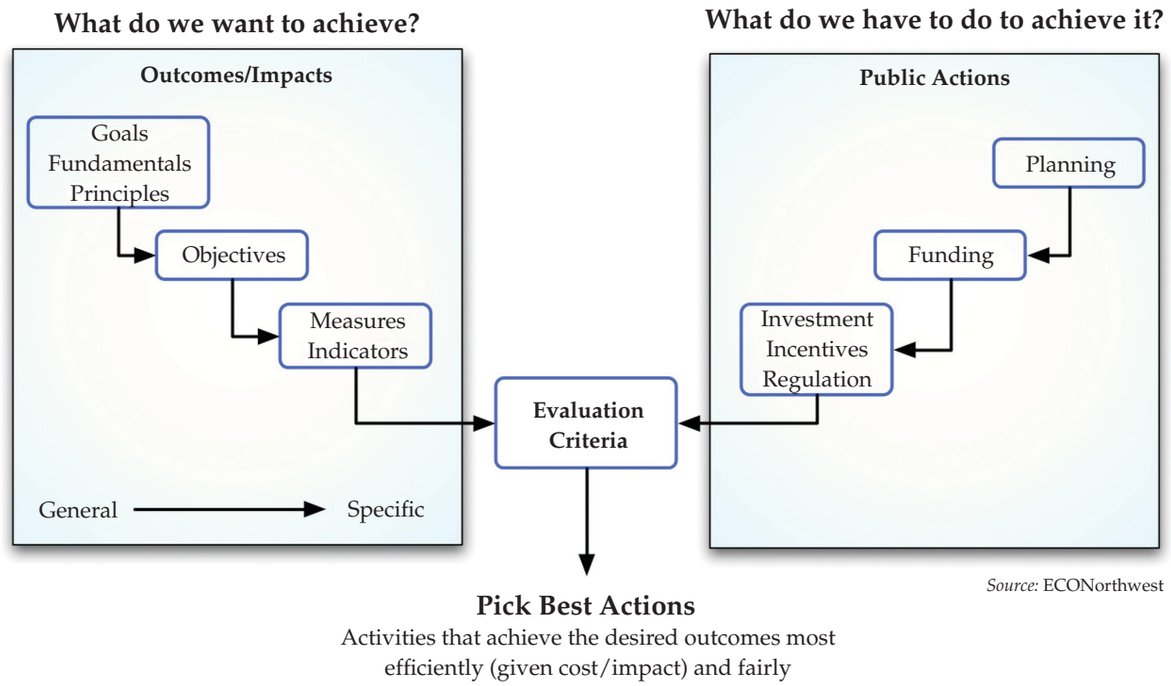
1. **Overview of Policy Evaluation** describes the broad goals of any evaluation of the full costs of large public investment decisions.
2. **Principles for Evaluation** defines terms and gives some guidance on how to identify and measure what matters to the public and elected officials.
3. **Using Technical Work in a Political Process** describes how multiple measures of desired objectives can get combined in a way that is technically defensible and makes sense to policy makers and the public.

OVERVIEW OF POLICY EVALUATION

Public policy gets adopted to achieve public objectives. Thus, at the most basic level, an evaluation of public policy must answer two questions: What do we want to achieve? and What do we do to increase the likelihood that we will achieve it? Figure A-1 illustrates the questions.

The two questions come together when possible policy actions get evaluated against measures of desired outcomes. Below is a description of the ideas and terms used in Figure A-1:

- *Things a community wants to achieve (desired outcomes).* These things may be stated broadly or specifically. Positives (what we want; desired outcomes; benefits) are mirror images of negatives (what we want to reduce or avoid; undesired outcomes; costs).
    1. *Goals* are broad statements of desired outcomes. Examples: increase environmental quality, economic prosperity, transportation choice, social justice. If the high-level goals get parsed into sub-goals, they are often called *objectives*. Logically, since goals and objectives are the categories of things people care about, they are roughly synonymous with the term *impacts:* the objectives are about good impacts that a community wants to increase, and bad impacts that it wants to reduce.



Source: ECONorthwest

Figure A-1. *The standard planning model for most regional planning efforts*

2. M*easures* are specific statements of outcomes. They should fall under ("nest within") one of the higher-level goals or objectives. Examples: number of new jobs by type; reported crimes per capita; amount of new investment in lower-income neighborhoods. Measures are also called *indicators.*
3. The measures—which should be consistent with, related to, and more specific than the goals—are *evaluation criteria*: logically, policy choices should be evaluated based on how effectively they achieve desired outcomes as specified by the measures deemed to best reflect those outcomes.

- *Things a community is willing to do to increase its chances of achieving what it wants to achieve.* The things that the public sector (a local, regional, or state government) can do are *actions* or *policies.* There are several ways actions can be classified (by where they get applied; by who implements them; by the area of development they affect). The following is a list of the techniques that can be used to achieve desired outcomes. The taxonomy here is as close as we can get to one that is comprehensive and mutually exclusive:
  1. *Planning*: identifying efficient opportunities for collective action
  2. *Funding*: getting the public to agree to pay for some of those actions; getting the money
  3. *Investment*: building public facilities; providing public programs (follows Planning and Funding: there should be agreement on what to do and on how much can be paid for before building can occur)
  4. *Incentives*: giving financial incentives (direct or in-kind) to the private sector to provide the desired public facilities or programs (an alternative to direct public Investment)
  5. *Regulation*: requiring the private sector, as a condition of development, to preserve or provide certain public facilities, amenities, or services (an alternative to Incentives)
  6. *Coordination*: getting everyone to cooperate, and to do so efficiently: not just public-private partnerships, but public-public partnerships.

Getting agreement on definitions is essential to any intelligent discussion. Fuzzy language risks fuzzy policy. Some related points:

- The distinction between what we want to achieve and what we should do is often not made. Goals get confused with actions. They are related, but different: Figure A-1 shows that.
- There are many terms that cover more or less the same idea, though they get used differently by different jurisdictions and even by different people in the same jurisdiction. Some examples:
  1. Terms related to outcomes: Goals, principles, fundamentals, objectives, impacts, measures, indicators, evaluation criteria
  2. Terms related to actions: strategies, policies, implementation tools, programs, regulations, investments

There are lots of ways to define and combine these terms. The essential point is to pick one and enforce its consistent use. Figure A-1 and the text describing it is an example.

Long-run urban planning presumes that thinking and taking collective action now can lead to a better future than failing to do so. When making decisions, long-run planning is trying to describe and evaluate alternative futures. Those futures are called alternatives or scenarios and are defined by the measures and the actions deemed relevant to achieving them.

There is a useful distinction to be made between *likely, desirable,* and *possible/hypothetical* futures. Consistent with the professional literature on scenario evaluation, we recommend the following use of terms:

- Reserve the term *scenarios* for hypothetical futures, independent of whether they are desirable or likely. A scenario might be, for example, "Very high energy costs" based on a combination of reduced supply from the Middle East and new, high gas taxes. That may not be likely, and it is hardly desirable, but it is possible, and a scenario might explore the implications of that future for travel demand and spatial development.
- Reserve the term *alternatives* to mean "potentially desirable and somewhat likely futures." Alternatives are real choices about policy direction—the typical choices in any planning or policy evaluation process. In the context of long-run planning for growth and development (the focus of a city's comprehensive planning), typical alternatives are defined spatially: "trend or status quo," "focus more growth in centers and corridors," "expansion at the urban fringe," and so on.

We now examine the left-hand side of Figure A-1 in a little more details: outcomes and impacts. The goal of public policy (of government action) is, in broad terms, to make the people government serves better off. The presumption is that collective action in some areas will yield superior results to a lack of collective action. That is the justification for taxing people: government will provide some desirable services individuals might otherwise be unable to provide by themselves (e.g., certain aspects of environmental quality) or would not provide very efficiently (e.g., a regional highway system).

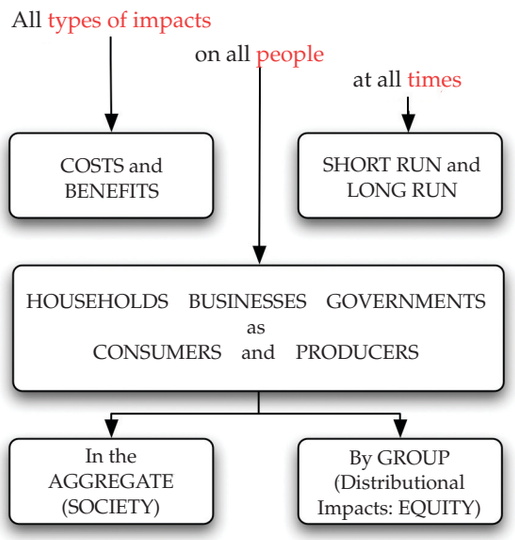
Government usually operates at the base of psychology's hierarchy of needs, trying to make sure certain biological, physiological, and safety needs are met (e.g., clean air and water; shelter; personal and property security). Individuals must supply their higher needs (belongingness, esteem, self-actualization) themselves. The assumption is that adequately meeting the base needs provide the time, security, and economic resources for pursuing the higher needs.[3]

In economic terms, the goal of government policy is to increase *welfare*: the economic and social well-being of the citizens it serves. Ideally, policy makers and the public they represent would like to know how alternative investments perform relative to one another. They want to know what they get (benefits) for what they give up (costs). Adding benefits (positives) to costs (negatives) yields, in theory, a

measure of *net benefits*. In broad terms, decision makers should be choosing among public investments with the highest net benefits.

