

ÉVALUATION DES MESURES DE PERFORMANCE DES TRANSPORTS URBAINS

EVALUATION OF TRANSPORT PERFORMANCE MEASURES FOR CITIES

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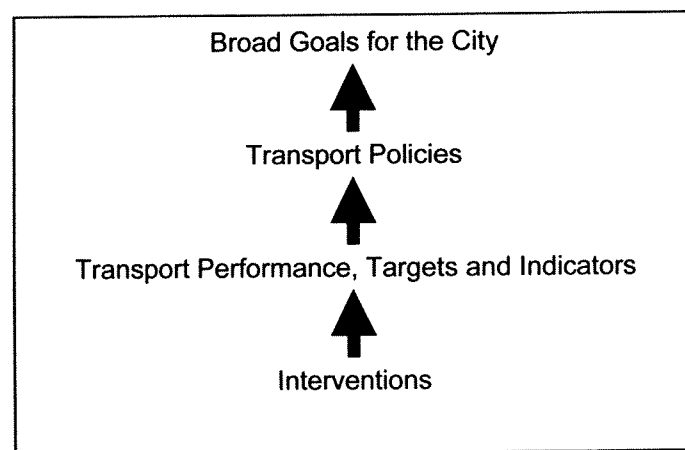
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EXECUTIVE SUMMARY

In today's cities, quality roads and transport systems can help achieve a better quality of life. Managers of transport organizations need to make decisions that contribute to city objectives that are broader than just transportation efficiency. Transport organizations face increasing challenges in meeting public expectations and to become more efficient and accountable for their actions. There is an increasing awareness that there are linkages between transport and other public policy domains: safety, the environment, the economy, social equity and mobility. Ideally, transport objectives reflect those linkages; are measurable so that transport performance can be evaluated; and assist in achieving city, regional and national policy goals.

Transport performance is assessed in numerous world cities, but there is no coherent body of knowledge about how transport contributes to broader city goals. Consequently, the members of Sub-Group 4: Measurement and Monitoring of Quality, of the Technical Committee on Urban Areas and Integrated Urban Transport (C10, PIARC), reviewed available literature and the experiences of the members themselves. Subsequently, Sub-Group 4 undertook a questionnaire survey of selected world cities in 2001/02. The purpose of the survey was to assess the strength of the alignment between:



The following is a summary of survey results, and Sub-Group 4 conclusions and recommendations. An overview of a literature survey, the questionnaire survey instrument and brief Case Studies for each responding city are in the appendices.

Survey Results

Eighteen cities located in Europe, Asia, Australia/Oceania and North America responded to the questionnaire survey. In most cases, respondents did not or could not respond to some of the questions. While the survey provided compelling insights, caution must be used when interpreting the responses because of the differences in perspectives and responsibilities of the organizations that prepared the responses.

Settings

Seven cities have populations of one million or less, while six have populations of more than two million. Five respondents reported recent metropolitan area growth rates in excess of one percent per year, while three have experienced losses. None expect significant changes in recent population growth rates over the next five to ten years. Population densities range from 580 to about 4,000 persons per square kilometer. Automobile ownership ranges from about 300 to more than 600 per 1,000 persons.

Transport responsibilities vary by mode, and to a lesser extent, by the phases of the planning, delivery and operation process. In many cases, these responsibilities are shared with other levels of government or other entities. Multiple ownership of the road system – usually corresponding to the national/regional/local function of individual roads – means that different elements of the network are managed and funded by different levels of government. Rail and port transport are generally not the responsibility of city agencies. However, in most instances cities manage or oversee and fund most mass transit and non-motorized transport.

There are clear objectives for land use/housing, economic development and the environment in most cities. However, no more than four of the respondents reported that their organization has significant influence over those objectives. Most reported “some” influence, which is a recognition that transport is but one – albeit important – component of urban society.

Policy Framework

The responding cities have a wide range of goals that address the economic, environmental, social and safety aspirations of their citizens. One of the primary purposes of this research was to consider how transport organizations determine the extent to which they are meeting public policy objectives for the transport system and how those policy objectives meet broader city goals.

Respondents reported a number of transport objectives for five major issue areas. However, only a few transport objectives were measurable, such as “a 30% reduction of the number of accidents with injuries and fatalities.” The following table is a summary of issues deemed most significant and the total number of measurable objectives reported by the 18 respondents.

Significance of Urban Policy Issues and Reported Measurable Objectives (All Respondents)		
Issue Area	Most Significant Issues	Measurable Objectives
Safety	<ul style="list-style-type: none"> ▪ Transport fatalities ▪ Transport injuries 	Five
Environment	<ul style="list-style-type: none"> ▪ Air quality ▪ General indicators (population growth, traffic volumes, etc.) ▪ Climate change 	One
Economy	<ul style="list-style-type: none"> ▪ Business attraction and growth ▪ Access to markets ▪ Employment 	One
Social Equity	<ul style="list-style-type: none"> ▪ Access by the disadvantaged 	None
Mobility	<ul style="list-style-type: none"> ▪ Accessibility ▪ Modal share ▪ Delay ▪ Quantity of travel ▪ Average speed 	Eight

Data and Technical Support for Decision Making

Transport policy objectives and related performance measures can play a critical role in setting policy, allocating resources and reporting on the results of transport programs and projects. Responding cities reported few examples of how such objectives and measures are used in decision making at system, corridor and project levels.

Respondents reported that many performance measures and a substantial variety of data are collected. Thirteen respondents provided detailed information on indicators of performance, outputs based on assessments of the indicators and the consequences of transport services. The most prominent measures are for safety (injuries and fatalities), the environment (vehicle-related emissions), the economy (employment and business attraction and growth), and mobility (accessibility, modal share, quantity of travel, delay, and average speed).

Conclusions and Recommendations

In today's cities, transport organizations responsible for moving people and goods face new and increasing challenges. These organizations also obtain, and use, a wealth of data and measures in carrying out their responsibilities. However, based upon the responses of the cities that participated in this research, there appears to be an absence of measurable policy objectives for which these or other data and measures could be used to determine if and how the goals of the city and transport agency are actually being met. If this is the case, then current transport policies in those cities are not being clearly supported by the data and measures that are currently available.

If these research results are indicative of practices in other world cities, it appears that significant changes are needed in:

- the articulation of measurable, realistic transport policies that support city goals;
- the identification of performance measures and associated data for those policies that can be used to make informed investment decisions; and
- the involvement of citizens and stakeholders in formulating the policies and assessing the results.

This will not be an easy task for many transport organizations. They must take into account planning and data collection budget realities, organizational competencies, and the extent to which decision makers accept a performance-driven approach. Incremental approaches to improving the linkage between policy objectives and performance-driven decision making may be necessary.

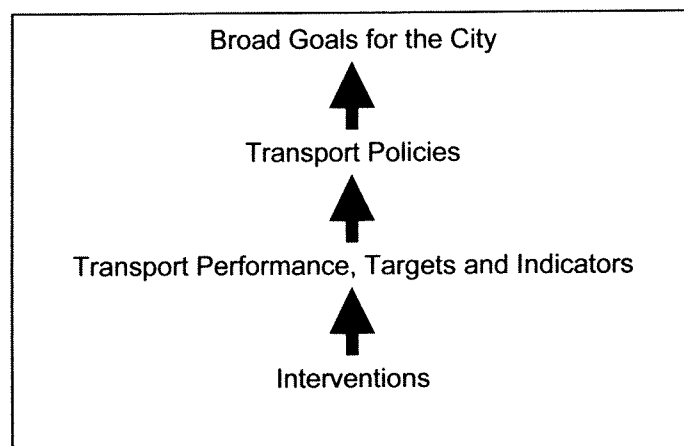
Additional research on the appropriate linkage between city aspirations and transport performance is needed to assist transport agencies in fulfilling their expanding role. This research study – limited by time and resources – is a starting point for discussions and a basis for further work.

1. INTRODUCTION

The goal of PIARC's Strategic Theme 2 – Road Transport, Livability and Sustainable Development – is to “encourage the development of road transport policies and programmes that take full account of the need for integration with other transport modes and result in beneficial community outcomes in economic, environmental and social terms.” The unifying objective of C10 – the Committee on Urban Areas and Integrated Urban Transport – is the achievement of viable and sustainable transport systems in a manner that reduces negative impacts of roads on the quality of life in urban areas. Within C10, four projects were undertaken:

- sharing the Main Street by Sub-Group 1;
- land Use and Transport Policies in Urban Areas by Sub-Group 2;
- transport Interchanges and Urban Development by Sub-Group 3; and
- measurement and Monitoring of Quality by Sub-Group 4.

Accordingly, the focus of the work in this project by Sub-Group 4 of C10 is “Measurement and Monitoring of Quality.” The project sought to go beyond the usual technical or physical assessments and attempted to address the strength of alignment between:



The project took into account the knowledge of members, available literature, a comprehensive international survey and some initial workshops to test the work to date. Members of the Committee were aware of numerous examples worldwide where transport performance was being assessed, but there was not a coherent body of information about how city objectives are established and, how transport contributes to the broader objectives for the city. Any comparison across the world of the performance of transport in cities would be of limited value and have a substantial cultural bias unless some attempt to align with goals for the city was achieved.

1.1. Importance of Measuring Transport Performance

The roles of government and transport agencies are changing, necessitating change in the ways transport performance is measured. The emphasis is shifting from emphasis on performance of the transport system itself to its contributions to the performance of the city.

1.1.1. Government Culture

Government at all levels throughout the world is experiencing rapid change. This change is apparent in the changing roles of government, its relationship with the public, and the way in which effectiveness is assessed. The customers of government, the public at large, expect more today from the public sector than they ever have. They expect to be involved, informed, and heard. They expect government to be coordinated across its policy areas, and as a result, government must become more accountable. It is this need to be accountable that drives the development and use of performance measurement tools.

Roads and transport systems are an essential part of economic growth, regional development and equitable access. Transport decisions need to be made in a way that plan and provide for the needs of future generations, while minimizing the impact on renewable resources. Transport infrastructure decisions have long-term effects. Accordingly, the positive contributions as well as the costs need to be assessed on their impacts now and in the future.

The expanding role of the private sector in the delivery of government services requires government to be more efficient, effective and customer oriented to survive in a competitive world. As a result, government attempts to be more responsive to the public and adopts strategic management performance. This approach to managing government includes performance monitoring, which allows for service delivery to be tied to policy objectives and decision-making.

1.1.2. The Role of Roads and Transport

Roads and transport agencies recognize the linkages between transport and other policy domains such as the economy, safety, environment and social objectives. For example, it has become clear that transportation has a role in improving the economy of a region, state or nation, especially as it relates to freight and goods movement. Improving road transport access substantially improves the size of markets. This increases competition, but also increases access to employment for workforces. Road transport thus plays a shared role in meeting broader societal goals. Roads are the basic form of transport on which economic growth, reduction in poverty and reduction in costs of getting goods to markets depend.

1.1.3. Broader Economic Development Role

Leaders are also increasingly concerned about finding the most effective uses of scarce resources in an era when many transport funding needs are not being met. In urban areas government will determine the type of city wanted, the role of transport and the contribution from roads and other modes.

Performance measurement has played a role in government for quite some time; however, the latest demand is for measures of outcome, not just effort. These measures allow for monitoring of effectiveness in the delivery of transportation services, especially when they are linked to a mission driven planning system with measurable objectives. The new philosophy is driven by the need for quality that can be demonstrated to the customer. The question is less how well does the road or rail system performs in its own right, but more how it contributes to the performance of the city.

1.2. Why Undertake Performance Measurement

Managing against desired performance should improve:

- accountability to the public;
- efficiency by staying focused an intended result;
- effectiveness by being aware of whether a promised outcome is being achieved;
- communication with internal and external customers by using effective tools to relay results; and
- organizational efficiency by monitoring the results and refining various activities.

