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"Efficiency - Equity - Clarity"

Evaluating Public Transit Accessibility

'Inclusive Design' Performance Indicators For Public Transportation In Developing Countries

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Abstract

This paper describes indicators for evaluating the quality of public transport services provided to people with disabilities and other special needs, suitable for use in developing countries. It discusses the concept of 'inclusive design,' identifies suitable indicators, discusses factors to consider when selecting indicators, describes examples of indicators currently in use, and provides recommendations for selecting and using indicators.

Introduction

Management experts often say that, "you can't manage what you can't measure." What is measured, how it is measured, and how data are presented can affect how problems are defined and which solutions are selected. A particular strategy may appear good when measured one way, but unsuitable when measured another way.

For example, a baseball player's performance can be evaluated based on batting averages, base hits, runs batted in, ratio of wins to losses, and various defense statistics that depend on the player's position. Performance statistics can be calculated per at-bat, per inning, per game, per season, or over a career. A player can be considered outstanding according to one set of statistics but inferior according to another. This illustrates the importance of carefully selecting the types of statistics used for evaluating performance.

This paper provides guidance on the development and use of performance indicators for evaluating public transportation service quality for people with disabilities and other special needs, particularly in developing countries. *Performance indicators* (or just *indicators*) are measurements used to help evaluate progress toward a planning objective. The process of accommodating people with disabilities is called *inclusive design*, *accessible design*, or *universal design*. These design practices can provide many benefits; not only do features such as access ramps, low-floor buses and easy-to-see signs help accommodate people with disabilities, they also improve the convenience, safety and comfort of other system users.

Concepts and Terminology ("Universal Design," VTPI, 2005)
Below are some terms used for accommodating people with disabilities.

Impairment – a constraint in a person's physical, mental or sensory functions.

Disability – a limitation in the way daily functions can be performed due to an impairment.

People with disability (this is preferred to simply using the term "disabled," since it emphasizes that they are people). Even better is to describe people's specific conditions: *people with impaired mobility, people with visual impairments, wheelchair users, etc.*

Accessibility (or just *Access*) can refer to facilities that accommodate people with disabilities. (*Accessibility* also has broader meanings, referring to the general ability to reach desired goods, services and activities.)

Accessible design, *Inclusive design* and *Universal design* – the process of designing facilities to accommodate people with disabilities and other special needs, such as families with children, people using hand carts, people carrying baggage, and visitors unable to speak the local language.

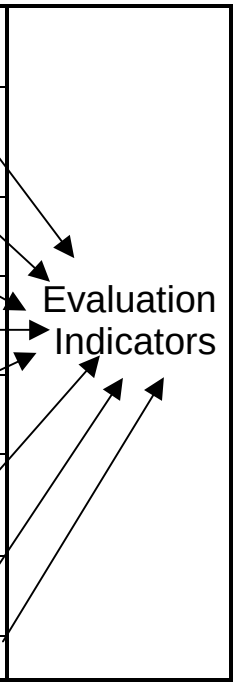
Public transit (also called *mass transit* and *public transportation*) includes various services using shared vehicles that provide mobility to the general public. These include passenger rail, fixed-route bus services, mini-buses and vans (also called jitneys, tuk-tuks, and other local names), shared taxis, paratransit (subsidized services providing door-to-door mobility for people with disabilities and special needs, such as travel to medical centers), and conventional taxi services. In developing countries, trucks and animal-drawn wagons may also provide public transit services. Public transit service quality is particularly important for people with disabilities because they often depend on transit for basic mobility, and because they are particularly vulnerable to system inadequacies.

What Can Be Measured?

Performance indicators can reflect various levels of impacts, as illustrated in Table 1. For example, indicators may reflect the quality of the planning process; the quality or variety of travel options serving people with disabilities; the quality of facilities and vehicles; outcomes, such as the number of trips or kilometers of travel by people with disabilities, and how this compares with able-bodied people, and, the effects these factors have on their activities and opportunities (the degree to which people with disabilities are able to access public services, attend school, commute, etc.).