A decision to change public policy or to make a public investment is a decision to try to change the future—an assumption of change is implicit in all such decisions. Thus, good evaluation requires a comparison of a proposed policy's benefits and costs to whatever the benefits and costs would otherwise be without the policy. That "different future" is often referred to as the "base-case," "trend," or "status-quo" scenario or alternative. The base case represents how the world relevant to the policy decision is expected to look if policy does not change.

Figure A-2 illustrates the challenge for policy evaluation: to measure all types of relevant impacts on all people at all times. The literature of policy evaluation and benefit-cost analysis sometimes refers to this goal as full-cost evaluation—usually synonymous with a framework that attempts to identify and quantify all impacts.



Source: ECONorthwest

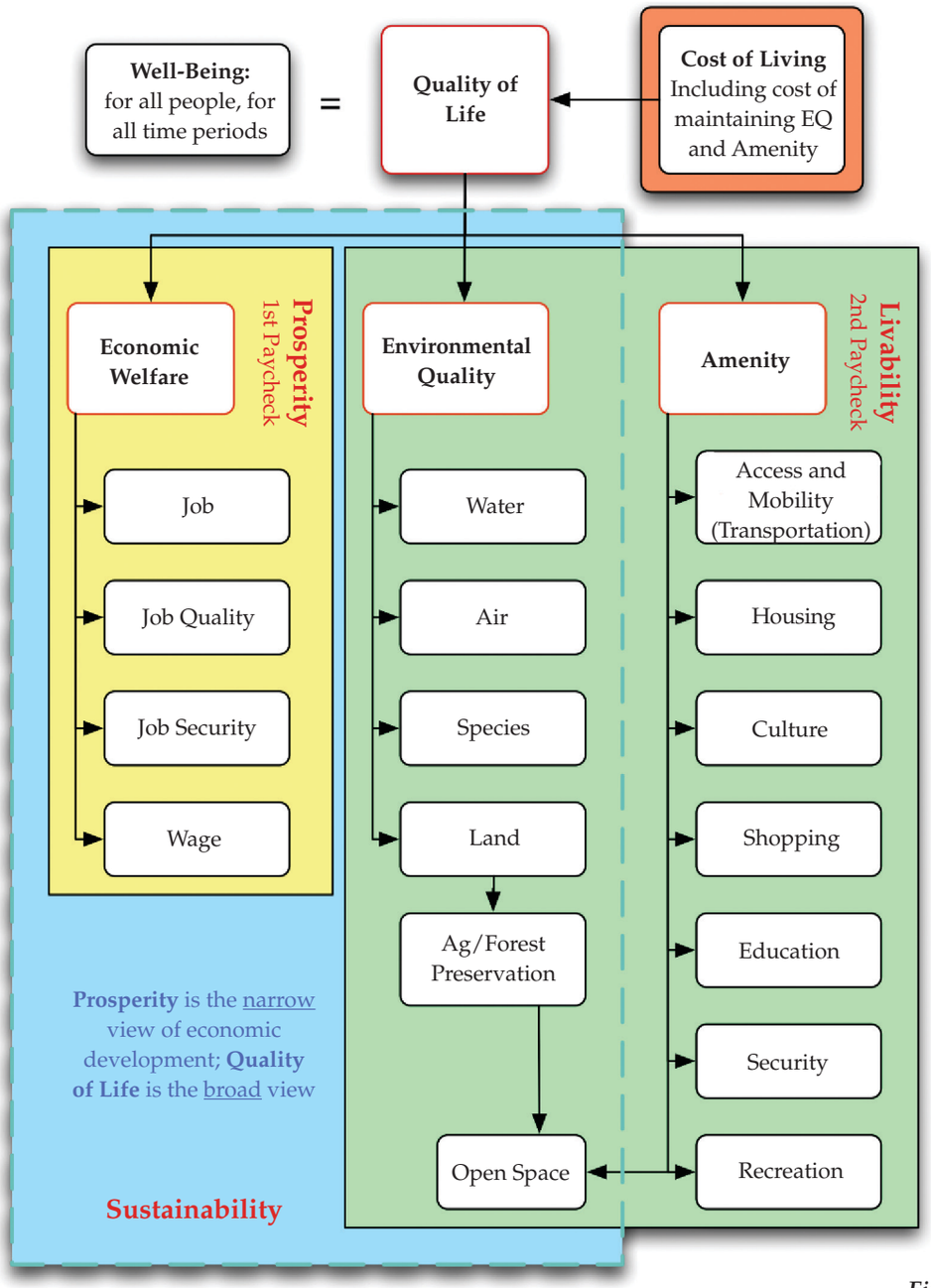
Figure A-2. *Goals of policy evaluation: what, who, and when*

Figure A-2 appears simple, but each of its boxes contains a lot complexity. Consider that there are:

- potentially dozens of categories of impacts, many with multiple measures of impacts;
- potentially millions of people, thousands of businesses, and scores of jurisdictions and interest groups in a metropolitan area, with overlapping affiliations; and
- changes to both impacts and affected people that occur over time. At the most basic level, communities choose to incur costs now (e.g., to build transportation projects) because they expect an acceptable return from future benefits.

Simple statements of broad objectives reveal their artificial simplicity when they get poked. "We are building this new road because it will make citizens better off." Really? In what way? What citizens in what roles: as families, workers, businesses owners, or property owners? Does "citizens" mean voters or residents? What about people that work in the city but don't live here? What about people that don't live here now but will move here within the next five years? And so on, and on, and on: specifying objectives in a measurable way is a very big deal.

These kinds of questions illustrate that a demonstration of net benefits in the aggregate (e.g., for an entire metropolitan region on average) says nothing about the net impacts to subsets of the region (e.g., geographic subareas, special groups). In other words, an efficient policy (one with likely net benefits) is not necessarily a fair one.[4]



Source: ECONorthwest

Figure A-3. *Types of impacts to be evaluated*

The challenge is to somehow make all people in some geography, now and in the future (not just the people that live in those boundaries now and vote, but unknown people who will live in those boundaries in the future), better off.

Figure A-3 considers the impacts examined in a good evaluation, dividing them into categories that try to be both *comprehensive* and *mutually exclusive*. If not comprehensive, important impacts might not be considered; if not mutually exclusive, some impacts may be counted more than once.

Figure A-3 shows that all types of impacts can be generally defined as the things affecting a community's quality of life.[5] The quality of life is a function of four main forces: economic welfare (or prosperity), the quality of the natural environment, the quality of the built and social environment (amenities), and the cost

of achieving quality in those three dimensions (cost of living). The boxes under the first three forces show some of their components, and the boxes around the forces show their main connections with terms often used when people talk about broader objectives for public policy (e.g., the term *livability* usually emphasizes environmental quality and amenity; *sustainability* usually emphasizes the environment and the economy).

The factors identified in Figure A-3 are all the different ways that new programs and policies can affect different groups of people over time. Some factors are not too hard to quantify with existing data: typically those under the "economic welfare" category. But an evaluation of a program or policy should consider all these impacts, not just those that can be counted.

Figure A-3 not only presents what planners and policy makers are typically trying to achieve in urban areas (i.e., the goals of public policy); it is simultaneously a relatively good model of regional growth and migration. People are attracted to an area because of economic opportunity (their "first paycheck"). But everything else influences the overall quality of that area: the natural features, built environment, and social and cultural services. The level of quality-of-life factors is a "second paycheck." People make location decisions based on their assessment of the size and value of both paychecks. Offsetting the first and second paychecks is the cost of living.

These three variables—the first and second paychecks, and the cost of living—have dampening effects on each other. If economic opportunity and wages are high, new residents will migrate to that region. The region might either invest to maintain livability (which may increase the cost of living) or defer maintenance on livability (the second paycheck goes down). Different regions equilibrate at different levels of the three variables.