Measurement of performance in the areas of safety, environment, economy, and social outputs is thus critical to the success of a transportation agency.

1.2.1. Uses of Performance Measures

Performance measurement in transportation can be used in three major ways: to set policy, allocate resources, and report on results. The challenge facing transport is the need to identify clear and long term objectives for the city – often determined outside the control of transport planners – and ensure that transport policies and plans make the optimal contribution. The following are examples of how they can be used in practice:

- serve as an integral part of the long range planning process by feeding back into the policy decision making process, thereby improving long range investment decisions;
- integrate transport policies with other concerns such as quality of life, economic impacts and environment concerns;
- provide annual performance reports on system conditions;
- screen and program transportation projects and therefore guide resource allocation; and
- perform system, corridor and project level analysis and before/after analysis of transportation improvements.

In other words, performance needs to be assessed in different ways at system, policy, project levels.

1.2.2. Linking Measurement to Policy

Measurement of performance or quality of service provides a government agency with an understanding of the impacts of their policies related to desired results. In return, the knowledge of the outcomes, when compared to goals and objectives, allows an agency to adjust policy accordingly and better meet customer expectations. This continuous cycle should be the guiding policy model of any government agency.

The focus on objectives for the city differentiates the work of the C10 team from much earlier work. A typical cycle includes:

1. establishing government/customer/community expectations,
2. developing guiding policies, goals and objectives related to safety, the environment, the economy, and social equity,
3. making investment decisions based on steps 1 and 2,
4. executing projects generated in step 3,
5. collecting data and measuring impacts,
6. comparing actual and desired results,
7. revising policies, goals or even expectations.

It is expected that the continuous cycle includes constant customer outreach and feedback mechanisms. The cycle can be applied at a system, corridor or project level yet respondents reported few instances where this occurs now (see Section III.3.1. Overall Assessment).

The process of measuring transport performance includes:

1. collecting data (e.g. traffic volumes, speeds),
2. determining outputs of investments (e.g. number of miles added to road system),
3. assessing the outcome (e.g. delay, travel time, reliability of a trip). The outcomes should be related directly to the goals of the agency and are the consequences for the public of policy and investment decisions.

However, this assumes a very tight alignment between desired transport performance and broader objectives of the city and feedback on this must be an essential element of management. The link between steps 5 and 7 is critical to the success of this model. The actual application of the link between data collection/measurement of performance and policy/investment decisions is one that needs further study in the real world of government operations.

1.2.3. Benefits of Performance Measurement

Benefits derived from performance measurement includes improved decision making and connection to agency planning and management strategy, as well as improved capability to report to and be accountable to the public.

2. METHODOLOGY

The work of Sub-Group 4 attempted to obtain a reliable picture of countries in different parts of the world – with different cultures, languages and states of development. A conscious effort was made to include cities beyond the Western and European countries that have the most active roles in PIARC. The adopted methodology needed to add to the body of technical knowledge available while specifically addressing the difficult policy choices that cities are making. The aim of Sub-Group 4 was to:

- reduce or remove cultural bias and not unduly reflect Western and European types of cities;
- build on work already done;
- utilize the wealth of experience available within C10 and in particular the sub-group;
- provide the maximum opportunity for PIARC members to contribute, whether or not on C10.

The Committee first met in March 2000 and agreed its role and expectations. The experience of many nations was added in subsequent meetings and correspondence. The approach included:

- i. Review of work by C10 in the past and experience of individual members;
- ii. Literature survey;
- iii. Detailed survey of major cities
 - a. Developing and piloting a questionnaire;
 - b. Administration of the questionnaire and personal follow up, with assistance by a Committee member;
 - c. Summary and case study of each respondent; and
 - d. Testing the summary with the respondent;
- iv. Discussion of common issues with C14;
- v. Preparation of draft report;
- vi. Testing the findings/material at workshops, including Budapest in November 2002;
- vii. Article for Routes/Roads; and
- viii. Seminar at World Congress in Durban.

2.1. Methodology for Literature Review

As part of the current work of this PIARC Committee, literature research was undertaken to obtain an indicative insight into how transport policy and investment affects the economic, social and environmental issues in various cities throughout the world. The research was undertaken in stages. The objectives of the literature overview were as follows:

- to provide an assembled database of relevant literature on transportation key indicators;
- to provide an initial view on whether further data collection (including surveys) may be required and if so what new data were to be collected; and
- to contribute to a better understanding of the significance of transportation key indicators relative to transport policies formulation and transport investment decisions.

The sources of data for the literature overview work were from available data published on the worldwide internet. The key words used in the internet searches were: transport, accessibility, mobility, environment, security, economy, performance and indicators. Based on professional judgment, the internet literature deemed as relevant to this research was selectively extracted from the internet for further examination. The examination of the relevant internet data was undertaken at a “strategic overview level” and “case specific level” for developed and other countries including transitional (i.e., former Eastern Bloc countries) and developing countries

The “strategic overview level” examination focused on the abstracts of various relevant performance indicator reports, without going into the details of the indicators. At the “case specific level” of examination, descriptions of the key performance indicators used in selected cities are presented. The extent of the literature overview at strategic overview and case specific levels was governed by the availability of the quality and details of the information on the internet. At this stage, there was no direct contact with authors of the internet information. The literature overview was undertaken using internet data published in English, German and Japanese languages. The concluding remarks drawn from the findings of this literature overview help to set and focus the tasks for the next stage in the research work.

There were only limited references in the literature to comprehensive assessment of the links between city objectives, transport objectives and assessment of performance and response.

2.2. Survey of Cities

A survey was developed to seek two different types of material:

- Clarity of objectives for the city and clarity of alignment of what was expected of transport and how performance would be assessed; and
- More detailed and mainly technical information on performance.

The survey was piloted in Australia in Brisbane and Sydney. Based on their excellent feedback, the survey was modified and administered to 18 cities worldwide. The Committee specifically wanted a very broad representation of:

- Developed, developing and transition countries;
- Different continents;
- Different languages; and
- Different cultures.

Sub-Group 4 identified a range of cities and likely contacts. When it became apparent that the response from Africa, South America and Spanish speaking countries in general would be low, members of Sub-Group 4:

- Wrote to first delegates;
- Contacted known contacts; and
- Refocused the proposed work of our committee for 2003 on testing our conclusions, including workshops in these areas.

2.3. Observations on Methodology

The pilot survey was completed by two Australian cities well known, and from a similar background, to the originator of the survey. In the initial pass to other cities, there was some different interpretation of terms and difficulty in completing responses to some questions. When respondents in these cities were provided an example of a completed survey, the response rate and reliability improved.

In some cases, the survey results were provided from the perspective of national and state respondents and in others by a city. This required re-interpretation of some responses.

The structure of the survey provided for senior policy managers to complete the first part, with more detailed information to be completed by technical staff. Where this was not fully understood, the survey was seen as complex. This separation is still seen by the Committee as a strength of the process.

The outcome of the survey was a very comprehensive report and valuable detail on a number of major cities. A limitation has been the absence of adequate representation from Africa, South America, South East Asia and transition countries. It is considered that this is also reflected more generally in PIARC's work and is a continuing issue.

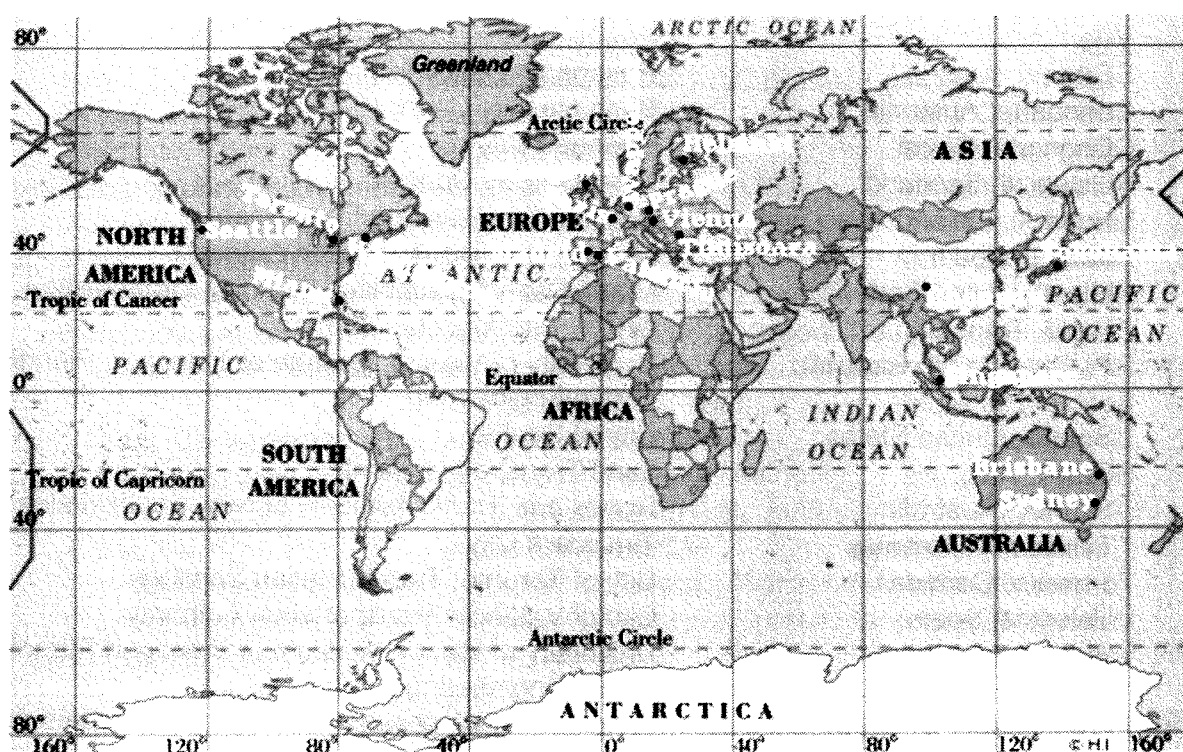
For the future, this may be addressed by more focused attention on completing a first pass of the initial work in about two years, including visiting and testing in a sample of these countries with a specific focus on relevance to them. The final report would reflect these processes.

3. SURVEY RESULTS

The results of the survey are organized into three types of information, similar to the organization of the survey document. They are:

- settings – background data about population, land area, vehicle ownership and the total transport system, with information on authority and management responsibilities and governance arrangements;
- policy framework – key objectives for the city and transport's contribution, with specific focus on five issue areas: safety, the environment, the economy, equity and mobility; and
- data and technical support for decision-making – key data and factors collected in the cities that relate to the five issue areas and that are used to assist in decision making.

Cities in developed and developing countries were invited to participate in the survey. Responses were obtained from 18 cities located in Europe, Asia, Australia/Oceania and North America. They are shown on the map below.



The following is a summary of the responses received by the Committee. While there was significant feedback, respondents did not or could not respond to some of the questions. As a result, the universe of responses to each question varies. For each question or issue area, the references to "respondents" are for those who responded to the specific question or issue area, and not to all 18 cities. Responses unique to one or a few cities are attributed to those cities.

3.1. Settings

In order to examine how transport policies and performance measures affect transport decisions, it is helpful to understand the demographics, modal responsibilities and overall government objectives that are supported by transport objectives in cities and regions. This section of the report, therefore, examines the settings in which transport decisions are made.

The responding cities represent a wide range of population size, densities, vehicle ownership and transport system characteristics. Responsibilities for the various modes of transport and intergovernmental relationships vary widely. There is somewhat less variation in the extent to which responding agencies influence the broad range of city objectives.