Table 1 **Levels of Impacts** (Litman, 2005a)

External Trends ↓	The number of people with disabilities, their incomes, their locations and destinations, etc.
Planning Practices ↓	The quality of decision-making activities, and the degree that they consider and include people with disabilities and other special needs.
Options or Incentives ↓	Quantity of transport services and facilities that accommodate people with disabilities.
Response (Changes to Physical Activities) ↓	Number of public transit trips and transit passenger-kilometers by people with disabilities.
Cumulative Impacts ↓	Total amount of trips and person-miles of travel by people with disabilities.
Effects on People and the Environment ↓	Ability of people with disabilities to access public services, education and employment.
User Perceptions ↓	The rating of public transit service and transport system quality by people with disabilities.
Performance Evaluation	Ability to achieve specified standards and targets.



This figure shows how indicators can measure various levels of impacts.

For example, public transit service quality can be evaluated based on its availability ("six bus routes accommodate people in wheelchairs, out of twenty total routes in the city"), its use ("disabled passengers took 250 trips in March on Bus Route # 17"), user perceptions ("people with disabilities report that transit services do better to accommodate them, but there are still significant problems, such as…"), or changes in overall travel patterns by people with disabilities ("since the implementation of an accessible features in the transit system, people with disabilities take 50% more vehicle trips than measured two years ago"). All of these indicators can be used to compare trends over time, different groups (people with disabilities compared with able bodied), different areas (people with disabilities in one neighborhood compared with another) and organizations (one transit service provider with another). In order to evaluate policy and planning changes it is important to collect baseline data before changes are implemented. For example, before implementing wheelchair ramps at a bus station it is useful to survey the number of people with disabilities who use that station, and the amount of motorized travel by nearby residents who are disabled. Later surveys can determine the degree to which inclusive design features affect travel patterns and provide benefits. Surveys should be performed using similar practices (e.g., at the same time of day and week) so results can be compared.

Access Audits and Comments

An *access audit* is a survey of a facility or service to determine the degree to which it accommodates people with disabilities and other special needs (Rickert, 2003). Such audits can be carried out by regulatory agencies reporting to transport ministries, by NGOs advocating for inclusive transport, or by other agencies. If possible, audits should be performed and user complaints handled by an independent agency, with results that are available to the public.

As much as possible, audits should be performed by properly trained staff and based on published guidelines and standards. Examples of appropriate standards include those published by the U.S. *Access Board* (www.access-board.gov), *Inclusive Mobility - A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure* (DfT, 2002) and *Enhancing The Mobility Of Disabled People: Guidelines For Practitioners* (TRL, 2004). These standards and audit results can be made available to the public (for example, posted on bulletin boards and websites). However, audits should not be limited to features that are specified in such standards, nor should such standards be applied without flexibility where needed to reflect specific conditions. For example, public transit providers in developing countries may be unable to provide mechanical lifts or other equipment specified in published standards, but they may be able to accommodate wheelchair users in other ways.

Below are examples of features that could be considered as part of such an audit. These can often be evaluated based on published guidelines and standards.

Design Features

- Train station entrances accommodate wheelchair users.
- Ramps do not exceed 1:12 (8.3%) grade, and meet other design standards.
- Buses (all or a minimum designed portion) have lifts that accommodate wheelchair users.
- Transit vehicles have priority seating for people with disabilities and elderly passengers.
- Transit terminal washrooms accommodate people with disabilities.
- Sidewalks in areas around transit stations accommodate wheelchairs.
- A minimum designated portion of taxi vehicles accommodate wheelchair users.
- Rail transit stations have signs and barriers suitable for people with visual impairments.
- Information on how to lodge a complaint, offer suggestions for improvements, or provide commendations is easily available to users.

Operating Features

- Wheelchair lifts operate at least 95% of the time.
- Buses come to a complete stop when requested by passengers with disabilities.
- Transit staff understand policies regarding the accommodation of passengers with disabilities.
- Transit station floors and platforms are kept clear for movement by people with disabilities.
- Washrooms are clean and functioning.
- There are a minimal complaints by people with disabilities concerning inadequate services.
- User complaints are processed appropriately.

Data Collection Practices

Good planning and management require good data. Unfortunately, there are many possible errors that can result in inaccurate data. For example, while it might seem reasonable to require bus drivers to record when they carry a wheelchair user, in practice such counts are often inaccurate. The data may be biased if drivers are motivated to overcount or undercount, or if they are simply distracted and forget. Mechanical counters can be attached to wheelchair lifts, but they also count lift cycles that occur during practice sessions and maintenance. Similar problems may occur with other types of data collection. It is therefore useful to verify, cross-check and use multiple approaches to collecting performance data.