Figure A-3 greatly generalizes the many concerns people have about regional development and policies that affect land use, transportation, economic development, and environmental quality. To generalize further, for each of these and other key impacts, citizens and their elected representatives should want policy decisions to consider these questions in the areas of efficiency and fairness:

- *Efficiency*: Can a reasonable case be made that a new policy will make enough of the larger collective enough better off? and Is that policy worth the disadvantages created for the rest of the collective (the net-benefits criterion)?[6]
- *Fairness*: Is there some reason (moral, legal) that some subset of the population should pay less than the estimated full cost of benefits, and another subset should pay, independent of the efficiency effects?

Public policy ultimately seeks to improve the overall quality of life for a community. But any policy or program cannot simultaneously maximize all these components of quality of life. Instead, it must *optimize*; that is, it must find the right combination measures to enhance quality-of-life so that it is maximized overall. In other words, good policy balances competing objectives—not only across components of quality of life, but across classes of people, subareas of the affected area, and existing and future residents.

In the context of regional planning, it is common to think about desired outcomes not in terms of efficiency and fairness, but in terms of what people most often think makes a region livable: economic opportunity and security, environmental quality, urban amenity and services (including, significantly, the pattern and quality of built space and transportation), and the cost of living.

PRINCIPLES FOR EVALUATION

This section describes an analytical framework to work towards the goals described above. The framework assumes that better information about the new policies citizens want and are willing to pay for is essential to the creation of sound public policy. An evaluation should try to do the following three things:

1. *Identify what matters to citizens*. Depending on the program, things that matter are called goals, objectives, impacts, outcome, priorities, and so on.
2. *Measure what matters*. Different disciplines use different terms, but basically the evaluation should measure positive and negative impacts: the pros and cons, the pluses and minuses, the benefits and costs, the values and prices, the causes and effects, the outcomes. That measurement can and should include a qualitative assessment of impacts (e.g., public opinion) as well as a quantitative one (e.g., the outputs of travel-demand models) while being careful not to double-count either a benefit or a cost.
3. *Let the technical work in the previous step inform the choice of public policies or investments*. Though the choices are ultimately political (made by a small group of decision makers elected or appointed to represent a larger public), their choices should roughly conform to a ranking of projects based on net benefits (or cost-effectiveness), subject to constraints imposed by goals for the distribution of net benefits (fairness and equity).

Identifying What Matters

A lot has been written about this step: though important, it is not central to our interest here, which is a framework for technical evaluation (the next two steps). We cannot resist, however, making a few points:

- *List the relevant impacts*. The impacts are essentially evaluation criteria, and evaluation criteria are measures. Evaluation criteria are similar to and derive from goals. They differ not in kind but in degree: evaluation criteria are more detailed and measurable versions of goals. Sources for the "relevant impacts" are the professional literature, similar studies by other jurisdictions, and public opinion (policy makers, stakeholders, the public).
- *Consider short-run and long-run impacts.* In the short-run, conditions are relatively constant. In the long-run, conditions will change with or without the action being considered, and changes will occur in reaction to the project.
- *Consider the incidence of benefits and costs*. The distribution of those benefits and costs can make a difference among alternative actions. For example, an action may provide net benefits for a city by creating large benefits for a small group of people and small benefits for everyone else. The question of who pays is also important—the costs may fall disproportionately on groups who are least able to pay or on groups that do not receive a proportionate level of benefits from the action.
- *Don't waste time reinventing the obvious*: high-level goals tend to be the same for all urban and regional land-use and transportation projects. Those goals look a lot like the top boxes in Figure A-3. In any long-run evaluation of transportation investments or policies, the top goals will be some approximation of (1) transportation system performance (access/travel time, safety); (2) urban form and amenity; (3) economic development; (4) environmental quality; (5) equity (social justice: the distribution of impacts); and (6) cost-effectiveness. Everything anyone cares about measuring can probably fit in one of those categories.

Any hope of rolling up dozens of measures in some technically defensible way into some small group of summary measures requires that the measures nest within each other. Since (1) the literature of psychology and common experience suggest that people have a hard time focusing on lists with more than five to seven items,, and (2) an evaluation of the impacts of a regional transportation system may require consideration of dozens or scores of measures of things people care about, the measures must get nested under the goals. Each goal may need subgoals (objectives) to achieve this seven-item limit, which means any goal could have up to 49 (7×7) items—a clear indication how cumbersome this can quickly get if not done carefully. We discuss this important point in more detail below.

Measuring What Matters

In the context of policy evaluation, specific and measurable outcomes are often referred to as *performance measures.* Developing performance measures for evaluating transportation policies and investments requires decisions about the following:

- *The nature of the measure.* What, precisely, is the measure measuring and what form will the measure take? One must consider the following:
  1. What level of detail is being addressed in the measure? Will the measure be applied to the entire subject or only a subset of the subject?
  2. How will the impact be specified? Assume, heroically, that policy makers can agree on a type of measure. How should it then be reported: as a total, as a change, as a percent change, as a ratio, by the rank of the region against another metropolitan area, or by some other method? Dozens of impacts, each with dozens of potential measures, each with a dozen ways they could be specified and reported.
- *The geographic focus of the measure.* Will the measurement of impact be applied to the entire metropolitan area?; a region within the metropolitan area?; a city?; a neighborhood?; or some other area?
- *The length of time the measure will be applied.* Will it be applied for a year after the end of the project, a five-year period, or 10 years? Does it consider activity before and after the project?
- *The link between action being considered and the measure of the impact.* In the context of transportation, does a clear and significant link exist between a certain type of transportation action and the measure of its impact? If so, what is the direction of the link? How strong is the relationship? What is the magnitude of the relationship? For example, does the change in the transportation system (e.g., a policy, backed by funding, to make transit stations safer for and more accessible to elderly travelers) have a positive, strong relationship with the nature of the measure (e.g., the percentage of elderly that use public transportation) that can result in a large change (e.g., overall increased ridership, more equity in the various modes of transportation)?
- *Bang for the buck.* What is the impact of the project per dollar spent? If the project provides a net benefit, does it provide enough benefit or does it provide as much benefit as a different project?
- *Winners and losers.* Who are the beneficiaries of the project? Are they the "right" beneficiaries? Equity considerations, in essence, expand the reporting of measurements as a multiple of the number of sub-groups of interest. If, for example, the measure was "change in travel time," that single measure may need to be calculated in a dozen ways: by city, by corridor, by mode, by income, and so on.
- *Does the measure work at the margins?* In the context of transportation, for example, does the measure cover all transportation projects or does it focus on specific projects or specific types of projects?

No single measure of any category of goals and objectives can cover all these issues. What seems like a simple item to measure might require many measurements to cover everything people care about.

For example, one measure of a healthy economy is the change in the number of jobs in the region. Jobs and transportation are related because firms depend on the transportation system to move goods and people (clients and employees). Once the relationship is clear, developing the performance measure involves answering a number of questions. Does the measurement include all jobs, jobs by sector, or only traded-sector jobs? If the region gets jobs, is that enough?, or Does one care about their distribution to subareas? What time period is being measured: for example, the year after the project or after 10 years with the project? Can one link the creation of jobs via existing models to transportation improvements to make it possible to forecast changes in measures of jobs based on assumptions about changes in transportation?

Can local models do that consistently and reliably for the different combinations of transportation actions (investments, programs, policies) under investigation?

A lot more can be said about measures, but lots of literature already says it. Every regional long-term transportation plan done by a Metropolitan Planning Organization (MPO) must address the measurement issue, and many have tried to do it well. Our advice: network. Subscribe to APA's Planning Advisory Service (they'll point you to the good examples); make calls to the bigger MPOs. You should be able to have plenty of information in a few days.

USING TECHNICAL WORK IN A POLITICAL PROCESS

These technical steps—defining goals and objectives (i.e., impacts you care about) and measuring them—have been central to rigorous and effective policy evaluation for decades. They show up in transportation benefit-cost analysis, cost-effectiveness analysis, least-cost planning, choosing by advantages, budgeting for outcomes, and processes of other names.

The technical evaluation is a *decision-aiding* tool, not a *decision-making* one. The presumption and hope of most policy analysts is for policy to be based on good information (i.e., understandable and accurate, with assumptions and variability clearly documented), resulting in better decisions.