Caution must be used when interpreting the responses from the 18 cities because of the differences in perspectives and responsibilities of the organizations that prepared the responses. Some of the responding organizations are parts of state or national governments, while others operate within municipal governments or councils. The responses reflect the perspective of the varying city and metropolitan organizations that participated in the survey. They were:

<u>City</u>	<u>Responding Organization</u>
Brisbane, Australia	Brisbane City Council
Chengdu, China	Chengdu City
Glasgow, Scotland	Glasgow City Council
Helsinki, Finland	Helsinki City Planning Department
Madrid, Spain	Metropolitan Transportation Authority
Miami, United States	Miami-Dade Metropolitan Planning Organization
Paris, France	DREIF (Metropolitan Authority)
Prague, Czech Republic	University of Vienna, Institute of Transport Planning and Traffic Engineering
Seattle, United States	City of Seattle
Singapore	Land Transport Authority
Sydney, Australia	Roads and Traffic Authority of New South Wales
Timisoara, Romania	Timisoara City
Toronto, Canada	City of Toronto, Transportation Services
Valencia, Spain	City of Valencia Transportation Authority
Vienna, Austria	University of Vienna, Institute of Transport Planning and Traffic Engineering
Washington, D. C., United States	Metropolitan Washington Council of Governments
Wuppertal, Germany	Wuppertal City
Yokohama, Japan	Yokohama City

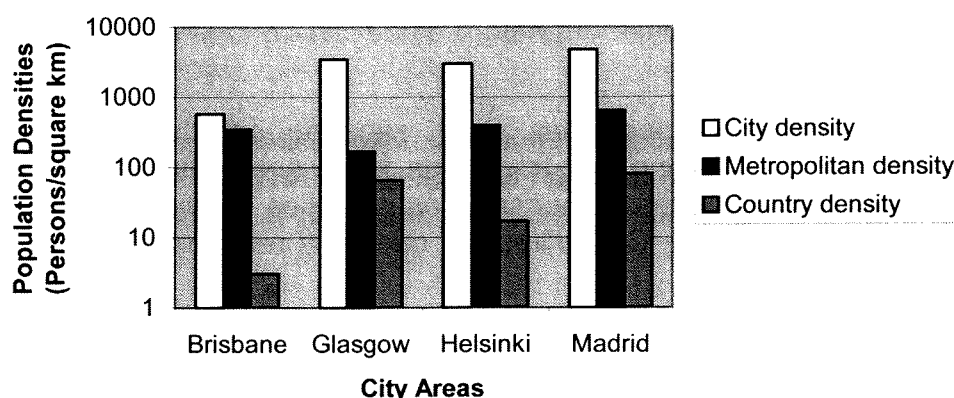
3.1.1. Demographic and Socioeconomic Characteristics

The responding cities range in size from less than 400,000 people (Miami) to over four million (Sydney). Seven cities have populations of one million or less, while six have populations of more than two million. This represents a good dispersion of respondents by city size.

Five respondents report recent metropolitan area growth rates in excess of one percent per year, led by Brisbane and Paris. Glasgow, Prague and Wuppertal have been experiencing losses. None of the cities expect significant changes in recent population growth rates over the next five to ten years.

Five of the cities have land areas of less than 200 square kilometers, while four others contain 400-600 square kilometers. Population densities reflect the urban nature of the responding cities: six cities reported densities of more than 3,000 persons per square kilometer; Brisbane has the lowest reported density (580). As expected, population densities are much higher in the cities than in their corresponding metropolitan areas and country. The following are examples.

Comparison of Selected Population Densities



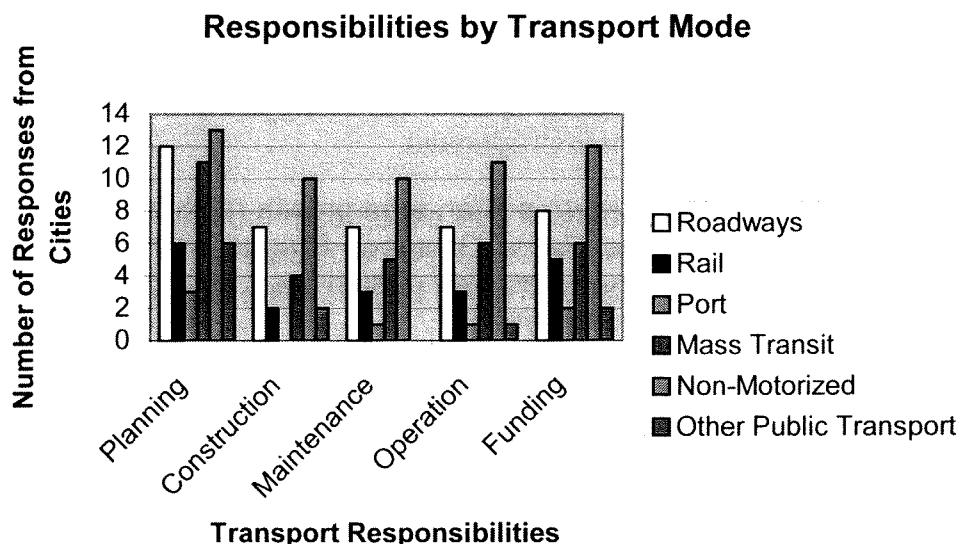
In each case, automobile ownership is higher in the nation than in the responding city. Passenger automobiles per 1,000 persons ranges from about 300 (Glasgow, Yokohama and Helsinki) to more than 500 (Toronto, Wuppertal and Valencia).

3.1.2. Transport Modes and Responsibilities

The responding cities contain a rich array of transport modes: road network, rail, mass transit and non-motorized transport. Only Chengdu, Madrid, Washington and Wuppertal reported not having a port.

Responsibilities

Transport responsibilities vary by mode, and to a lesser extent, by the phases of the planning, delivery and operation process. In many cases, these responsibilities are shared with other levels of government or other entities. This is discussed in more detail in the following section on Governance Arrangements. Reported responsibilities are:



- Roadways – All responding cities except Prague, Vienna, Wuppertal and Yokohama have at least some responsibilities for highways and major arterial roadways. Almost two-thirds of those have responsibility for road construction, maintenance, operations and at least some funding.
- Rail – About half of those responding have planning responsibilities for rail. Singapore and Yokohama reported at least partial responsibility for rail construction, maintenance and operations. Five cities have some responsibility for funding rail services.
- Ports – Three respondents have planning responsibilities for ports. None reported responsibility for port construction. Yokohama is the only city that reported responsibility for maintenance and operations of ports. Yokohama and Paris are responsible for at least some funding.
- Mass Transit (Buses) – Almost all respondents have responsibilities for planning for mass transit (buses). Four cities are responsible for construction and six reported responsibilities for maintenance and operations. Six cities reported some responsibility for funding.
- Non-Motorized Transport – All respondents except Chengdu, Madrid and Yokohama have planning responsibilities for non-motorized transport modes (e.g., cycling and walking). At least three-fourths are responsible for maintenance, operation and funding of non-motorized facilities.
- Other Public Transport – Six cities reported planning responsibilities for other public transport services (taxis, jitneys, etc.). Brisbane and Singapore reported responsibilities for at least some construction or operations. Brisbane and Paris reported some funding responsibility.

Areas of Special Interest

The Committee solicited additional information on ports and mass transit systems. In addition, respondents were encouraged to elaborate on the scope of transport in their metropolitan area. The following are highlights of selected responses.

- Ports – Yokohama recognizes that its port is an international gateway. It accounts for the largest cargo volumes in Japan and performs a major distribution function within the Tokyo metropolitan area. The port influences the implementation plan for the entire metropolitan area.
- Mass Transit Systems – Bus systems coexist with rail passenger and subway systems in several of the responding cities. Valencia, Vienna and Yokohama report robust systems with deep penetrations in the passenger markets. A massive nationwide privatization of bus services since the late 1980s has significantly affected Glasgow; the city itself now provides only services deemed socially necessary and not provided commercially. Brisbane is unique in Australia because it is the only local government directly providing bus services for the metropolitan area; all other cities including Sydney have state owned or privatized bus services. Bus service in Chengdu is comparatively low and captures a 10 percent modal share; cycling has a 50 percent share.
- Scope of Transport in the Metropolitan Area – Road and motorway networks in Paris have a very high quality, but peak hour congestion is a concern. The public transport system also reaches a very high level and is the primary mode within Paris and for access to it. The subway system in Madrid has been significantly expanded since 1995, from 115 kilometers to 227 kilometers. The Washington area is complex: roads are owned by the District of Columbia, two states and local governments; an authority owns a regional rail and bus system; there are six other local government bus systems; and commuter rail is managed by three separate entities.

3.1.3. Governance Arrangements

There are significant differences in governance responsibilities in the responding cities. In Singapore, there is only one level of government. Local governments have at least shared responsibility for addressing urban issues in all other cities except Yokohama, where Prefectures (equivalent to states and cities) have the responsibility. Regional or State governments have responsibilities in most cities as well. National governments have responsibilities in less than half of the cities. In the United States cities, the Federal Government provides substantial transport funding, but is not involved in day-to-day urban governance issues.

Governmental Responsibilities for Urban Issues (Number of Responses)		
<u>Level of Government</u>	<u>Yes</u>	<u>No</u>
National	5-7*	7
Regional/State	11-13*	2
Local	14-15*	1

* Range is for cities where there is only one level of government or a level of government manages issues on a case-by-case basis.

In Madrid, Paris, and Wuppertal all three levels of government have responsibilities. This contrasts markedly with Chengdu, Toronto, and Timisoara where the local government has all responsibilities.

Most cities reported relatively complex processes for interactions and cooperation between the various levels of government. Planning responsibilities appear to be well-defined in most cities, such as in Paris, Glasgow, Miami and Toronto. The funding of projects and services often involves more than one level of government, depending on the nature of the project or service. Madrid, Paris, Toronto and Vienna reported such relationships.

Allocation of Transport Responsibilities

Transport responsibilities are shared by at least two of the three levels of government in all cities except Chengdu (and Singapore, where there is only one level). In many cases, the responsibilities vary by mode or by a road system hierarchy. For example, in Vienna the national government is responsible for motorways, railways, regional buses and suburban trains, while the City of Vienna is responsible for buses, trams and rail rapid transit.

Higher level roads are the sole responsibility of the national government in Prague, Vienna, and Yokohama. In Australia, while national highways are controlled by state governments, the funding for planning, construction and maintenance on these roads is the responsibility of the commonwealth government. Provincial level highways are the responsibility of the Province of Ontario in Toronto. Almost all responding cities share responsibilities for roads and public transport.

Contribution of Transport to City Goals

Transport infrastructure is seen as essential in helping meet city goals for urban development, economic development and quality of life. The primary emphasis of the responses from Brisbane, Chengdu, Madrid, Singapore, Sydney, Valencia and Vienna was on the importance of viable public transport to help meet land use, economic, social and environmental goals.

Allocation of Transport Funding

Roadways – Funding for roadway planning, construction, maintenance and operations is allocated by the owner of the road in almost all cases. Generally, national governments fund or subsidize “major” (variously referred to as trunk roads, main roads, motorways and perimetral highways). State and regional governments generally fund state and regional roads. Local (e.g., city or municipal) streets are typically funded by local governments. Reported exceptions include Toronto in which the City Council is responsible for all roads and Singapore where road funding is from the National Ministry of Finance.

Rail – Rail planning and construction funding is more varied. In Glasgow, most rail assets have been privatized, with some governmental financial support. However, most of the responses can be characterized as follows:

- national funding – Madrid, Prague, Timisoara, Vienna and in the United States (AMTRAK service in Miami, Seattle and Washington),
- national subsidies – Madrid, Miami, Seattle, Sydney, Yokohama, and Washington,
- state funding/subsidies – Brisbane, Miami, Sydney,
- shared regional/local funding – Helsinki, Valencia.