Travel statistics should be clearly defined and consistently applied. For example, it is important to specify whether a "trip" refers to a one-way trip or a round (return) trip. It would be an understandable mistake for a paratransit driver to count a journey taking a patient from home to a medical clinic and back to home as a single trip. However, by common practice, transport planners and transit agencies consider this journey two trips (one to the clinic, another back to home). Standardizing statistics allows travel data to be compared accurately.

Various *reference units* can be used for evaluating transit travel (Litman, 2003), including trips and passenger-kilometers per capita (in this case, counting residents with disabilities), cost per trip or passenger-kilometer, and transit vehicle load factors (passengers per trip). Such units are useful for comparing performance over time, and between different routes, areas, service providers and jurisdictions. They can help identify trends, potential problems and performance efficiencies. For example, changes in costs per vehicle-kilometer or passenger-trip, or changes in load factors may indicate possible problems, inefficiencies and even fraud. By comparing average costs per passenger-trip a service agency may be able to determine whether it is more cost effective to operate their own vehicles or to contract with a local transit or taxi company.

Below are examples of data useful for evaluating public transit system performance for people with disabilities:

- Portion of the overall population with disabilities that affect their travel ability (with information on the type and severity of their disability).
- Average trip making rates by people with disabilities.
- Portion of people with disabilities who a.) require frequent medical services, b.) attend school, c.) are employed outside of their home.
- Relative household income of people with disabilities (to determine what portion are both disabled and low income).
- Portion of people with disabilities who live in households that have a telephone.
- Household location of people with disabilities.
- Number of wheelchair users and passengers with other types of disabilities who use a public transit service each day, week, month and year.
- When and where people with disabilities travel (origins and destinations).
- Number of complaints lodged by people with disabilities.
- Quality of walking facilities around transit stations and stops, and the degree to which these accommodate people with disabilities.

Demand and Ridership Information

Transportation and transit agencies use various methods to collect travel demand and ridership data, including ticket sales, passenger counts, on-board surveys and general transportation surveys, as summarized in the table below. Such surveys should be designed to collect information on people with disabilities, such as their number, types of disabilities, and the obstacles they face.

Table 2 **Ridership and Travel Surveys**

Type of survey	Key advantages	Key disadvantages
Ticket sales and fare collections, including sales of concession fares for people with disabilities	• No cost. • New electronic ticketing systems allows location and time of each trip to be recorded.	• Limited data. In most cases there is no information on trip location or time.
Dispatch lists. Taxi companies and special mobility services may be able to provide such information.	• No cost.	• Only available from some types of transportation services.
Estimates made by drivers.	• No cost or low cost.	• Drivers are usually too busy to do this.
Field surveys (e.g., observations at heavily used transit stops or on board a certain % of vehicles)	• More impartial. • Low cost if observations only made of a small percentage of total system. • Surveys can provide information on time and location of travel, portion of users with visible disabilities, and some types of problems they encounter.	• Probably not a scientific sample of passengers (e.g., disabled passengers often try to avoid peak hour congestion) • Too subjective (Different observers will have different criteria for who is "disabled," who is a senior)
Passenger surveys. Survey a sample of passengers (e.g., every tenth person boarding a bus or entering a railroad terminal are given a printed survey or verbal interview).	• Can be highly representative if a valid sample of passengers are effectively surveyed. • Can collect detailed information on travel demand, trip-making patterns, preferences, problems, etc.	• High cost. • Some people cannot respond to a printed survey (e.g., people who are blind, cannot read or do not speak the survey language). • Personal interviews may alarm some people unaccustomed to this approach.
General travel survey. Survey a sample of residents or employees.	• Can collect data from non-users (people who do not currently ride transit). • Can collect detailed information on travel demand, trip-making patterns, preferences, problems, etc.	• High cost. • Some people cannot respond to a printed survey. • Personal interviews may alarm some people.
Activity and destination data. Information may be available on visits to medical clinics, school enrollment, employment activity, event attendance, etc.	• Is sometimes easy to collect (if the information is collected anyway).	• Is only a proxy for transit ridership.

This table describes various ways to collect ridership and travel data. These can be designed to collect data on passengers' disabilities and the problems they face.

Many transit agencies have a regularly scheduled program for collecting and releasing this data. For example, a transit agency may publish monthly, quarterly and annual ridership figures, and perform on-board surveys on a quarterly or annual cycle. Transportation agencies may perform major travel surveys every few years, and some now have an on-going program of annual surveys to provide ongoing data.