The use of measures to aid public decision making usually follows some approximation of the following steps:

1. *Define alternatives* (desired alternative futures and packages of actions intended to increase the probabilities of arriving at those futures)
2. *Describe the important attributes of those alternatives* (the impacts, which become measures and evaluation criteria)
3. *Compare the alternatives* across attributes
4. *Pick the alternative* with the best array of attributes

Principles for Comparing Measures

A proper analysis employs several principles of structure and logic to correctly identify and estimate the impacts related to a particular project. Some examples:

- *Frame the analysis with and without the action under consideration*. The impact of a project or planning alternative is the difference between what the world would be *with* the project and what it would be *without* the project. Framing the analysis in this way forces one to consider future changes likely to happen without the project—impacts from these changes are not impacts of the project because they will happen anyway. Framing an analysis as "before and after" often causes analysts to incorrectly attribute impacts to a project that would happen without the project. In the context of an Regional Transportation Plan (RTP), such an evaluation could theoretically be done (1) at the project level (e.g., what are the changes in outcomes—in impacts—when the project gets built and operated?) or (2) at the system level (e.g., with packages of projects organized around some theme; say, a focus on highway expansion versus a focus on transit expansion).
- *"No Action" is not "No Change."* The "Without Action" alternative referred to in the previous bullet should almost certainly not be defined as "nothing changes." The economy, politics, and other policies may change the future even in the absence of the adoption of the policy being evaluated. A No-Action alternative represents the world without the project. The environment is likely to change under the No-Action alternative, and these changes must be considered to accurately assess the impacts unique to the project. Changes will occur even without the project because of other planned or likely projects, population growth, economic shifts, increased travel, and many other factors not directly attributable to or even related to the proposed project.
- *Focus on differences among alternatives at the margin*. Many analyses report the total impact of various alternatives, without reporting the marginal differences

between the alternatives. For example, "health of the economy" is always listed as one of the top five considerations in any regional planning process. But if the transportation policy options under consideration cannot be shown to have any measurable difference on the health of the economy, then that variable is (technically, and in theory) irrelevant to the decision making. There are no *differences.*

Aggregating Measures into a Summary Evaluation

Public policy making always has multiple goals, objectives, and, therefore, criteria. An implication is that public policy is trying to *optimize*, not *maximize.* Technically, one can only maximize a single criterion. Hence, goals like "minimize environmental impacts" are, practically and technically, an impossibility in the real world: pollution can be reduced from what it might have been in the absence of some policy choice or perhaps even reduced in an absolute sense, but it cannot be minimized in any scenario that keeps the economy and government running about like they do now. The evaluation of any region's transportation alternatives is unavoidably in the world of multicriterion (multi-impact) analysis.

Because there are multiple criteria, one cannot avoid the issue of *weighting*: what is the *relative importance* of each measure/evaluation criterion? If no weights are specified, criteria implicitly get weighted equally. Social scientists have been working on developing a method for estimating the relative values of different objectives for decades without finding an ultimate solution. They never will. Among the difficulties:

- A city or region may consist of tens or hundreds of thousands of people, all of whom have slightly different values, preferences, and circumstances, and many will be affected somewhat differently by a change in policy.
- Regional economies, ecosystems, and public policies are complex and interrelated; many effects occur only over a long period; and outside market, social, and natural forces affect those systems. Thus, the net impact of a policy change on all significant aspects of those systems is impossible to predict.
- Even if one could somehow add all the different types of impacts for all individuals to get some estimate of the total net impact, and even if that impact were positive, policy makers might still decide that negative impacts on some people are too great to justify the total net benefits to society as a whole.

Only a small percentage of policy makers, and a smaller percentage of citizens, have the desire or patience to wade through the complexity of the interrelationships in an urban economy and ecosystem. Even if technical experts attempt to deal with that complexity, it ultimately must be simplified substantially. That simplification cannot occur without value judgments.

Benefit-cost analysis is one way to deal with the multicriterion problem. First, in the context of evaluating transportation actions, it collapses many of the possible measures of transportation performance into a single measure of net benefits: a measure of the efficiency of the project. Second, it attempts to convert other, nontransportation impacts to dollars so they can be added to or subtracted from estimates of transportation net benefits. Third, it can, if an analyst chooses, address issues related to equity by showing how those impacts are distributed across different areas or different groups.

This PAS Report takes an economic perspective and argues that transportation systems are so complicated that estimating the net benefits of packages of transportation investments cannot be evaluated without reference to demand-and-supply interactions and the *consumer and producer surplus* they generate. Thus, it should be no surprise that we argue for the application of benefit-cost techniques to the evaluation of long-run regional transportation investment choices. Anyone who wants to explore that advice can find an introduction in Appendix D, and the state-of-the-practice manuals (as of 2006) at the sites in this endnote.[7]

But benefit-cost analysis, in its full glory, is not commonly used. A more common approach to the multicriterion problem involves defining categories of impacts

(outcomes) and creating measures of how different transportation projects or packages of projects perform on those measures. As a practical matter, that method usually means that (a) the final public decision on a region's growth alternatives (for the development of land and infrastructure, including transportation) must be about no more than five alternatives (two or three is better), with five to 10 criteria to evaluate those alternatives, and (b) the performance of the alternatives based on the criteria must get summarized in some kind of matrix to facilitate comparison of the alternatives. EISs sometimes miss on both points.

We call this type of evaluation a *matrix display* because the final product is usually a matrix whose cells show how different actions (e.g., transportation project investments: the rows) are expected to perform on outcomes the planning process has defined as important (the columns). To get from the matrix of actions/impacts to a decision about which alternative to choose, one must either score the alternative actions or use a less quantitative means of comparison. If scoring is chosen, one must either (a) put all the criteria in the same units so they can be added (usually dollars, when this method is used, in which case it is a cost-benefit analysis), or (b) give each measurement a score, which implies a formal weighting scheme.

Constructing a matrix of impacts can be accomplished using methods that usually contain some close variation of the following steps:

1. Work with a task force, technical advisory committee, or study team to agree on alternatives and general categories of criteria.
2. Propose ways to measure the criteria (quantitative preferred; qualitative where measurement is not reasonable).
3. Prepare a table and text discussing, for each criterion, the relative performance of the alternatives on that single criterion (the problem of weighting does not occur until one tries to compare alternatives *across* criteria). Each row of the table may be summarizing a somewhat or much larger technical analysis: a section, chapter, or technical appendix of a final report.
4. Summarize all that information into a single table. The table shows a summary measure, score, or text description of impacts/performance for each alternative for each criterion, but does *not* try to add up performance measures across criteria to get a score for each alternative.
5. Facilitate a discussion among technicians and policy makers that allows them to identify (a) clearly inferior alternatives, (b) clearly superior alternatives, and (c) alternatives in between, in a process that leads ultimately to a choice between two or three alternatives. Note that criteria are not weighted upfront. Such upfront weighting seems to protect fairness (people can not later change weights to favor the projects they want), but it can be a mistake both technically and politically.
6. Conduct additional research to supply information policy makers think they need to make a final decision.

The technical analysis to support the decision making should be aimed at a summary evaluation that can be reported in a matrix that looks (in concept) something like Table A-1.[8]

What makes Table A-1 different from a standard matrix display of the performance of policy choices on decision-making criteria is its focus on *relative advantages* when comparing alternatives across criteria. The early steps in the evaluation are the same ones that would be needed to construct Table A-1:

- *Define the alternatives* (see below). In this project, the alternatives are primarily transportation ones, but they have a land use/development component.
- *Define the criteria* (see below). At the broadest level, criteria are goals. At the most specific level, criteria are performance measures. Both will be used—goal-based criteria will be the categories within which analysts can consider and "roll-up" more specific performance-based criteria depending on the required level of detail.

TABLE A-1. TYPICAL EVALUATION MATRIX

CRITERIA	ALTERNATIVES			
	A1 (base case)	**A2**	**....**	**An**
C1				
C2	All of the cells in the matrix get filled in with (1) facts about the performance of each A on each C, (2) an evaluation of the relative performance of ALL A's across each C, and (3) an identification and relative weighting of the most important advantages. Each row (criterion) may be supported by a full report.			
....				
Cn				

Source: ECONorthwest

- *Fill in the facts relating to each criterion, for each alternative*. A fact may be a single number, or it may be an entire report with many numbers.
- *Add criteria as necessary.* While an initial set of criteria and performance measures will be established, it may become appropriate to add criteria or performance measures later in response to the findings of the study as such measures occur.

Table A-2 illustrates the next step in the evaluation, assuming all the data (facts) have been collected and summarized into the matrix. It illustrates how one would compare facts *across each criterion* (work across the rows). (Note: Tables A-2 and following are illustrative only: there would be many more criteria for a real evaluation.) The comparison can and must happen across criteria because, for each criterion, the facts for each alternative are measured in the same units. One cannot work across an alternative (by column) because all the criteria for a given alternative are measured in different units and are, therefore, not easily comparable.

In summary, Table A-2 illustrates these steps:

- *Describe the difference in advantage for each criterion.*
- *Highlight the best alternative for each criterion.* For illustration, we assumed that Alternative 3 performs best on Criterion 1, and Alternative 1 performs best on Criterion 2.

Many evaluation exercises stop here. If one alternative has the most highlighted cells, the decision might be relatively easy. Even if it does not, it may be that the display of facts and relative advantages is enough of a base for an informed discussion and consensus decision.