Funding for rail maintenance and operations is allocated similarly to funding for planning and construction, with the exception that private operators have responsibility for maintenance and operations in Yokohama and for operations in Singapore.

Ports – Funding allocations and sources for ports are almost identical for all planning, construction, maintenance and operations activities. Reported responsible entities are:

- the city – Helsinki, Prague, Vienna, Yokohama,
- local/regional authority – Glasgow, Miami (primary),
- state – Brisbane, Miami (part), Sydney,
- national – Valencia.

Mass Transit – Five cities reported that funding for mass transit planning and construction was shared by the Region and the City. Mass transit is funded primarily by the state in Sydney, and by the state and the City Council in Brisbane. National subsidies for planning, construction and operations are provided to Miami, Seattle and Washington. National subsidies are available in Yokohama for new systems and private operators provide funding for bus facilities. Singapore receives funding from the National Ministry of Finance and the private sector (for transit stands and stops).

As with rail, private operators play a larger role in funding maintenance and operations of mass transit in some cities. Glasgow, Paris, Singapore, Valencia and Yokohama all reported varying degrees of private sector funding responsibilities.

Funding for planning, construction and maintenance of taxi stands and stops in Singapore is provided by the National Ministry of Finance. Funding for operations is the responsibility of the operators.

Non-Motorized Transport – Funding for planning, construction, maintenance and operations of non-motorized transport (primarily bicycle and pedestrian facilities and services) is primarily a responsibility of cities. Helsinki and Sydney receive assistance from the State. Paris may receive funding assistance from the region, or even the national government, depending on the project and its objectives.

Disposition of Transport Fares

In most of the responding cities, fares collected for the use of transport remain with the provider to operate and improve the provider's system. In Chengdu, taxi fares are used to subsidize bus transport and to construct infrastructure.

3.1.4. City Objectives That Affect Transport Service Delivery

Transport agencies work within a complex urban fabric and transport is used to meet many needs. Respondents were asked to describe city objectives in the areas of land use/housing, economic development and the environment. In addition, they were asked how much influence the responding organizations had on the objectives.

- **Land Use/Housing** – Almost all respondents believe that there are clear objectives for land use and housing in their cities, providing guidance to the provision of transport services. Specific themes related to reducing vehicle kilometers, reducing urban sprawl and increasing the use of public transport were cited by Brisbane, Chengdu, Sydney, Prague and Vienna. Paris reported regional goals for (1) multi-polar development and (2) social solidarity. Sydney pointed out that objectives to reduce vehicle kilometers may conflict with governmental approvals of urban development at its fringe. Almost half of the respondents reported that they had “some” influence on these objectives; two reported that they had none. Glasgow, Helsinki and Madrid respondents believe that they have significant influence on land use and housing objectives.
- **Economic Development** – Almost all respondents believe there are clear objectives for economic development to guide transport decisions. Paris and Vienna cite objectives that focus on their city's competitiveness in the global economy. Seven respondents believe that they have some influence on these objectives, while two respondents reported no influence. Chengdu, Glasgow, Madrid and Sydney report significant influence.
- **Environment** – Most also believe that there are clear objectives for the environment in their cities. In addition to air quality and noise objectives, other issues cited include sustainable development (Paris), the protection of green fields and reduction of green house gases (Prague, Vienna) and an objective for no net loss of biodiversity (Brisbane). Seven respondents reported some influence on environmental objectives; three reported no influence. Glasgow and Helsinki report significant influence.

3.2. Policy Framework

Transport decision making takes place within the context of broader city – and in some instances, regional and national – goals. The responding cities provided information on the extent and formulation of goals that address economic, environmental, equity or social, and safety issues. Within this context, information on transport objectives, strategies, measurement data and organizational capabilities was obtained for the following issues: safety, the environment, the economy, equity and social, and mobility.

3.2.1. Key Objectives for City and Transport's Contribution

Thirteen cities provided information on broad goals within which transport functions. For example, the Brisbane City Council has established its Corporate Plan, which includes a vision for Living in Brisbane 2010 and “desired environmental outcomes” for such issues as its economy; natural environment and waterways; transport system; and community life, health and safety. Madrid, Prague, Timisoara, Toronto and Wuppertal did not report city goals; Washington responded that there are no areawide goals for the Washington Metropolitan Area. The following is a summary of goals for each issue area:

- **Economic** – The primary themes of these goals are business and employment growth, and successful competition in the global economy. Other economic goals address financial assistance to new and expanding businesses, governmental efficiency, job training, and creation of a positive business climate.
- **Environmental** – Environmental goals address many diverse issues. They include air quality, noise, reduction of vehicular travel (especially single-occupant vehicles), water, wastewater, energy consumption, climate protection, green fields and a sustainable environment. Brisbane and Sydney go beyond protection, advocating the restoration and enhancement of the quality of the environment. No one or two issues are predominant in the responses.
- **Social Equity**– These goals also address diverse issues. They include increasing home ownership, assisting new and expanding businesses, assisting minority businesses, community and neighborhood involvement, nurture and support of children and families, reasonable transport access at reasonable costs to everyone, equitable access to jobs, efficient and affordable public transport, social equity and citizen participation. Brisbane specifically supports land use and transport systems that encourage less reliance on private vehicles. Again, no few issues are predominant.
- **Safety** – There are also no dominant themes for safety goals. Issues include safe and secure neighborhoods, reduction of violent crime, reduction of trauma transport times, the safety of all roads, and minimizing accidents. A goal for Vienna is “the safest city in Europe with over one million inhabitants.”

Twelve cities responded that city goals are available to the public, most often in published master or strategic plans. Brisbane, Glasgow and Vienna make the information available on city websites. Goals are developed by city departmental managers and staffs in six cities, while elected officials develop them in Brisbane, Chengdu, Glasgow and Yokohama. The review of achievement of goals varies widely: from quarterly in Miami to every four years in Vienna.

The thirteen cities that provided information on city goals identified transport policies that help achieve the goals. The policies respond to the same four issue areas and mobility:

- Economic – The dominant theme is improving the transport system. Policies were cited for making freight transport more competitive (Sydney), achieving a 75% modal split for public transport (Singapore), managing travel demand (Brisbane) and providing more urban space for people instead of cars (Vienna).
- Environmental – The dominant theme is the reduction of environmental impacts of transport, particularly related to air quality and noise. Other policies address energy efficiency, provision of effective public transport, and making non-motorized travel an attractive alternative (Brisbane).
- Social Equity– There are no dominant themes. Policies address improving the transport system, coordination of transport and land use decisions, efficient and affordable public transport and equity in the provision of mobility services, reducing the social impacts of traffic, support for an urban village strategy (Seattle), and meeting the needs of growing suburbs (Sydney).
- Safety – The themes of safety policies are the reduction of traffic accidents and fatalities.
- Mobility – The most dominant theme is the provision and improvement of public transport (cited by each respondent that provided detailed transport policies). Other policies address meeting current and future mobility needs, providing a range of transport alternatives, reducing the use of the automobile, pedestrian- and cyclist-friendly design and facilities, regional cooperation, parking space management and maintaining current operating conditions.

Seven respondents reported that it is clear what is expected from transport in their cities for policy areas discussed above, with the exception of equity issues (Helsinki and Valencia). Other respondents did not provide information on this question. Two respondents cited planning publications that document these expectations.

Success in carrying out policies and meeting objectives is measured in a variety of ways. In Paris, there are specific targets for number of employees, population and infrastructure; specific evaluations of over 50 indicators in its Contrat de Plan are underway. Sydney reports that its indicators of success include accident rates, vehicle kilometers of travel and public transport patronage. Glasgow has a Budget and Service Plan with performance indicators, and uses public perception surveys and market research. Brisbane publishes a range of indicators in its annual report on its Transport Plan. Other cities cited specific measures such as average travel time to downtown, average journey speed, and various air quality standards.

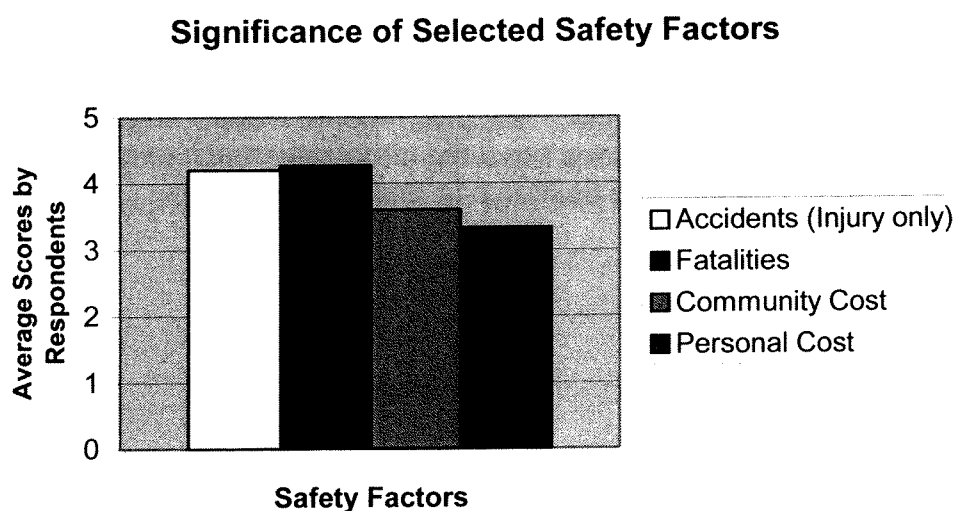
These indicators of success are established by local government department managers and staffs in about half of the cities. The State, or the State and regional and city government stakeholders, establishes them in Paris. In Yokohama, the Mayor makes the decisions. Transport department staff are the primary users of information related to these indicators. Other users include elected officials, the public, and national and regional agencies.

3.2.2. Transport Policy

Respondents were asked to identify transport policy objectives – if they exist – along with supporting strategies, data and information, and related information. Respondents also ranked – on a scale of 1 to 5 – several factors for each issue area for significance, where (1) means that the factor is not important and (5) means the factor is a very important policy issue. The responses addressed safety, environmental, economic, equity/social and mobility issues.

Safety

Transport safety is often cited as a high, or the highest, priority of transport organizations. Respondents assessed the significance of four safety factors in their city as shown below. Fatalities and accidents are the most significant safety issues to the respondents.



Objectives – Ten cities have articulated safety objectives for injuries and fatalities. Three cities reported objectives that address community and personal cost. Most objectives call for reductions of the factor (e.g., fatalities); the following are measurable objectives:

- reduce local street crashes by 3% per year (Brisbane),
- reduction of 30% of the number of accidents with injuries and fatalities until 2010 (Vienna),
- halve the road toll (fatalities) by 2010 (Sydney),
- less than 50 accidents per million vehicle kilometers of travel on the bus system, and no fatalities on the subway and bus systems (Madrid),
- seek to reduce fatal and serious casualties by at least 40%, reduce fatal and serious casualties for children by 50%, and reduce slight casualties by 10% by 2010 (Glasgow).

Strategies – Most strategies cited are targeted at injuries and fatalities, although they should have cost reduction benefits as well. Strategies include: improving accident-prone areas, systematic review and monitoring of high accident locations, safe school routes and travel programs, and more control over motorbikes (Vienna, in response to the absence of helmet use in many fatalities).

Data and Information – Information on accidents and fatalities are the most frequently cited. Other data include customer attitudinal surveys (Brisbane), information from taxi companies and post offices (Yokohama), locations and population characteristics of pedestrian crashes (Miami), specific assessments for such facilities as toll roads and program assessments such as for “Drink Driving” (Sydney), and monitoring of casualties following engineering projects (Glasgow).