Because transportation affects many other activities, many types of surveys can provide opportunities to collect data on travel demand and barriers facing people with disabilities. For example, education agencies sometimes survey residents to identify barriers to their children attending school, and public health agencies sometime survey residents to identify barriers they face reaching medical services. Such surveys can be designed to specifically ask whether people experience difficulty reaching such destinations due to physical, sensory, or cognitive disabilities which are not accommodated by available transportation services.

In practice it is often difficult to obtain accurate information on the number of people who are disabled and their travel demand, particularly in developing countries. Consider, for example, an attempt to calculate the number of transportation disadvantaged people in continental Latin America.[1] Data from CEPAL (the Economic Commission for Latin American and the Caribbean) indicated that seniors totaled 27.3 millions, or 5.4% of the population, and women totaled 256 millions, or 51.4% of the population. However, the population with physical, sensory, or cognitive disabilities, could only be estimated crudely by averaging disparate data from studies in nine countries which used different methodologies and definitions of disabilities, and may also have been biased by underreporting (by those not wishing to self-identify as disabled), and possibly in some cases, over-reporting (if some benefit was seen as coming from being reported as disabled). This methodology indicated that 6.5% of continental Latin America residents were disabled.[2]

The conventional definition of "disability" may be overly restrictive. The same high steps that may stop a wheelchair user or someone with arthritis from boarding a bus, may also make the trip impossible for those of shorter stature (including many women and children) or less strength (frail elders). Similarly, operational changes, such as requiring buses to completely stop for boarding, and improving walking facilities around transit stations, also benefit vulnerable users. As a result, a significant portion of public transit passengers (probably 20-30%) can benefit from inclusive design[3]

It can be difficult to predict future transit demand for people with disabilities. This demand depends on the number of people with disabilities in the population, their desire to travel away from their neighborhoods, and the overall accessibility of the transportation system. As people with disabilities are more able to attend schools, obtain jobs, earn and spend more money, and in other ways participate in society, their trip making is likely to increase. Improving walking and wheelchair conditions between homes and transit stops, and to destination will also increase their trip making. As people with disabilities become more familiar and comfortable with transit services, their transit travel demand will continue to grow.

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[1] Preformed June 2002 by Tom Rickert for *Enhanced Accessibility for People with Disabilities Living in Urban Areas*, sponsored by the UK's Department for International Development (DFID). The complete Inception Report for this project is found at the DFID web site at www.transport-links.org or the AEI web site at www.globalride-sf.org.

[2] Data averaged by Tom Rickert from P. Dudzik, A. Elwan, and R.L. Metts, *Disability in Latin America: A Review of Statistics and Inclusionary Policies*, an unpublished draft paper prepared for a March 16, 2001, seminar of the Inter-American Development Bank in Santiago, Chile, p. 9. Averaging the data resulted in an estimate that 6.5% of those living in continental Latin America were disabled according to the disparate data.

[3] *Improving Transport for People with Mobility Handicaps: A Guide to Good Practice* (Paris: ECMT, 1999), p. 7, citing studies in Germany and France. Looking at the issue from a different perspective, the USA's Bureau of Transportation Statistics estimates that "15% of adults in the US have a disability or health problem that makes travel difficult," of which one third were age 65 years or older.

Market and Satisfaction Surveys

Market surveys (which analyze current and potential passengers) and user satisfaction surveys (which analyze what current users think about the quality of service) can also provide important information for transportation and transit planners. Such surveys can help identify problems that passengers and potential passengers face using the transportation system, with special attention to the needs and problems facing people with disabilities (including physical design, pedestrian access, cost, reliability, and safety). Table 3 describes various types of these surveys.