TABLE A-2. ILLUSTRATIVE EVALUATION MATRIX, PHASE 1, RELATIVE ADVANTAGES

CRITERIA	ALTERNATIVE 1 (BASE CASE)		ALTERNATIVE 2		ALTERNATIVE 3	
Format	*Describe Facts for Alt 1*		*Describe Facts for Alt 2*		*Describe Facts for Alt 3*	
	Describe difference in advantage	*Score*	*Describe difference in advantage*	*Score*	*Describe difference in advantage*	*Score*
Criterion 1 Air Pollution	10 PPM of X		20 PPM of X		5 PPM of X	
	5 PPM more than Alt 3	Score	15 PPM more than Alt 3	Score	Lowest pollution	Score
Criterion 2 Cost	$1,500,000		$2,000,000		$2,500,000	
	Lowest price	Score	$.5M more than Alt 1	Score	$1M more than Alt 1	Score

Source: ECONorthwest

If the analysts and decision makers want to go farther into quantification of the relative importance of the advantage (i.e., into weighting and scoring), the matrix facilitates the process. Table A-3 shows the next steps. The fact-finding part is over. Now some group (technicians, stakeholders, citizens, policy makers: it can happen at any or all levels) are trying to make quantitative judgments (i.e., by using scoring) about value—about the relative importance of the advantages.

There are five steps illustrated in Table A-3:

1. Look at all the highlighted boxes. Make a judgment (through whatever process) about which cell contains the most important advantage and highlight that cell (green box). This is not necessarily the most important criterion, but the most important relative advantage.
2. Arbitrarily give that cell a score of 100.
3. Look at the remaining boxes highlighted in yellow. Give them scores relative to the most important advantage (for illustration, we gave a score of 90).
4. For each criterion, rank each alternative relative to the score for the best alternative on that criterion.
5. Ultimately, the whole matrix of cells gets a score, and the scores can be added by alternative (column).

TABLE A-3. ILLUSTRATIVE EVALUATION MATRIX, PHASE 2, SCORING

CRITERIA	ALTERNATIVE 1 (BASE CASE)		ALTERNATIVE 2		ALTERNATIVE 3	
Criterion 1	*Describe Facts for Alt 1*		*Describe Facts for Alt 2*		*Describe Facts for Alt 3*	
xxx	*Describe difference in advantage*	*Score*	*Describe difference in advantage*	*Score*	*Describe difference in advantage*	*Score 50*
Criterion 2 Air Pollution	10 PPM of X		20 PPMof X		5 PPM of X	
	5 PPM more than Alt 3	Score	15 PPM more than Alt 3	Score	Lowest pollution	Score 90
Criterion # Cost	$1,500,000		$2,000,000		$2,500,000	
	Lowest price	Score 100	$.5M more than Alt 1	Score	$1M more than Alt 1	Score

Source: ECONorthwest

We said above that we would return to the idea of a *nested hierarchy* of goals, objectives, and measures. Figure A-4 illustrates the problems and the solution.

The problem is that as one moves from broad goals to narrower goals (objectives), to impacts of concern (positive and negative), to measures of those impacts, the number of categories expands. Figure A-4 suggests that six broad goal categories[9] might turn into 50 to 100 different measurements. All those measurements are in different units. They cannot be added. Decision makers and the public cannot deal effectively with 10 different measures, much less 100. Planners know well the standard rule from above "If it's not summarized on a single page, Councilor X won't read it." What does a planner do?

We've already given one solution: work through the details of Tables A-1 through A-3. But for 50 measures?

The likely reality is that technicians will have to systematically roll-up multiple measures into some kind of rating for the category that comprises them. In Figure A-4, for example, that means that various measures of congestion for different transportation alternatives (proposed actions) would get rolled into a single score (e.g., better or worse; + or 1; 1 to 5) on the objective called *Congestion Relief*. Then the scores on congestion relief, safety, choice, and so on would get rolled-up into a score for the goal *Transportation Choices.*

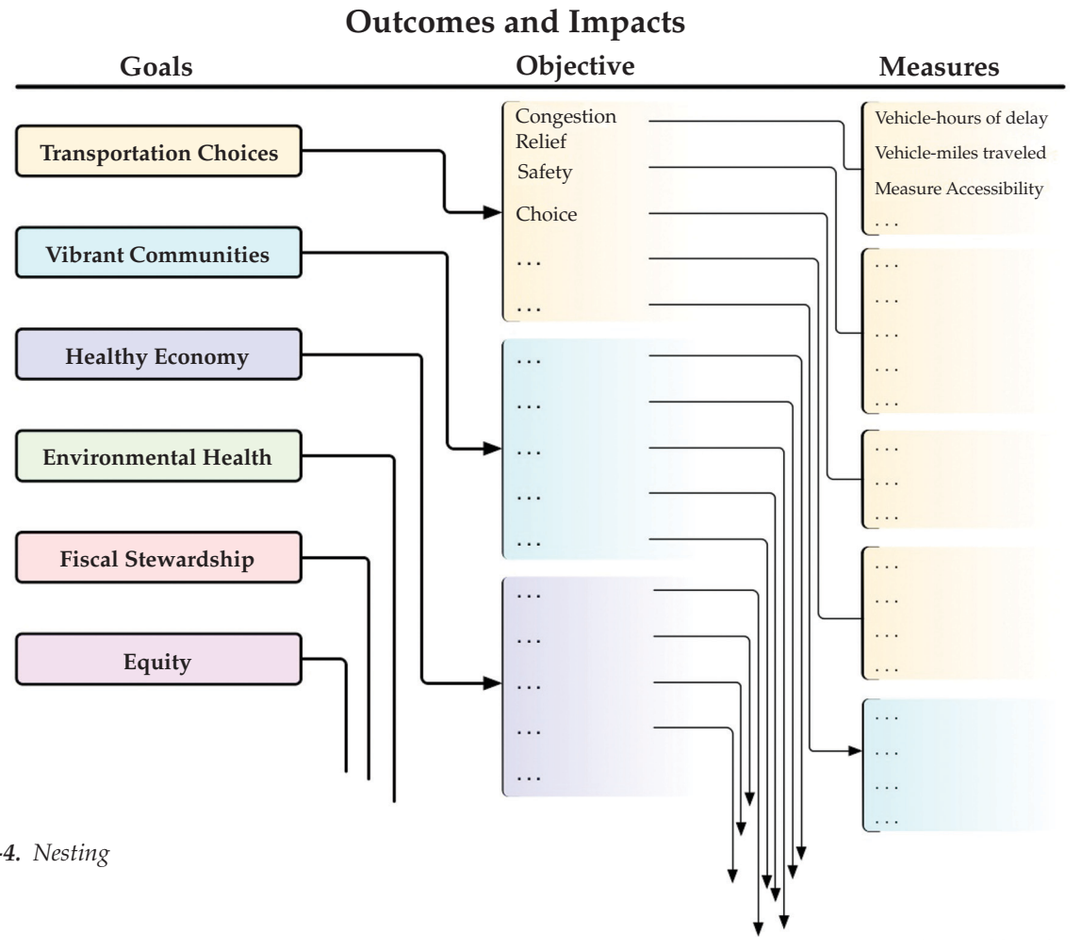


Figure A-4. *Nesting*

Source: ECONorthwest

Clearly, weighting has to occur to do that. It may happen formally and explicitly; it may happen implicitly without anyone knowing it. But it will happen. If it is explicit, it may happen by scoring (e.g., in a process like the one described for Tables A-1 through A-3), but more likely it will happen by visual inspection, expert judgment, voting, and consensus.

However it happens, it will happen more easily and more defensibly if the process makes an effort from the beginning to nest objectives in goals, and measures in objectives. That is a practical way of approximating the principles of comprehensiveness (every covered) and mutual exclusion (everything covered only once).

The following example makes the theory more concrete. Assume that four alternative transportation investment packages are being considered (the *policy alternatives*), all specified to meet the same financial constraint (i.e., all have the same budget of "reasonably available" funds). Assume a public/political process has led to agreement on the use of several *measures* that relate to achieving a broad goal of "Better Transportation System Performance." These measures will be in different units (e.g., vehicle-miles traveled, person-hours of delay, accidents per million vehicle-miles), so they cannot be added. Technical staff (MPO staff, consultants, local government advisory group, a formal task force) could look at these multiple measures of Transportation System Performance and then work through some qualitative process to arrive at a relative ranking of the four alternatives on the broad goal of "Better Transportation System Performance." That process, if applied to all the broad goals (e.g., land use, the economy, the environment) would lead to a summary matrix of

relative performance of each of the four alternatives on each of four to seven broad goals that could be presented on a single page.