Reaction to Objectives Not Met – When objectives are not achieved, most respondents reported that strategies are reviewed, revised or new strategies are defined. Singapore reviews its standards based on performance. In Sydney, new targets are set and new initiatives are put in place. Brisbane reviews design standards for inappropriateness, and seeks amelioration measures. Glasgow reviews its intervention and remedial actions onsite.

Organizational Capabilities – Brisbane, Glasgow, Madrid, Paris, Singapore and Sydney report that their transport organizations have the capability to achieve safety objectives. Some other cities report budget and staff size limitations.

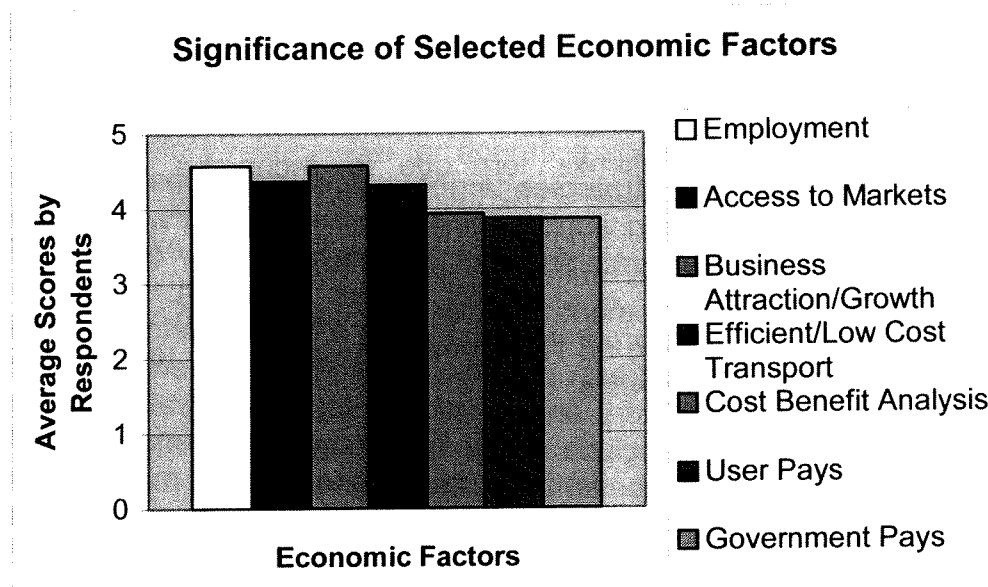
Data and Information – Air quality data are collected in all eleven responding cities, usually by environmental agencies or departments. Miami, Seattle and Washington must undergo determinations that their plans and programs conform to national and state air quality standards and plans. Data for general indicators are collected in general population or travel and traffic surveys and from secondary sources. Data to assess climate change issues are generally those used to assess air quality. Noise levels are measured in nine cities; Brisbane and Sydney also review complaints. Data on soils and underground water are collected for project-specific monitoring in Sydney.

Reaction to Objectives Not Met – When objectives are not achieved, most respondents reported that strategies are reviewed and modified if necessary; Brisbane and Sydney undertake remedial action at the project level. Federal transport agencies will withhold funding if emissions budgets are not met in Miami, Seattle and Washington.

Organizational Capabilities – Brisbane, Glasgow, Madrid, Miami, Paris, Sydney and Vienna reported that their transport organizations, usually in concert with environmental agencies or specialists, have the capability to achieve environmental objectives. Several other cities report budget and staff size limitations.

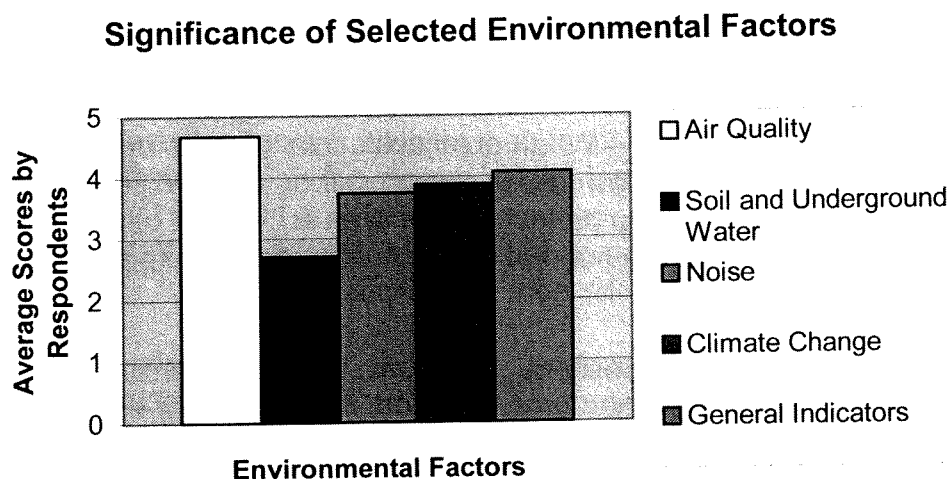
Economy

Three types of economic issues are addressed in the survey: economic development, microeconomic issues such as the use of cost benefit analysis in project development, and finance. Respondents assessed the significance of economic factors in each of the areas. The results are shown below.



Environment

Environmental quality is also a major concern of transport organizations. Respondents assessed the significance of five environmental factors. Air quality is the most significant environmental issue, followed by general indicators (population growth, Gross Domestic Product, traffic volumes, etc.) and climate change.



Objectives – Nine cities have articulated objectives for air quality and noise. Seven cities reported objectives that address climate change and six cities have objectives related to general indicators. Only one city reported an objective that addresses water quality (Miami), while Brisbane targets acid sulfate soils. Most cities have objectives that call for reductions in vehicle emissions (e.g., CO₂, NO_x and particulates) and for reducing or mitigating traffic noise. Five cities have objectives to reduce greenhouse gases, the use of fossil fuels or the net loss of biodiversity. Policies that address general indicators call for increased use of alternatives to automobiles, reductions of urban sprawl, and an urban villages/direction of growth to urban centers strategy (Seattle). The only measurable objective reported was a reduction of noise levels between 5 and 10 dB(A) (Vienna).

Strategies – Most air quality strategies target vehicle emissions using means such as emissions testing, encouraging conversion to alternative fuels, and improving public transport. Other air quality strategies include lowering duty costs for low emission vehicles and construction of a cross-city tunnel (Sydney), minimizing population expansion (Brisbane) and incorporating modeling and monitoring in transport projects (Glasgow). Strategies to address policies directed to general indicators focus on improvements to public transport, and monitoring travel and traffic patterns. Strategies to address climate change include those for air quality, along with expansion of a cycleway network (Sydney), better land use planning that minimizes the distances needed to travel (Brisbane) and taxes on fuel (Vienna). Strategies to address transport noise focus on noise mitigation as a part of road construction projects along with retrofitting at problem locations. Other strategies include the use of low-noise pavements (Yokohama, Vienna and Valencia).

For economic development, employment and business attraction and growth are the most significant issues, followed by access to markets and efficient/low cost transport. Other economic development factors cited were regional integration, private sector participation and economic stability (Madrid and Sydney), and land ownership (Prague).

Cost benefit analysis is significant to most respondents. Other microeconomic issues cited are risk assessment (Sydney) and the economic vitality of Quality Bus Corridors in Glasgow. "Government pays" and "user pays" are of essentially equal significance.

Objectives – Nine cities have articulated objectives related to economic development. Most recognize the importance of transport infrastructure to support economic growth. Sydney also emphasizes efficient and effective traffic management. Seattle has an objective to add a specific range of jobs over a 20-year period, along with other objectives that encourage a broad mix of higher-than-average wage jobs, support job training and creating a positive business climate. Microeconomic objectives call for favorable cost benefit ratios (Brisbane, Singapore), efficient pricing for products and services, provision of affordable transport, and internalizing external costs. Financing objectives focus on partnerships among government and private sector providers and beneficiaries of public investments to minimize public expenditures. Seattle seeks funding from the region for regionally significant projects and from new revenue sources.

Strategies – Most economic development strategies emphasize improvement of road networks and public transport to support economic growth. Singapore cites strategies for optimum travel speeds and a 75% usage target for public transport, while Vienna pursues the development of subcenters around public transport stations. Washington focuses on maintaining existing transit and highway corridors as one way to encourage economically strong regional activity centers and the regional core. Microeconomic strategies emphasize favorable economic evaluations of proposed projects, risk analysis in investment planning (Sydney), and the introduction of road pricing based upon trip length (Vienna). Financing strategies focus on leveraging of government funds through mechanisms such as seeking returns on development profits (Yokohama), making operators responsible for operating costs (Singapore), and partnering with the private sector to the maximum extent feasible (Miami). Other financial strategies include parking space management (Vienna), the construction of toll roads (Yokohama) and pursuit of new or increased taxes, fees and other revenue sources (Brisbane, Seattle).

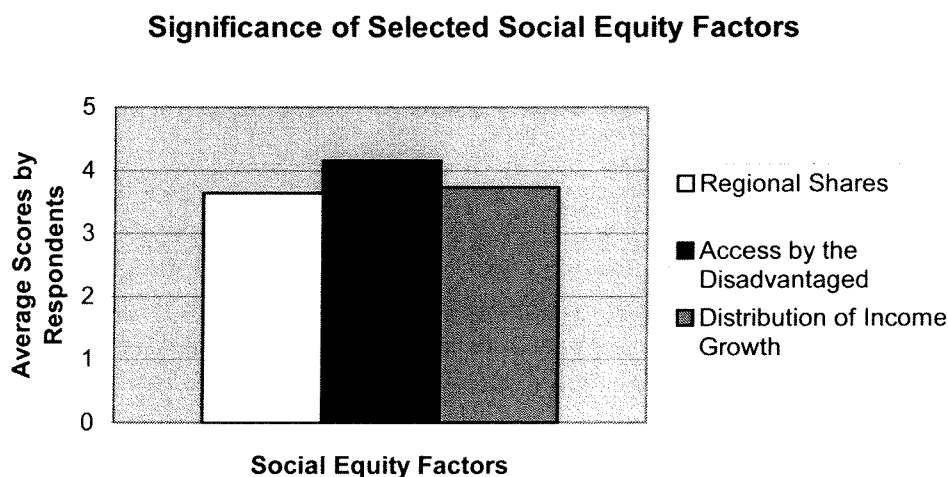
Data and Information – Economic development information generally is obtained from secondary sources (employment, demographics, number of new businesses, etc.). Sydney examines the contribution of the transport sector to Gross Domestic and Gross State Products. Singapore examines travel speeds and public transport usage to gauge transport impact on economic development. Brisbane tracks community satisfaction with planning and development issues, including the availability of employment, services, businesses, etc. Microeconomic information includes the extent of use of, and the appropriateness of methodologies for, cost benefit analysis along with risk analysis (Sydney); work trip length (Vienna); and the formation of vanpools/carpools along with new public transport ridership (Miami). Financing information includes expenditures for transport compared to changes in level of service (Miami), public expenditures and private capital inflows for road construction ((Sydney), and modal split data for freight transport (Vienna).

Reaction to Objectives Not Met – When objectives are not achieved, most respondents reported that strategies are reviewed, and modified if necessary. Seattle and Sydney report efforts to identify new revenue sources, some of which include private sector participation in the financing and delivery of projects.

Organizational Capabilities – Brisbane, Glasgow, Miami, Seattle, Sydney and Singapore reported that their transport organizations have the capability to achieve economic objectives. Several other cities report budget and staff size limitations.