Table 3 **Market and Satisfaction Surveys**

Type of Survey	Key Advantages	Key Disadvantages
Focus groups (a group selected to represent users and potential users) meet to discuss their ability to use transport.	• Cost varies, but can be minimized. • Can help determine how disabled people feel about a service and the barriers they face.	• Can be costly to perform. • May not be representative of all users. • It may be difficult for people with disabilities to attend focus groups.
Public meetings, sponsored by an agency or an NGO, to which disabled persons and/or other user groups are invited to discuss their access to public transport.	• Low cost • May help create a group to advocate for passengers with disabilities.	• May not be as representative as a carefully selected focus group, raising the concern that the views of some users (e.g., those with the greatest need) may not be heard.
On-board surveys.	• Low cost • Effective way to survey riders.	• Unlikely to gather information from non-users.
Passenger complaint, commendation and suggestion system (feedback forms, complaint telephone line, customer service office, etc.).	• Low cost. • Lets user respond directly. • Commendations can be used to reward employees who are particularly helpful.	• Many people (particularly those with disabilities) have difficulty or are shy about writing down complaints. • Agencies may ignore feedback.
Household surveys carried out by trained personnel.	• Can be highly representative if a valid sample of households is included and carefully prepared questions are asked to help quantify issues of transport access.	• Relatively expensive.
Mailed questionnaires (e.g., to a representative sample of persons with disabilities)	• Properly worded questions can produce a wealth of information from those who do reply.	• May require multiple languages and formats (e.g., Braille, large print) • Unsuited to non-readers. • Rate of return may be too low.
Telephone surveys	• Useful in areas where most people have a telephone • Allows for deeper understanding through follow-up questions	• Costly. • Only surveys people who have phones. • Some people with disabilities cannot respond to telephone surveys.

This table describes various ways to collect market and user satisfaction information.

Certain types of complaints apply to transit passengers with disabilities. Such complaints can then be reviewed by special staff and advisory committee. Complaint rates can be tracked over time to identify specific problems and trends, and possible solutions.

- Bus passed up disabled passenger, or did not stop close enough to the curb.
- Operator did not ask priority seats to be vacated for disabled or elderly passenger.
- Wheelchair lift or securements defective.
- Discourtesy by transit agency staff to a disabled passenger.
- Driver did not call out stops or transfers (especially concerning passengers with limited vision)

Developing Performance Indicators

Transportation and transit agencies should establish general performance indicators to evaluate their overall quality of service. Such indicators can be tracked over time, compared with peer communities and agencies, and used to establish and evaluate progress toward performance targets and standards. For guidance on developing such indicators see FWHA and FTA (2002); Kittleson & Associates (2003); Litman (2004); DfT (2004); Litman (2005a). Below are examples of the types of features and impacts that these indicators should evaluate.

- Service coverage, speed, frequency, hours of operation and reliability.
- Passenger convenience, comfort and security while traveling to and from transit stops, waiting at stops, and on transit vehicles.
- Ease of boarding and leaving stations and vehicles.
- Consideration by drivers and other transit staff.
- Fare affordability and payment options (e.g., availability of single fares, fare books and passes).
- Quality of passenger information, including schedules, maps, directional signs, etc.
- Accommodation of baggage.
- Ease and responsiveness to questions, complaints and complements.
- Ridership levels, such as trips and passenger-kilometers per capita.
- User ratings of performance and frequency of complaints.

These indicators can be modified and applied to evaluate service quality for people with disabilities and other special needs. For example, indicators can indicate the portion of transit stops and vehicles that accommodate wheelchair users, and compare service quality (coverage, speed, frequency, hours of operation, etc.) for wheelchair users with the quality of service for able-bodied passengers. Below are some recommendations for developing such indicators.

1. Develop a simple methodology for categorizing people with disabilities and quantifying their numbers. Ideally, an internationally-recognized methodology should be developed by a major international organization, such as the World Bank or the Institute of Transportation Engineers.

2. Develop methodologies to predict transit travel demand by people with various categories of disabilities.

3. Develop a similar methodology to quantify the number of people who would benefit from accessible design and operating features, taking into account benefits to children, women, people carrying baggage, etc.

4. Perform before-and-after studies of inclusive design improvements to help determine the effect they have on ridership and mobility by people with various types of disabilities and vulnerabilities.

5. Establish performance indicators and standards early in the planning process. For example, include them in invitations for transport concessionaires to provide services, and in requests for proposals for supplying transport vehicles or infrastructure.

6. Make performance indicators and audit reports available to the public, for example, posted on a transit agency's website and summarized in annual reports.

Examples Of Inclusive Design and Operation

This section includes examples of inclusive design and operation practices used by various transit agencies. These features and practices can be measured by appropriate indicators, taking into account the needs and abilities of the jurisdiction and organization.