Note that the method just described assumes an answer to an important question: Should weights be assigned before measuring impacts, after, or not at all? Tables A-1 through A-3 assume weights are assigned after impacts have been measured. The political wisdom of that order is that policy makers (1) may not a have a good idea about weighting criteria in the abstract, and (2) may want the flexibility to adjust weights to try to select their project preferences after impacts have been measured. An additional downside of weighting before impacts are measured: it takes a lot of time to do it properly and can slow down the front-end of a planning process.

The second point in the previous paragraph, however, is why most technicians tend to recommend weighting *before* impacts have been measured: so that policy makers cannot "game" the evaluation process by assigning higher weights to criteria that makes their preferred project look better. We are in the minority in believing that to be potentially as much an advantage as a liability. Policy makers need some time and flexibility to find there best interest. Abstract weights will not have much meaning to many until they see how they affect policy and project rankings.

We do not think there is an unambiguous right answer to the question of when to weight criteria, but the results of the analyses will probably be different depending on when weighting is done.

SUMMARY

Much more could and has been written about the topics covered in this appendix. Our purpose here was to provide a framework for thinking about how to evaluate public policy, not a users manual. The main points:

1. In the context of regional planning, there are many doors, but all lead to the same room. Whether you enter because of a primary concern about land use, transportation, economic development, or environmental quality, you will arrive at the same place: one in which all those concerns, and more, have to be considered. Citizens and policy makers will not accept, in response to their questions about the impacts of a transportation project on the achievement of a land use plan, the response, This is a transportation plan, so we didn't deal with land use. In short, you have to deal with multiple objectives, and ones not bounded by any single element or discipline.
2. If you accept the previous point, you are confronted by the task of trying to develop the all-by-all, eye-of-God matrix for a regional economic and ecological system. Everything affects everything else in complicated ways that cannot be modeled well individually, much less collectively. Computer models are suggestive, but not definitive. Moreover, policy makers and the public are suspicious of "black boxes" (a process that does not explain itself; things go into the box and come out, but what happens inside is not observable). They want something transparent. They want planners to make something inherently complex into something simple and intuitive (i.e., something they can understand according to their individual intuitions, which, of course, can vary widely across individuals). Good luck.
3. In the context of regional transportation, an application of the principles and techniques of benefit-cost analysis has the best chance *technically* of dealing with the multiobjective/multicriterion problem. *Politically*, however, such an analysis is complicated and too much of a black box for most policy makers. In some cases, a benefit-cost measure may be only *one criterion* of a multicriterion evaluation. In short, you are very likely going to do your evaluation with some version of *matrix display*.
4. If you use a matrix display (its limitations notwithstanding), your work will be better both technically and politically if you follow the principles described in this appendix. Those include nesting measures under broad goals; having solid analytical work sitting behind the summary evaluation in the summary matrix;

nesting evaluation criteria and measures inside of objectives and goals; evaluating the relative advantages of each policy alternative on each measure/evaluation criterion; and scoring (if you choose to do scoring) based on relative advantages, with scores anchored to the primary advantage.

APPENDIX A NOTES

1. The material in this appendix draws heavily on other work by Terry Moore and ECONorthwest, published in part in several other reports and books. Thanks in particular to the Transportation Research Board (TCRP and NCHRP), the Lincoln Institute of Land Policy, and Metro (Portland, Oregon).
2. In the rest of this appendix, we use the term *policy* broadly to include any type of public decision, including budget allocations (investments) for infrastructure or programs, or changes in regulatory requirements.
3. Government does provide certain social programs (especially education) that help people meet the higher needs, but those policies are not the focus of land-use and transportation agencies, and are beyond the scope of this book.
4. "Social justice" is the current jargon for referring to issues of equity and fairness.
5. Quality of life is how planners tend to refer to what economists refer to as economic welfare or well being.
6. Some texts on public policy distinguish between *efficiency* (do things right) and *effectiveness* (doing the right things). It is not a benefit to society if public actions do the wrong things efficiently. In this appendix, we use the term efficiency to mean net benefits, which implies a consideration of effectiveness.
7. ECONorthwest for the National Cooperative Highway Research Program and American Association of State Highway and Transportation Officials (AASHTO). 2003. *A Manual of User Benefit Analysis for Highways, 2nd Edition.* Washington, D.C.: AASHTO; and ECONorthwest/Parsons Brinkerhoff for the Transportation Research Board. 2002. *Report R-78. Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners.* Washington, D.C.: TRB.
8. The method illustrated in Table A-1 and following is called "Choosing by Advantages" and is described in: Suhr (1999).
9. These six are from the Long-Range Transportation Plan of Metro (Portland, Oregon), 2007.

Appendix C

Goals of Stakeholders

INTRODUCTION

The main motivation behind conducting an evaluation is the desire to improve system performance. An effective evaluation can clarify what parts of the system (in this case, the EmX) are and are not working. To evaluate how well those parts are being achieved, they have to be identified and, to the extent possible, measured. When goals / objectives get measured, they become evaluation criteria or performance measures.

But defining what is and is not working requires the evaluators to consider what stakeholders want and how they define "working." This is especially true for public investments, such as the EmX, where there are always multiple objectives and perspectives that address the goals and desired outcomes for the system.

There are at least two broad ways to identify relevant performance objectives and the resulting measures needed to quantify the performance objectives: (1) review the professional literature, and (2) ask stakeholders what they want. For transit in general and the EmX specifically, stakeholders include the agencies that fund and operate transit (FTA and LTD), and those that use and/or are affected by the system (e.g., planners, community members, policymakers, businesses).

For this evaluation framework, CPW both reviewed the professional literature and asked stakeholders what they wanted. The literature reviewed centered on the FTA and its evaluation criteria. In addition, CPW conducted 29 interviews, three focus groups and two online surveys to ask city planners, policymakers, business owners, and community leaders what their goals were for the EmX and what aspects of the system they would like LTD to measure.

It is typical for evaluation methods to first describe broad categories of goals/objectives/impacts/desired outcome, and then to look at ways they can be measured so that a quantitative evaluation can be done. As mentioned above, CPW researched the goals of the Federal Transit Administration (FTA), LTD, city planners, policy makers, community members, and representatives of the business sector. The following sections discuss the goals of each of these stakeholders. We provide a brief discussion of the similarities and differences among the goals of the stakeholders at the end of the section.

GOALS OF DIFFERENT STAKEHOLDERS

As CPW conducted in-depth research of stakeholder goals, it was important to know the background of how and why the BRT system came to be. The concept of BRT was first documented in the Eugene-Springfield Transportation Plan in 1986. From this time on, BRT has been an integral component of how the Eugene and Springfield areas plan for their transportation future. Unfortunately, because of the length of time between revising TransPlan and its associated community outreach efforts, much of the community is unaware of how ingrained BRT is in the community.

Figure C-1 (next page) shows a logic model of TransPlan that shows BRT inputs, actions, objective and goals that were decided on by the community. Although the stakeholders CPW worked with did not specifically mention all of the items listed in Figure 2, it is important to keep these items in consideration as a backdrop when creating the EmX evaluation framework.

The following subsections will describe the goals of various stakeholder groups in relation to BRT.

FTA

LTD's BRT demonstration line, the Franklin Corridor, was funded through the FTA's Small Starts program. The Small Starts program provides capital funding for low-cost transit projects that meet a specific set of FTA's goals. The FTA has many goals for its Small Starts program including reduced travel time, increased ridership, schedule adherence, land use improvement, cost effectiveness, low traffic impacts, and positive public perception. The FTA examines the success of a BRT project using measures of increased ridership and requires that a proposed BRT project include as many elements of BRT as possible (see Appendix C for more details).