Social Equity

Issues related to social equity appear to be less developed than other issues in the transport organizations. "Regional shares" relates to issues of equitable distribution of services within subareas of a region. Access by the disadvantaged is the most significant social equity issue, followed by distribution of income growth and the regional shares issue.



Objectives – Five cities have articulated objectives for access by the disadvantaged. The objectives are related to providing facilities to meet the requirements of disadvantaged groups (Sydney and Vienna) and access for the handicapped (Brisbane, Singapore), providing affordable public transport and exempting some fees (Singapore), and alternative (e.g., virtual) access to government (Sydney). Sydney has objectives related to the distribution of income growth: providing transport to low growth, low income, densely populated areas; and seeking development contributions for road projects. The State of New South Wales, which includes Sydney, has established objectives related to regional shares. Those objectives include serving regional communities with access roads, and the development of efficient and reliable passenger and freight corridors.

Strategies – Most strategies related to the disadvantaged focus on accommodating the needs of the disadvantaged in transport projects (e.g., lower curbs, widening of pavements, tactile guidance systems), and adaptation of public transport vehicles. Miami develops a three-year service plan that describes needs, solutions and programs for the disadvantaged. Brisbane cited its strategies of providing non line-haul public transport services and wheelchair accessible buses. Seattle strives to include low income, minority and disabled populations in the planning process. There were no strategies provided by respondents that relate directly to the distribution of income growth. Sydney reported that its strategy to provide for the interconnectivity of the road network supports regional shares issues.

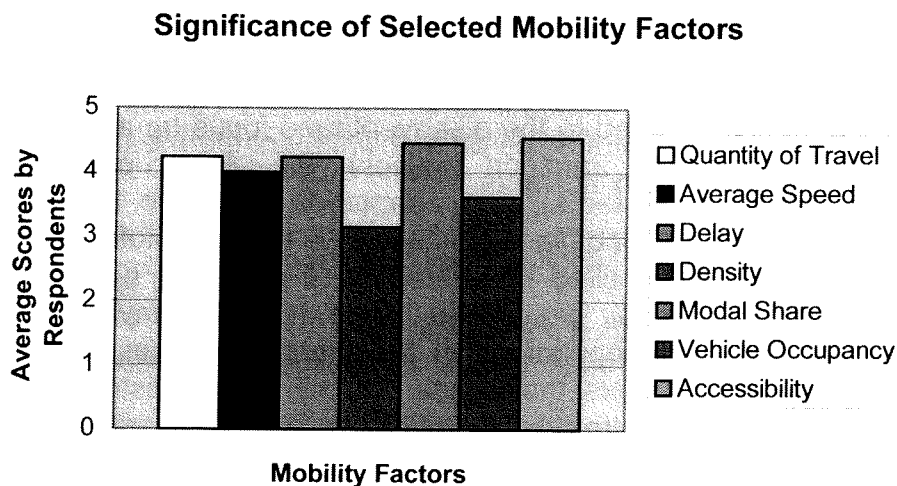
Data and Information – Respondents cited data on the number of barrier-free facilities (Vienna) and results from community awareness surveys and consultations (Sydney) as information related to access by the disadvantaged. Brisbane uses patronage and bus service levels to determine its level of support for providing access to the disadvantaged. Vienna obtains information on regional Gross Domestic Product to assess the distribution of income growth. Sydney also uses information from community awareness surveys and consultations to assess regional shares issues.

Reaction to Objectives Not Met – When objectives are not achieved, most respondents reported that strategies are reviewed, and modified if necessary.

Organizational Capabilities – Brisbane, Glasgow, Madrid, Miami, Singapore, Sydney and Vienna reported that their transport organizations have the capability to achieve social equity objectives. Several other cities report budget and staff size limitations.

Mobility

Seven mobility issues are addressed in the survey. The significance of each issue to the respondents is shown in the table below. Accessibility and modal share were the most significant issues, followed by quantity of travel and delay. Average speed was also deemed to be significant, with an average score of 4.0 on the 1-5 scale. Vehicle occupancy and density were considered to be less significant.



Objectives – Eight cities reported objectives related to accessibility. Each of them addresses multimodal access; six place emphasis on public transport. Glasgow also addresses bicycle accommodations in development corridors and the importance of reducing the need for travel through land use policies. Nine cities have objectives to increase modal share for public transport. Yokohama also seeks to achieve punctual bus service and Helsinki's objective focuses on public transport in its downtown area. Seven cities have objectives for delay. Yokohama and Valencia seek to reduce delay, while Miami strives to reduce delay by increasing the use of public transport. Vienna seeks an increase in the average speed of public transport.

There are objectives related to quantity of travel in six cities. Miami and Valencia focus on shifting travel from automobiles to other modes, while Sydney and Vienna strive for maintaining or reducing vehicle kilometers of travel (VKT). Objectives related to average speed were reported by six cities. Four cities have objectives to either maintain or improve average speeds, while Singapore seeks to achieve an optimum range of travel speeds. Five cities have objectives to increase vehicle occupancy. In Yokohama, the focus is on carpooling, while the focus in Glasgow is on encouraging public transport and other measures to reduce dependence on automobiles. Six cities report objectives related to density. Traffic management (High Occupancy Vehicle lanes, telematics, etc.) is the focus of several cities. Other objectives cite trunk road construction (Yokohama), encouraging sustainable transport (Glasgow), and a reduction in vehicles per lane coupled with increases in lane capacity (Miami). The following are measurable objectives for mobility:

- A transport network that will allow a 15 minute trip to the nearest station and a 30 minute trip to the downtown area (Yokohama)
- A long term public transport target of 75% modal share (Singapore)
- Public transport should account for at least 2/3 of the inbound motorized trips to Helsinki's downtown peninsula during the morning peak (Helsinki)

- Reduce average speed to 30 kilometers per hour in sensitive areas (Vienna)
- Increase the vehicle occupancy rate to 1.4 persons per vehicle in 2011 (Brisbane, in support of a regional plan target)
- Non-motorized travel is safe and effective so that walking and cycling account for 15% and 8% of all trips, respectively (Brisbane)
- Support public transport by requiring that the maximum straight line distance to existing and future stops on a public transport route can be 400 meters for 80% of the lots proposed in a subdivision (Brisbane)
- Maintain operating conditions for car traffic outside peak hours and peak areas at the present level (Helsinki)

Strategies – Because respondents represented transport organizations, it is not surprising that many mobility strategies were cited. The following three tables are lists of strategies for mobility issue areas.

Strategies to Meet Mobility Objectives
<p><u>Quantity of Travel</u></p> <ul style="list-style-type: none"> ▪ develop a multimodal transport system, ▪ better integration of land use and transport to reduce the need for travel (Sydney), ▪ manage travel demand (Brisbane). <p><u>Average Speed</u></p> <ul style="list-style-type: none"> ▪ better use of road space by using technology and traffic management (Brisbane, Sydney), ▪ provide good public transport, ▪ encourage demand and work hour management, ▪ integrate land use and transport planning, ▪ provide special platforms for public transport (Valencia), ▪ introduce 30 kilometer per hour zones (Vienna), ▪ include a road network and a plan to remove bottlenecks in a comprehensive plan (Yokohama). <p><u>Delay</u></p> <ul style="list-style-type: none"> ▪ most strategies listed under “Average Speed”, ▪ implement incident management programs (Miami), ▪ give preference to public transport in traffic using global positioning (GPS) technology (Valencia), ▪ keep freight moving (Brisbane). <p><u>Density</u></p> <ul style="list-style-type: none"> ▪ use demand and traffic management techniques and technologies, ▪ better integration of land use and transport to reduce the need for travel. <p><u>Modal Share</u></p> <ul style="list-style-type: none"> ▪ improve public transport by such means as implementing busways, extensions of networks, improving network efficiencies and travel times, and enhancing joint use with other modes, ▪ better integration of land use and transport to reduce the need for travel, ▪ support transport management associations (Miami), ▪ make non-motorized travel a genuine alternative (Brisbane).

Strategies to Meet Mobility Objectives (Part 2)

Vehicle Occupancy

- use carpool/vanpool and other demand management techniques,
- increase usage of high occupancy vehicle (HOV) lanes,
- improve public transport.

Accessibility

- place high priority on intermodal projects and regional transit passenger facilities (Miami),
- concentrate rail transit in heavily developed corridors and require buses to provide reasonable service in other areas (Singapore),
- create points of transfer from automobiles to public transport (Madrid and Valencia),
- require bicycle accommodations in proximity to public transport facilities as a part of land development controls (Glasgow).

Data and Information – Mobility information is collected in all responding cities and used to address multiple mobility issues. This information includes:

- the results of surveys of traffic, public transport use, household travel (Sydney) and censuses;
- counts of overall traffic volumes, automobiles using HOV lanes and usage in vanpool programs (Miami), and occupancy interviews at river crossings (Valencia);
- speed surveys to estimate average speeds by day, on major links, peak hours, and to measure delay;
- computations of VKT, trip lengths, person trips, hours spent in congestion, delay of public transport (Vienna), average speed compared to the speed limit (Helsinki), mode share;
- general mobility surveys conducted approximately each seven years (Madrid); and
- other data such as growth in Central Business District and fringe parking spaces (Brisbane), commercial travel surveys (Sydney), crossing traffic volume investigations and pre-/post-construction measures of delay (Yokohama), annual audits of bus services to ensure adequate levels of service (Singapore) and instantaneous speed measurements and artificial vision cameras to assess density (Valencia).

Reaction to Objectives Not Met – When objectives are not achieved, most respondents reported that strategies are reviewed and modified if necessary.

Organizational Capabilities – Brisbane, Glasgow, Miami, Sydney and Vienna reported that their transport organizations have the capability to achieve mobility objectives. Several other cities report budget and staff size limitations.

3.3. Data and Technical Support for Decision Making

The final section of the survey examined the information collected in cities for the various factors related to the five issue areas and how it is used. While the preceding, broader information relates primarily to policy choices, this information relates to technical performance. Respondents provided an overall assessment of how the information is used in decision making and detailed information on indicators of performance. Output measures, and consequences of transport for some issues, were provided for both project level and program level decision making.

3.3.1. Overall Assessment

Respondents were asked to assess how transport policies, strategies and information are used in their cities in making decisions at the transport system, corridor and project levels. The responses are summarized in the following table.

Use of Policies, Strategies and Data in Decision Making	
<u>Level</u>	
System	<ul style="list-style-type: none">• performance information is used in strategic planning to link budget allocations to organizational outcomes (Sydney);• the information is used to set transport targets and to provide direction in terms of transport infrastructure and service priorities (Brisbane)• elements provided by evaluation assessments are one criterion. They are more important for multi-criteria assessments; less important for socioeconomic assessments (Paris);• travel demand model statistics are used as very broad indicators of system performance; they are a gross diagnostic measure (Miami).
Corridor	<ul style="list-style-type: none">• performance measures are used, such as “additional new riders to the transit system” and “cost effectiveness ratios” (Miami).
Project	<ul style="list-style-type: none">• performance information is used; various objectives such as road safety must be taken into account (Sydney);• post project evaluation is used to determine if the project is performing as expected (Brisbane, Sydney);• elements provided by valuation assessments are one criterion. Project analysis is more important than the analysis of systems (Paris).

In addition, responses were requested on how post implementation evaluations are made. With the exception of Brisbane and Sydney, respondents made little distinction between system, corridor and project evaluations. In Brisbane and Sydney, the following occur:

	<u>Brisbane</u>	<u>Sydney</u>
System	Setting and maintaining transport targets and providing direction in necessary transport infrastructure requirements.	A strategic planning process reviews progress toward achieving system objectives and develops strategies to reflect community needs.
Corridor	The success of the strategies and actions in the Transport Plan will be measured against the targets set for the identified corridors.	The business plan measures and monitors changes to outcome performance measures.
Project	As projects are completed the network will be monitored to determine if they are achieving their expected performance.	Post-implementation audits confirm projects are constructed as contracted.