Mobility for the Disabled Poor (Rickert, 2001)

Vehicle and infrastructure design features

- *Vehicle design* should include large print destination signs to assist those with visual impairments; prioritized seats for disabled and elderly passengers; adequate hand grips and vertical stanchions at doors and inside vehicles, use of bright contrasting colors; non-skid step and floor surfaces; and, where feasible, a retractable first step at a bus entrance (or a movable stool) to assist semi-ambulatory passengers.
- *Transit terminals and stations* should have well-located signs with high-contrast large print to assist deaf and visually impaired passengers or with icons to assist passengers who cannot read; a low ticket counter for use by wheelchair users and short persons; tactile guideways, where appropriate, to and within transit terminals and stops, and tactile warning strips at curbs and platform edges to assist blind persons.
- Unpaved *bus stops* could be made more accessible with a short (e.g., 2 meter) yellow curb piece, thus helping blind people to position themselves behind the curb piece, people with visual impairments to see the stop marker, and people with reduced mobility to step up on the curb piece as a way to reduce the distance to the first step of the bus (usually the most difficult step to reach).
- *Pedestrian pathways and buildings* serving the public should incorporate inclusive design (level pathways of adequate width, curb ramps serving wheelchair users and all other pedestrians, ramps to public buildings, accessible bathrooms, etc.), noting that new construction can be made accessible at relatively little cost compared with retrofitting old construction. Village roads, tracks, and paths should be kept free of obstacles and maintained in as accessible a state as possible.
- Provide special features to accommodate *passengers using wheelchairs*, including policies permitting friends to assist a wheelchair user into a vehicle and fold his/her chair, ramped wayside platforms at key sites, low-floor buses or high-floor "Bus Rapid Transit" vehicles with bridges serving all passengers from high platforms, and where necessary, lift-equipped buses.

Operational practices for passengers with disabilities also tend to assist all other passengers.

- Establish regulatory mechanisms to enforce safe vehicle operation by private and informal sector transit operators, and establish positive and negative incentives to encourage safety and courtesy to passengers
- Provide sensitivity training to transit personnel (including bus drivers and fare collectors) concerning the needs of disadvantaged riders.
- Require that buses and jitneys come to a complete stop at bus stops and remain stopped until passengers have entered and positioned themselves for their ride
- Require drivers to call out key stops and require audible announcements at transit terminals, as an aid to passengers who are blind or partially sighted
- Disaggregate data on bus accidents where possible, to gain information on their type (e.g., injuries while trying to board a moving vehicle, while crossing traffic lanes to get to a vehicle, while on-board due to aggressive driving, etc.) and victims (children, elders, people with various types of disabilities, etc.).
- Accommodate and encourage employment of women as bus drivers.
- Avoid paying drivers "per passenger," to remove the incentive for unsafe operation.

Examples Of Indicators Used In A Large-City, Door-to-Door System

Over the past 25 years, San Francisco, California, has developed a door-to-door system that provides over a million trips per year to nearly 12,000 active riders. This is an example of a large door-to-door service system in a large urban area. The following information is collected for performance evaluation.

Table 4 **Paratransit Service Performance Indicators**

Indicator category	Examples of data collected
Service level data	- total trips by mode (e.g., lift-equipped vans, group vans, regular taxis, ramped taxis) and by company, collected monthly - group van data, includes total trips for each social service agency receiving service. - total weekday and weekend trip data
Efficiency data	- "no show" trips by mode and company, in absolute numbers and as a % of total trips, to evaluate how to reduce the number of trips cancelled upon arrival of vehicle. - revenue miles and hours per month, by mode - passengers per revenue vehicle mile and hour - revenue vehicle miles per revenue vehicle hour
Reliability data	- on time performance by mode – lift van, group van, taxi, and missed trips - on time performance by window (on time, 15-30 minutes late, 31-59 minutes late, & 60+ minutes late) - complaints, by type, per month (late, missed trip, incident, reservation, dispatch, etc.) - compliments, by mode, per month
Rider certification data	- total riders in database - total active riders - total active riders by mode - total certifications completed - total recertifications completed - total certified riders with full eligibility - total certified riders with conditional eligibility - total denials of eligibility - total appeals of denials of eligibility - total second-level assessments (by professionals, by in-person interviews, via telephone interviews)
Financial data	- costs, by mode, of broker supervising participating companies providing door-to-door service - cost per passenger trip - total fares collected - average fare per passenger - ratio of passenger fares collected to total service cost

This table summarizes information collected for performance evaluation by a large paratransit system.