LTD

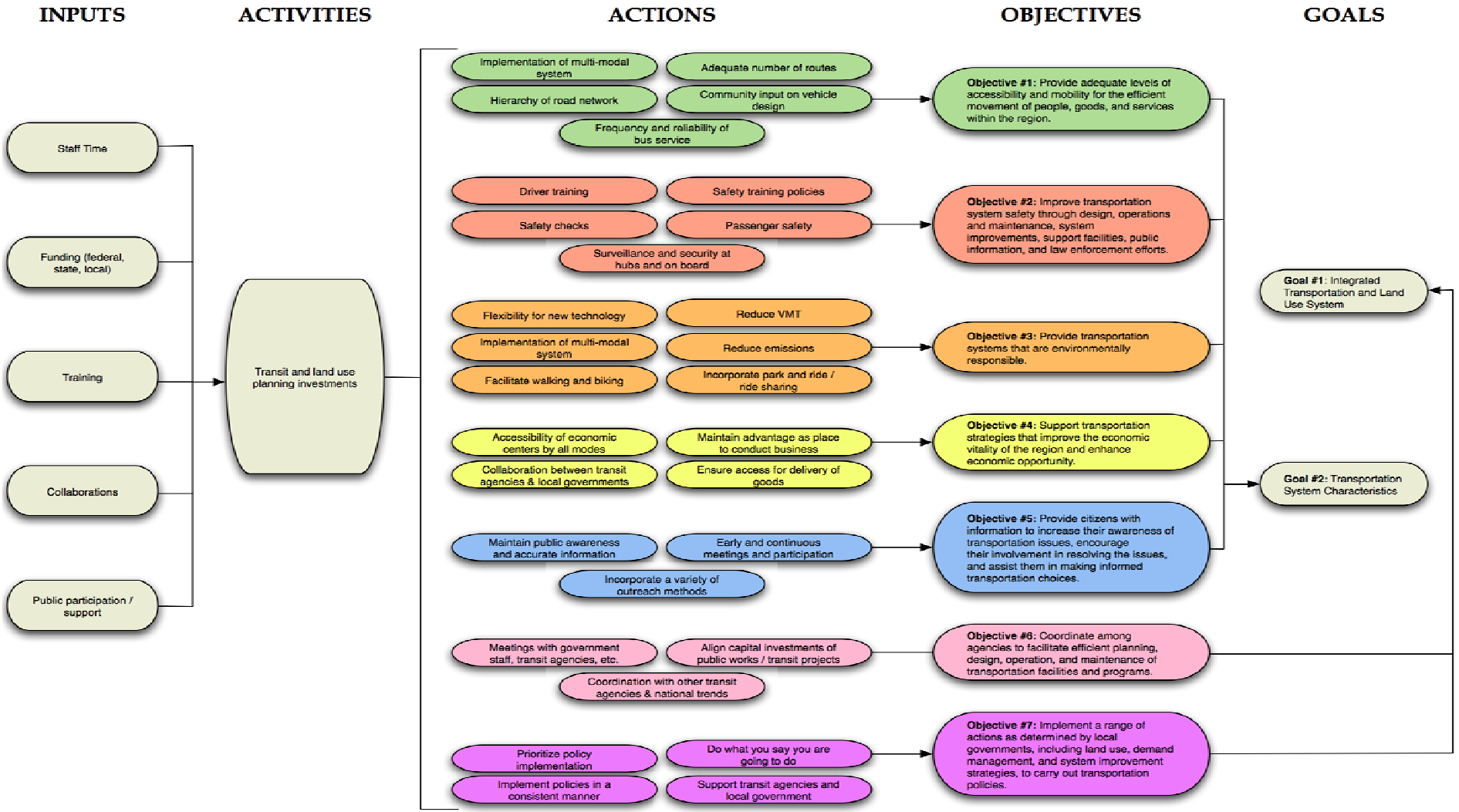
LTD's goals for the EmX were determined through interviews with LTD staff and research on EmX materials that LTD provides to the community. Not surprisingly, LTD's goals substantially overlap those of the FTA. For the EmX LTD hopes to see reduced travel time, increased ridership, good reliability, good coordination with land use, low operating costs, creation of connections between neighborhoods, adequate carrying capacity, and integration with the surrounding infrastructure.

Planners

We interviewed five planners from Eugene and Springfield. Their goals for the EmX focused on the EmX development process and LTD's coordination with other needs:

- **Better coordination between transportation and land use**. Planners were interested in transit that is well coordinated with land use. They were focused on linking long-term EmX planning to long-term land use goals and projections and hoped that transit and land use could be better coordinated. In addition, planners hoped that synchronizing funding and decision-making in addition to improving communication between LTD and land use planners could aid this coordination.

Figure C-1. TransPlan Logic Model



- **Adherence to the transportation policies established in TransPlan.** Planners indicated the important role existing planning documents have in guiding transportation planning in Eugene. In particular, planners look to the Eugene-Springfield Transportation System Plan (TransPlan) for guidance on transportation related issues. TransPlan includes BRT as an important mode within the community, so planners hope to create the system indicated by this plan.

- **Better coordination between policy makers and LTD.** Planners' goals are guided by the goals of policymakers. Planners see themselves as facilitators between LTD and policy makers and hope to improve the facilitation process for EmX development.

Business Sector

The goals of the business sector were determined through interviews of the Eugene and Springfield Chambers of Commerce and the Lane Metro Partnership and a survey of business owners. CPW found that area businesses have mostly access-related goals for the EmX system. The goals of the business sector are set out below in more detail.

- **A fast, reliable transportation option.** The business community wants the EmX to be a fast, reliable transportation option for customers, employees, and other business associates while offering service to a broad area and provide access to key destinations in the Eugene-Springfield area. Another aspect of this goal is ensuring that the EmX service is as convenient as possible in order to increase ridership. This aspect requires schedule adherence, maintaining short headways, and improving neighborhood feeder services.

  It is worth noting that there is a disagreement within the business community about whether offering no-fare service on the EmX helps or hinders this goal. Some individuals feel that charging a fare for the EmX creates a barrier to the overall convenience of the system. Others feel that providing the service for free attracts homeless or displaced individuals, which are believed to deter other riders from using the service.

- **Inhibition of other transportation modes.** While transit access is an important goal to some area businesses, an important subset of this goal is that the EmX does not hinder access for other modes of transportation. Of primary concern are limitations placed on motor vehicle access to businesses along the EmX routes. CPW found that area businesses would like to see the EmX achieve high ridership, but not at the cost of limiting motor vehicle access.

- **Reduce LTD's overall operating costs.** Apart from issues of access, we found that area businesses would like to see the EmX reduce LTD's overall operating costs. This goal is undoubtedly linked to the fact that area businesses provide

funding for LTD's operations through the imposition of a payroll tax. Our research indicates that businesses support these tax dollars being used more efficiently and the EmX is perceived as a way of achieving this goal.

Community Members

The goals for community members and groups are taken from information gathered in six interviews with community members and one survey sent to active members of the Fairmount Neighborhood Association. These stakeholders have a wide range of perspectives based on their personal interests and the interests of community groups that they participate in.

For this reason, it is difficult to present a clear set of goals for this stakeholder group and some of the goals may contradict one another. The following are some comments and suggestions that we found to be common among the community members.

- **Incorporate all elements of BRT.** Both community members who support the EmX and those who are critical of it insisted that, in order to gain support, the EmX must have all of the aspects that define BRT.

- **Minimize environmental impact.** A number of community members were interested in the environmental impact of the EmX and want LTD to do more to reduce this impact.

- **Use funding more efficiently.** Community members do not all believe that BRT is appropriate for Eugene and think that LTD's money would be better spent on light rail or improvements on traditional bus systems. Some community members also mentioned that the routes chosen for the EmX might not be appropriate.

Policy Makers

The goals of policy makers for the EmX are taken from eight interviews with local policy makers. Overall, they cited a strong relationship between BRT and area policies, strict adherence to including all elements of BRT, and community acceptance as their goals for the EmX. While other goals were brought up in our interviews with policy makers, these three goals were repeatedly referred to.

- **Collaborate with jurisdictional partners.** Policy makers want to see more collaboration between EmX (as well as other LTD projects) and land use planning in the communities. They believe that only through this collaboration will public policies related to transportation and land use work. Many policy makers cited the Eugene-Springfield Area Transportation Plan (TransPlan), as the main policy that LTD and local planning departments should work together to meet.

- **Incorporate all elements of BRT.** Policy makers believe that in order for the EmX to be successful, there must be strict adherence to the definitional elements of BRT. Policy makers said that every time an element of BRT is compromised in the design of the EmX, the less successful the EmX will be.

- **Capture community buy-in.** Policy makers measure the success of the EmX by community approval. Therefore, one of their biggest goals for the EmX is to achieve the most community buy-in. Policy makers believe that buy-in is linked to the design elements of the EmX. For example if an EmX gets stuck in traffic because it does not have designated lanes or signal priority, then it will become just like any other bus. If the EmX can't maintain a reliable frequency of every 10 minutes, community approval might falter as a result.

DISCUSSION OF GOALS

While the stakeholders' goals have variations, common themes are evident. To get the most out of its efforts, LTD could focus on the commonalities between the stakeholders' goals. Table 1 (page 9) sets out the common stakeholder goals in a table to illustrate that it is possible for LTD to satisfy more than one stakeholder by focusing on only one goal. For example, adhering to design elements of BRT would meet a goal of three stakeholder groups – community members, policy makers and the business sector.