The following is a summary of other responses:

- The use of socioeconomic methodologies and cost benefit analysis, often with other criteria such as cartographic mapping (Paris)
- The process depends on the project. For example, air quality monitoring is carried out; traffic flows are analyzed before and after improvements; cycle counts are made to measure increases after improvements; traffic level monitoring is constant. (Glasgow).

Transport information is made available to the decision makers through reports, submissions to other organizations, and proposals. Information is made available to the public in a wide variety of ways: newspapers, television, websites, annual reports, exhibitions and community consultation.

3.3.2. Safety

Safety data are collected in all responding cities. Accident and fatality data are typically collected annually or quarterly by law enforcement agencies. Transport organizations collect cost data except in Yokohama, where the police are responsible. Reported indicators for safety factors are:

Safety Indicators	
Accidents	<ul style="list-style-type: none"> • Injuries per million VKT (most cities) • Accidents per million VKT (Sydney) • Number injured (Valencia and Glasgow) • Injuries per 100,000 inhabitants (Helsinki) • Bicycle and pedestrian injuries per 100,000 population (Miami) • Number, type and severity of accidents, based on VKT (Brisbane) • Number of accidents (Yokohama) • Seriousness of injuries (Valencia)
Fatalities	<ul style="list-style-type: none"> • Fatalities per million VKT (most cities) • Fatalities per 100,00 inhabitants (Sydney and Helsinki) • Bicycle and pedestrian fatalities per 100,000 population (Miami) • Number of fatalities (Vienna)
Community Cost	<ul style="list-style-type: none"> • Cost to the community (four cities) • Police expense (Yokohama) • Costs by transport mode (Singapore).
Personal Cost	<ul style="list-style-type: none"> • Estimated every two years in Sydney • Determined by transport mode in Singapore

Few safety output measures were reported. Respondents cited the following:

Safety Output Measures	
Project Level	<ul style="list-style-type: none"> • Injuries and fatalities per million VKT and injuries and fatalities per 100,000 inhabitants (Helsinki) • 40% reduction in injury accidents and fatalities (Glasgow) • Accidents with children at school and locations with high numbers of accidents (Vienna)
Program Level	<ul style="list-style-type: none"> • Injuries and fatalities per million VKT and injuries and fatalities per 100,000 inhabitants (Helsinki) • Subway and bus injuries and fatalities per million VKT (Madrid) • 32% reduction in injury accidents and 21% reduction in fatalities (Glasgow) • Bicycle and pedestrian injuries and fatalities per 100,000 population (Miami) • Annual fatalities (Prague)

There were no responses for indicators of cost per person for the consequences of accidents. Helsinki estimates community costs at the project and program level, while Vienna estimates them at the program level.

3.3.3. Environment

Environmental data are the most uniform set of data collected by the responding cities. Air quality data are collected in ten responding cities continuously or daily, except in Singapore (monthly) and Brisbane (annually); typically, data are collected by environmental agencies or departments. Soil and groundwater data are collected in Madrid, Sydney and Yokohama, and are collected at contaminated sites in Brisbane. Ten cities cite the collection of noise data; in most cases the data are collected as required by transport organizations. Climate change data collection was reported by five cities; data collection ranged from daily to annual and was accomplished by local or regional organizations. Reported indicators for environmental factors are:

Environmental Indicators	
Air Quality	<ul style="list-style-type: none"> • Presence of oxides of nitrogen (NO_x), hydrocarbons (HC), carbon monoxide (CO) and particulate emissions (most cities) • Presence of Ozone (Brisbane, Helsinki, Madrid and Sydney) • Presence of sulfur dioxide (SO₂) (Brisbane, Helsinki and Sydney)
Soil and Ground Water	<ul style="list-style-type: none"> • Intensity of water use (Sydney, Wuppertal and Yokohama) • Use of pesticides (Brisbane, Sydney, Wuppertal and Yokohama) • Use of salt (Wuppertal and Yokohama) • Presence of organics, heavy metals, lead, acidity and salinity (Brisbane)
Noise	<ul style="list-style-type: none"> • Noise emissions from traffic (most cities) • Complaints (Brisbane, Sydney) • dB(A) along roads and rail lines in noise level maps (Vienna)
Climate Change	<ul style="list-style-type: none"> • CO₂ emissions (Helsinki, Sydney, Vienna, Wuppertal, Yokohama) • Energy consumption (Helsinki, Sydney, Wuppertal and Yokohama)

Few environmental output measures were reported. Respondents cited the following:

Environmental Output Measures	
Project Level	<ul style="list-style-type: none"> • Road runoff (Brisbane, Sydney) • Presence of NO_x, HC, CO, SO₂, and particulate emissions (Sydney) • Presence of NO_x, HC, CO (Madrid) • Sedimentation basin deposits and surface road runoff (Madrid, Sydney) • dB(A) descriptions for time of day (Sydney) • LDEN noise equivalent standard for day-evening-night (Helsinki) • Greenhouse inventory (Sydney) • Dust control (Brisbane)
Program Level	<ul style="list-style-type: none"> • Parts per million (PPM) of air pollutants (Vienna) • dB(A) along roads and rail lines in noise level maps (Vienna) • LDEN noise equivalent standard for day-evening-night (Helsinki) • Road building emissions and energy consumption (Sydney) • CO₂ emissions (Vienna)

3.3.4. Economy

Economic data collected by responding cities are very diverse. Data are collected on an annual basis, with very few exceptions where it is collected monthly or quarterly. Data are collected by a wide range of national, regional and local agencies. Reported indicators for economic factors are:

Economic Indicators	
Economic Development	<ul style="list-style-type: none"> • Employment (most cities) • Business attraction and growth (six cities) • Access to markets (five cities) • Input costs (efficient low cost transport) (four cities) • Visitor statistics (Miami) • Gross Domestic Product (GDP) and capital expenditures (Vienna) • Average weekly earnings (Brisbane)
Microeconomic	<ul style="list-style-type: none"> • Cost benefit assessment (six cities) • Inflation rate (Vienna)
General	<ul style="list-style-type: none"> • Population growth (most cities) • Road traffic volumes (most cities) • Industrial production (six cities) • Growth of GDP (six cities) • Building approvals, vacant residential land, value and number of property sales, vacant industrial land (Brisbane) • Interest rates and housing construction (Sydney) • Inflation rate (Vienna)

Responses related to economic output measures differed substantially from those for other issues. Those who responded primarily indicated whether or not they generate output measures described in the survey document. Respondents cited the following:

Economic Output Measures	
Project Level	<ul style="list-style-type: none"> • Total transport costs, user costs and transport time (six cities) • Improved access to markets (Valencia)
Program Level	<ul style="list-style-type: none"> • Total transport costs, user costs and transport time (Brisbane, Madrid, Sydney and Valencia) • Improved access to markets (Valencia)

Responses related to economic transport consequences were treated by respondents similarly to those for economic output measures. Respondents cited:

Economic Consequences	
Project Level	<ul style="list-style-type: none"> • Economic growth (GDP) (Madrid, Sydney) • % high-paying jobs (Miami, at times) • Direct employment (Sydney and Miami at times) • Indirect employment (Sydney)
Program Level	<ul style="list-style-type: none"> • Economic growth (GDP) (Madrid, Sydney; Valencia measures regional GDP) • Direct employment (Sydney and Vienna) • Indirect employment (Sydney) • Number of newly-found companies (Vienna)

3.3.5. Social Equity

There were very few responses related to the collection of information related to social equity issues, reflecting the previous observation that equity issues do not appear to be considered as in-depth as other issues. Data are typically collected on an annual basis, with the exception of data collected by Brisbane and the living standard data collected by Vienna as noted below. Data are collected national and local agencies. Reported indicators for equity factors are:

Social Equity Indicators	
Regional Shares	<ul style="list-style-type: none"> Budget share (Sydney) Community satisfaction (Sydney) Fare convenience (Yokohama)
Access by Disadvantaged	<ul style="list-style-type: none"> % of barrier-free infrastructure (Vienna) Access time (Yokohama) % of transit vehicles with total accessibility (Madrid) Budget share (Sydney) Community satisfaction (Sydney) Community feedback and ridership results from trial services (Brisbane, periodically)
Distribution of Income Growth	<ul style="list-style-type: none"> Variations in employment levels (Sydney) Living area per capita and household size (Vienna, every 10 years)

Few social equity output measures were reported. Respondents cited the following:

Social Equity Output Measures	
Project Level	<ul style="list-style-type: none"> Degree of sub-regional satisfaction, via a questionnaire (Yokohama) Physical access and price subsidies for disadvantaged (Sydney; Singapore on a need-to basis) Access time to stations for disadvantaged (Yokohama) Fully accessible vehicles and infrastructure meeting standards (Brisbane)
Program Level	<ul style="list-style-type: none"> Degree of sub-regional satisfaction, via a questionnaire (Yokohama) Regional GDP, living area per capita and household size (Vienna) % of barrier-free infrastructure and usage by disadvantaged (Vienna) Fare concessions, number of fully accessible vehicles and extent of infrastructure achieved (Brisbane) Level of shadow tolls, community service obligations and concessionary pricing related to disadvantaged (Sydney) Geographic spread of services and capital investment (Sydney) Physical access and price subsidies for disadvantaged on a need-to basis (Singapore)

Responses related to social equity transport consequences were:

Social Equity Consequences	
Project Level	<ul style="list-style-type: none"> • 15 minute access time to the closest station for disadvantaged (Yokohama) • Physical access and price subsidies for disadvantaged on a need-to basis (Singapore)
Program Level	<ul style="list-style-type: none"> • Community satisfaction and budget share related to regional shares (Sydney) • 15 minute access time to the closest station for disadvantaged (Yokohama) • Community satisfaction and budget share related to disadvantaged (Sydney) • Physical access and price subsidies for disadvantaged on a need-to basis (Brisbane, Singapore)

3.3.6. Mobility

Mobility data collected by the responding cities are wide-ranging and cover many factors. Almost all respondents collect quantity of travel, speed, density, modal share and vehicle occupancy data, typically over periods of one to five years. Delay data are collected continuous in Sydney and up to every two years in other cities. Accessibility data, collected in seven cities, is collected annually or as needed. Local transport organizations collect most of the data, although some organizations rely on state or national agencies. Reported indicators for mobility factors are:

Mobility Indicators	
Quantity of Travel	<ul style="list-style-type: none"> • VKT (Paris, Miami, Vienna) • Number of trips (Brisbane, Paris, Vienna) • Trips per person (Paris) • % change in traffic volumes and average speed on selected roads (Sydney) • Traffic volumes (Brisbane, Sydney, Vienna and Wuppertal) • Average daily intensity (Valencia) • Central Business District and fringe parking (Brisbane)
Average Speed	<ul style="list-style-type: none"> • Kilometers per hour for roads and for public transport (Paris) • Kilometers per hour per trip, certain routes and times (Singapore) • Kilometers per hour per trip by mode (Vienna) • Travel speeds on selected routes (Brisbane) • Traffic volumes (Sydney) • Average speed and instantaneous speed (Valencia)
Delay	<ul style="list-style-type: none"> • Delay time (Singapore, Wuppertal and Yokohama) • Transit delay time (Madrid) • Regularity indicator (Paris) • Delay by mode and by purpose (Sydney) • Hours in congestion and delay of public transport (Vienna)