Examples Of Indicators Used In A Large Multi-Modal System

Table 5 summarizes indicators used to evaluate performance by the public transportation agency in San Francisco, California. This agency offers a variety of service modes, including rail, express bus, and local bus.

Table 5 **Large, Multi-Modal Transit System Performance Indicators**

Category	Indicators for Fixed-Route Transit (bus, trolley coach and rail)	Comments on indicators relative to inclusivity
System Reliability (partial listing only)	• on time performance • passups due to overcrowding (no following vehicle within 3 minutes) • peak period passenger load factor • headway adherence	The four indicators at left are especially important for disabled passengers who may have difficulty standing and waiting at bus stops, or traveling on an over-crowded vehicle. In addition: • Designated staff conduct monthly inspection of a sample of vehicles to verify that maintenance staff have maintained wheelchair lifts, securements, and other access features at designated levels.
System Performance	• passengers carried by mode • fare revenues generated by mode • hours & miles operated by mode	
Staffing Performance	• expenses incurred by mode • vacancy rate • staff attrition	
Customer Service	• marketing plan developed • complaint resolution • operator training • crime incidents • schedules published • annual passenger survey • improve passenger information • accident reduction	• A special brochure for disabled passengers is periodically updated and distributed • Monitors all complaints, including those by passengers with disabilities • A sample of operators is requested by designated staff to operate wheelchair lift in revenue service to verify proper training (monthly) • While the indicators at left monitor service for all passengers, women and passengers with disabilities are especially assisted by measures to reduce crime incidents and to reduce on-board accidents.
Employee satisfaction	• employee education & training opportunities • security, health, & safety training • average years of service, by job category	Well-motivated employees are more likely to provide courteous service to all passengers, including those with disabilities.

This table summarizes indicators used to evaluate performance by transit agencies in a large urban area that offer a variety of services. Many of these indicators can be applied to evaluate service quality for people with disabilities and other special needs.

Examples Of Indicators Used In A Large Commuter Rail System

Table 6 summarizes performance indicators used by the Bay Area Rapid Transit (BART) system in California. These indicators are taken from BART's quarterly Passenger Environment Survey (PES).

Table 6 **Commuter Rail Performance Indicators**

Category	Indicators
Safety (includes aspects which affect perceptions of safety)	- police personnel observed in stations - police personnel observed in parking lots/garages - police personnel observed on trains - station cleanliness - parking lot cleanliness - graffiti indicators (interior, exterior) - train cleanliness
Accessibility	- restroom cleanliness - elevator cleanliness - brochures in kiosks - agent availability - agent in uniform (or with name badge) - arrival announcements - transfer announcements - destination announcements ("one observation per train car while traveling between two adjacent stations") - temperature on train
Reliability	- % time elevator in service throughout quarter (continuous monitoring) (and posting of out of service elevators to forewarn passengers, and provision of alternative transport (where possible). - train on-time performance - customer on-time performance (arrive within 5 minutes of published schedule) - elevator availability (escalator to street)(to platform) - fare gate availability - ticket vending machines availability

This table summarizes indicators used to evaluate performance by the Bay Area Rapid Transit (BART) transit system. Many of these indicators can be applied to evaluate service quality for people with disabilities and other special needs.

References and Information Resources

Access Board (www.access-board.gov) is a U.S. federal agency that develops guidelines and standards for accessible design.

Accessibility Program (www.marh.gov.bc.ca/ACCESS) provides practical information on universal design, and provides useful publications.

Adoptive Environments Center (www.adaptenv.org) provides resources for universal design.

Access Exchange International (www.globalride-sf.org) is a non-profit organization that promotes cost-effective access to public transportation for disabled persons in developing countries.

Access Management Publications, U.S. National Transportation Library (www.bts.gov/ntl/subjects/access.html), provides a variety of publication concerning universal access.

Barter, Rahman Paul and Tamim Raad (2000), *Taking Steps: A Community Action Guide to People-Centered, Equitable and Sustainable Urban Transport*, Sustainable Transport Action Network for Asia and the Pacific (www.geocities.com/sustrannet).

Center for Universal Design at NC State University (www.design.ncsu.edu/cud) is a national research, information, and technical assistance center that evaluates, develops, and promotes universal design in housing, public and commercial facilities, and related products.

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