Appendix D

FTA Requirements for BRT Systems

FTA REQUIREMENTS FOR BUS RAPID TRANSIT SYSTEMS

Section 5309 of the FTA Capital Investment Grant program contains a capital funding program for low-cost projects called Small Starts. To qualify as a Small Starts project, a transit project must cost less than $250 million, be in a fixed guide way for at least 50% of the project length in the peak period and/or be a corridor-based bus project.[1]

Projects that meet these threshold requirements are then evaluated and graded based on established Project Justification Criteria and Local Financial Commitment. The main criteria that the FTA looks at when rating a qualified project are cost effectiveness,[2] land use,[3] and economic development.[4] For the Local Financial Commitment component of the evaluation, the FTA reviews the project for the following:

- A reasonable, local plan for securing funds for capital costs or availability or proof of other sufficient funds,
- Forecasted operating and maintenance costs of the project that make up less than 5% of the agency's operating budget, and
- A transit agency that is in good financial condition.

After the transit agency has submitted all of the necessary information to FTA for review, the transit agency continues into the planning and project development stages of the process. When necessary, the FTA may request supplementary information from the transit agency prior to issuing a ranking and funding recommendation for the project.

The FTA is also required to conduct an alternatives analysis to supplement the proposed project when deciding whether to recommend a project for funding. After the alternatives analysis has been completed, the FTA approves the transit agency to move

[1] A corridor-based bus project per FTA must at a minimum include the following elements: substantial transit stations, signal priority/pre-emption, low floor/level boarding vehicles, special branding of service, frequent service (10 minutes peak/15 minutes off peak), and offer service for at least 14 hours per day. (Source: www.fta.gov)

[2] The FTA defines cost effectiveness for purposes of its Small Starts project-ranking system as incremental cost per hour of transportation system user benefits compared to the baseline alternative using the opening year's forecast. (Source: www.fta.gov)

[3] Three categories are evaluated for this criterion: existing land use patterns, transit supportive plans and policies, and the performance and impact of these policies. (Source: www.fta.gov)

[4] Economic Development is considered an "other" category. Per FTA's website, applicants are encouraged to provide economic development impacts, congestion pricing, and other project benefits for consideration in the rating process.

forward into the next phase of the process—project development.[5] After some negotiation during the project development phase, a project construction grant agreement is drafted to provide financial assistance for the project. However, the funding process is not complete until Congress appropriates the funds. Congress has the discretion to follow or reject the FTA's recommendations.

The FTA requires evaluation of an FTA-funded project both prior to and after construction. Small Starts projects must follow the post-construction and opening evaluation requirements under the New Starts program. Under SAFETEA-LU, a project that receives funding through the FTA's Small Starts program must conduct a before-and-after study that:

- Describes and analyzes the impacts of the new fixed guide way capital project on transit services and transit ridership;
- Evaluates the consistency of predicted and actual project characteristics and performance; and
- Identifies sources of differences between predicted and actual outcomes.

[5] To be approved into the project development phase, a transit agency must first complete the alternative analysis and adopt a locally preferred alternative (LPA). The LPA must be included in the MPO's long-range plan. Then the transit agency must complete the NEPA process and receive a medium rating or better from FTA. Additionally, the transit agency must develop an acceptable Project Management Plan that includes a budget and schedule.

Appendix E

Summary of NEPA Process

INTRODUCTION

The Federal Transportation Administration requires transit districts to implement the process outlined by the National Environmental Policy Act to make decisions about the bus rapid transit projects that it funds. Therefore, understanding this process is important to implementing these projects

THE HISTORY OF THE NATIONAL ENVIRONMENTAL POLICY ACT

The environment became a public concern in the United States in the 1960s, which prompted the government to implement environmental protections. Some important environmental legislation, like the Clean Air Act and the Clean Water act, was passed in the late 1960s and early 1970s. The National Environmental Policy Act (NEPA) of 1969 was one such piece of legislation. NEPA was intended to promote environmental protection through legal processes, disclosure of environmental problems, interagency cooperation, and public participation in the decision-making process. Since being signed into law in 1970, some changes have been made to NEPA—mostly on a procedural level—but the spirit of the law has stayed the same.

THE RELATIONSHIP TO OTHER POLICIES AND GOVERNMENT AGENCIES

The National Environmental Policy Act (NEPA) is a significant piece of legislation because it gives teeth to other environmental policies like the Clean Air and Clean Water Acts. NEPA requires government agencies to assess the environmental impacts of all actions they undertake. It also acts as a guideline for agencies that seek to ensure environmental quality. The President's Council on Environmental Quality (CEQ) was created by NEPA, and offers guidance and regulations to help agencies comply with NEPA. The Environmental Protection Agency (EPA), created in 1970, plays an important role in the NEPA process, both by offering guidance to other federal agencies and by reviewing NEPA documents for adequacy.

Individual agencies and states often have their own regulations that determine compliance. Some states also have "little NEPAs," (called SEPAs or state environmental policy acts) which generally have more stringent regulations than the Federal NEPA. Oregon does not have a "little NEPA" because state land use and environmental legislation—which NEPA requires compliance with—is fairly strong.

Common Acronyms

NEPA: National Environmental Policy Act

EA: Environmental Assessment

EIS: Environmental Impact Statement

DEIS: Draft Environmental Impact Statement

EPA: Environmental Policy Act

CEQ: President's Council on Environmental Quality

THE APPLICATION OF NEPA

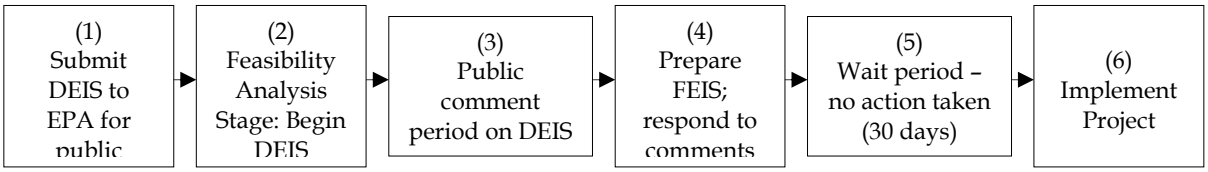
NEPA applies to all major federal actions "significantly affecting the human environment."

Significant impact is determined through a preliminary assessment. The federal agency overseeing the action prepares an Environmental Assessment (EA), which determines whether or not the project will have a significant impact on the existing natural and human environment. Significance is only vaguely defined in NEPA, but is based on the context and intensity of the impact and whether it crosses a "threshold of significance," which is agency or project specific. If the agency determines there is no significant impact, compliance with NEPA ends with the submission and approval of a Finding of No Significant Impact (FONSI) by the lead agency and EPA respectively.

If there will be a significant impact, the agency must prepare an Environmental Impact Statement (EIS), which is an in-depth study of foreseeable impacts. It is common for state or local agencies to prepare the EIS for a federal agency, but federal agencies are responsible for reviewing the EIS and submitting it to the EPA. The first step in the EIS process is to define the purpose and need of a project. The agency must then conduct a "scoping" process to determine what other agencies or groups may have an interest in the project. Involvement of other federal agencies and the public from the beginning is an important goal of NEPA.

PROCESS STEPS AND TIMELINE

NEPA does not contain formal time limits for this process, but it generally should not take more than 12 months. The amount of time for public comment is also not specified in NEPA, but must be at least 45 days. The process involves the following steps:



THE ENVIRONMENTAL IMPACT STATEMENT

The different sections of an EIS are:

- **Introduction:** Briefly proposes an action, focusing on its purpose and goals. There is a also a description of the proposed action, including information about the site.
- **Alternatives:** The proposed action and a no action alternative must be included as alternatives, but multiple alternatives are preferable. In practice, there are usually only three or four alternatives presented in an EIS. Alternatives must fulfill the purpose and need of the project and be reasonably feasible—although they need not be within the agency's jurisdiction. The agency must assess the foreseeable environmental impacts of each alternative, covering topics like air quality, hydrology and water quality, geology, soil, wildlife, noise, aesthetics, and socioeconomic and environmental justice impacts. The assessment should

address direct, indirect, and cumulative impacts of an action, and should include mitigation procedures that address these impacts.

- **Preferred Alternative:** The agency chooses a preferred alternative, which may or may not be the proposed action. In general, if the proposed action includes appropriate mitigation, has less negative impacts than the other alternatives, and adequately addresses public concerns, it will be approved by the lead agency.

There is generally a Draft EIS and then a Final EIS, both of which are open to public comment. Public comments made on the Draft EIS must be addressed in the Final EIS. Public comments can lead to the addition of new alternatives, which have to be studied for their environmental impact before the Final EIS is submitted. In theory, public participation is a vital aspect of the NEPA process, but EISs are not always as accessible to the public as intended. The lead federal agency on the project determines whether or not the preferred alternative and the EIS are acceptable. Yet, even if the EIS and the preferred alternative are deemed acceptable, it is possible to legally challenge decisions in court after they have been made. In general, courts are more sympathetic to people arguing against the action when they have been involved in the public review process from the beginning.