Density	<ul style="list-style-type: none"> • Lane occupancy on selected routes (Paris and Sydney)
Modal Share	<ul style="list-style-type: none"> • Modal split (Brisbane, Helsinki, Miami, Seattle, Singapore, Vienna) • Public transport trips, length of bus and HOV lanes, public transport service levels, and cycling mode share (Brisbane) • Number of trips and vehicle kilometers (Paris)
Vehicle Occupancy	<ul style="list-style-type: none"> • Persons per vehicle (Paris, Singapore, Vienna) • Demand per transit vehicle (Madrid)
Accessibility	<ul style="list-style-type: none"> • Average distance to public transport stop (Vienna) • Number of buses, frequency of service and seats offered (Valencia) • % of transit vehicles, stations and transfer facilities accessible to transportation disadvantaged (Madrid) • Length of bicycle and pedestrian facilities (Brisbane)

Mobility output measures were cited as follows:

Mobility Output Measures	
Project Level	<ul style="list-style-type: none"> • Delay, in vehicle hours (Paris, Seattle, Valencia) • Delay at intersections (Brisbane) • Density – vehicles per lane per hour (Paris, Seattle, Valencia) • Density – before and after comparisons (Vienna) • Density – degree of saturation volume to capacity ratio (Brisbane) • Modal Share – % travel by transit (Seattle, Sydney, Valencia) • Modal Share – traffic counts and vehicle occupancy (Brisbane)
Program Level	<ul style="list-style-type: none"> • Delay, in vehicle hours (Helsinki, Seattle, Valencia) • Travel time surveys (Brisbane) • Transit delay in minutes (Madrid) • Density – level of service (Brisbane) • Density – vehicles per lane per hour (Seattle, Vienna) • Modal Share – % travel by transit (Helsinki, Paris, Seattle, Vienna, Valencia) • Modal Share – vehicle occupancy and public transport ridership (Brisbane)

4. FINDINGS

Most responding cities have a full complement of transport modes to accommodate passenger and freight travel. In most cities, the institutional arrangements are complex and overlapping. Transport organizations provide facilities and services within cities and regions that have a wide range of goals that address many issues. Few responding cities have measurable transport objectives that directly relate to those issues. Respondents reported many performance measures and collect a substantial variety of data. However, they reported few examples of how transport objectives and measures are used in decision making at system, corridor and project levels.

Caution must be used when interpreting the responses from the 16 cities because of the differences in perspectives and responsibilities of the organizations that prepared the responses (see Pages 11-12). The survey results also reflect only the responding cities; observations and conclusions might be different if a broader, more representative survey of world cities were to be undertaken.

4.1. Settings

Multiple ownership of the road system – usually corresponding to the national/regional/local function of individual roads – means that different elements of the network are managed by different levels of government. Rail and port transport is not generally in the purview of city agencies. However, cities manage or oversee most mass transit and non-motorized transport.

Generally, funding of road improvements is allocated along ownership lines. There is a greater tendency for shared funding for rail, ports and mass transit, often in the form of subsidies. There is an emerging trend toward some privatization and partnerships with the private sector in road and mass transit services. Cities bear most of the funding responsibility for non-motorized transport.

There are clear objectives for land use/housing, economic development and the environment in almost all cities. However, no more than four of the respondents reported that their organization has significant influence over those objectives. Most reported “some” influence, a recognition that transport is but one – albeit important – component of urban society.

4.2. Policy Framework

Transport plays a vital role in world cities. It helps cities and their citizens and businesses meet demands for movement from place to place. It is a means to desired ends. Those ends are often expressed in the goals articulated for a city. These goals often address the economic, environmental, social and safety aspirations of its people. The cities that responded to this survey have a wide range of goals that address these issues.

Transport organizations provide their facilities and services within this broad context. At times, city goals overlap, or even conflict with each other. Less than half of the respondents reported that it is clear to their organizations what is expected from transport to meet city goals. Ideally, transport policy objectives support city goals and assist in achieving them. These policies often address more than one goal issue, and at times conflict with each other also, increasing the challenges transport organizations face.

The literature search found few examples of measurable transport policies. Most measures were specific to projects or types of projects for specific modes, and not to broader transport policies [1], [2] and [3] are examples. Some measures have been developed that address more than one mode [4 and 5], and for use in monitoring key transport issues [6].

One of the primary purposes of this research was to determine how transport organizations determine the extent to which they are meeting public policy objectives for the transport system. Respondents reported many transport policies that address five transport policy issue areas. Key findings are summarized below.

Safety – Most Significant Issues: Transport Fatalities and Injuries

More than half of respondents reported objectives transport fatalities and injuries. Five of the reported safety objectives establish measurable targets, such as a reduction of 30% of the number of accidents with injuries and fatalities. Most strategies designed to meet safety objectives target injuries and fatalities. Most cities report the collection of data to assess remedial actions. When objectives are not met, most respondents review and either revise strategies or define new ones; this was the most common response in each of the five issue areas.

Environment – Most Significant Issue: Air Quality

General indicators (e. g., population growth, economic activity, traffic volumes) are also significant. One reported objective was measurable. Most strategies target vehicle emissions. Many strategies were also reported for noise mitigation. Air quality data and information are collected in all responding cities, usually by environmental agencies or departments. Noise levels are measured in most cities, particularly when developing improvement projects.

Economy – Most Significant Issues: Employment and Business Attraction and Growth

Three types of economic issues are addressed: economic development, microeconomics and finance. Four economic factors were deemed important (i.e., the average rankings were 4 or greater on a scale of 1-5). The most significant are employment and business attraction and growth, followed by access to markets and efficient, low cost transportation. Only one reported objective was measurable: the addition of a specific range of jobs over a 20-year period. Most strategies emphasize improvement of road networks and public transport to support economic growth. Microeconomic strategies focus on favorable economic evaluations of proposed projects (e.g., through the use of cost benefit analysis). Financing strategies focus on leveraging government funds through partnerships with the private sector. A significant share of economic data is gathered from secondary sources.

Social Equity – Most Significant Issue: Access by the Disadvantaged

Issues related to social equity appear to be less developed than the other issues in responding cities. Access by the disadvantaged is the most significant. No measurable objectives were reported. Most strategies related to the disadvantaged focus on accommodating their needs in transport projects. No strategies were reported that relate directly to the distribution of income growth. Few data and information items were reported.

Mobility – Most Significant Issues: Accessibility and Modal Share

Seven mobility issues were addressed. The most significant are accessibility, modal share, the quantity of travel, delay and average speed. Almost half of the respondents reported mobility objectives. Eight were measurable. Most mobility strategies address more than one of the seven mobility issue areas. Most strategies focus on making the transport system perform more efficiently and improving alternatives to automobiles. Data and information are collected through periodic surveys, counting programs, speed surveys and computation of numerous indicators (VKT, number and length of trips, amounts of delay, etc.).

4.3. Data and Technical Support for Decision Making

Transport policy objectives and related performance measures can play a critical role in setting policy, allocating resources and reporting on the results of transport programs and projects. Responding cities reported few examples of how such objectives and measures are used in decision making at system, corridor and project levels. Brisbane has established transport-related strategic objectives to help achieve city goals and “desired environmental outcomes”; Brisbane has established, or is establishing, a number of specific policies and strategies to help meet those strategic objectives. Sydney uses performance information in strategic planning to link budget allocations to transport organizational outcomes. Paris points out that assessments of performance are but one criterion in decision making and that they are more important when multiple criteria are assessed.

There was little reported variation in post implementation evaluations, except in Brisbane and Sydney. Brisbane monitors the transport network to evaluate the performance of completed projects. In Sydney measured progress toward achieving system objectives influences strategies to meet community needs, while project post implementation evaluations focus on audits of construction performance. Glasgow observes that the evaluation and decision making process is dependent on the type of project that is being considered (i.e., assessments of such issues as air quality, traffic flows, modal data, etc. vary).

Transport information is typically made available to decision makers in the form of reports and proposals. Information is provided to the public in a variety of traditional means of communication (newspapers, television, etc.). Several cities report the existence of websites to provide public information. There were few reported instances of efforts to receive feedback from "customers;" these include exhibits and community consultation.

Thirteen respondents provided detailed information on indicators of performance, outputs based on assessments of the indicators and/or the consequences of transport services. Many were consistent with project and modal indicators identified in the literature survey. It appears that there was a degree of uncertainty for some respondents on the distinctions between indicators, outcomes and consequences which led to some redundancies in responses, and possibly caused some reluctance to respond to specific questions. However, the responses provide indications of the types of performance information for transport issues that is being collected by those cities.

Safety – Most Prominent Measures: Injuries and Fatalities

Safety data are collected in all thirteen responding cities. The most prominent performance measures are injuries and fatalities per million VKT. Some cities measure injuries and fatalities as a function of population. Some cities assess safety performance subsets of "customers," such as children at school, bicyclists and pedestrians. There were few reported measures for community or personal cost of accidents.

Environment – Most Prominent Measures: Air Quality

Environmental data are the most uniform set of data collected by the cities. NO_x, HC, CO and particulate emissions are monitored by most cities to assess how they are meeting performance standards. Most cities monitor noise emissions from traffic. Few cities reported measures for soil and ground water (e.g., intensity of water use, use of pesticides, etc.) or for climate change (e.g., CO₂ and energy consumption).

Economy – Most Prominent Measure: Employment

Economic data collected by responding cities are very diverse. The most cited economic development indicator is employment, although about one in four responding cities also measure access to markets, business attraction and growth, and input costs (efficient low cost transport). The use of cost benefit assessments was reported by six cities. Other general indicators collected by at least four respondents are population growth, road traffic volumes, industrial production and growth of GDP. The most significant economic output measures for project and program decision making are total transport costs, user costs and transport time. There were few reported measures for the economic consequences of transport.

Social Equity – Few Measures

There were very few responses related to performance measures and related data for social equity issues. There is more focus on access by the disadvantaged than on regional shares or distribution of income growth issues. With the exception of access by the disadvantaged, there were no output measures common to more than one city.

Environment – Most Prominent Measures: Travel, Speed/Delay, Modal Share

Almost all responding cities collect quantity of travel, speed, density, modal share and vehicle occupancy data. The most prevalent indicators cited were VKT, kilometers per hour (with some differentiation by mode, route, time of day, etc.), delay (again, with some differentiation by mode), and modal share. Output measures focus on delay, density and modal share at project and program levels.

5. CONCLUSIONS AND RECOMMENDATIONS

Transport organizations face increasing challenges in meeting public expectations and are under increasing pressure to become more efficient and accountable for their actions. There is increased awareness that there are linkages between transport and other public policy domains: the economy, the environment, safety and social equity.

5.1. Conclusions

Ideally, transport policy should reflect those linkages and assist in achieving city, regional and national policy goals. Policy objectives should focus on outcomes of transport decisions, such as changes in delay, travel time, trip reliability, etc. In addition, transport policy objectives should be measurable so that performance can be evaluated and reported to decision makers and the public.

The establishment of measurable policy objectives can particularly impact program investment decisions of transport agencies. Transport organizations with measurable objectives (examples are to maintain roadways at specified condition levels or to meet specific public transport ridership targets) can more readily determine program investment levels required to accomplish the objectives than can those organizations with very general, or no policy objectives. This can give decision makers the opportunity to assess tradeoffs between investment levels in various programs, assess the cost of meeting alternative measurable objectives, and determine the optimum allocation of resources to meet the wide range of responsibilities with which they are charged.

5.1.1. City Goals and Transport Policy

This research examines how some cities are responding to those challenges. However, caution must be used when interpreting the responses from the 18 cities because of the differences in perspectives and responsibilities of the organizations that prepared the responses. The survey results also reflect only the responding cities; observations and conclusions might be different if a broader, more representative survey of world cities were to be undertaken.

Most respondents stated that clear goals exist in their cities for such fundamental issues as land use and housing, the economy and the environment. Most responded that their transport organizations have "some" influence in meeting those objectives. This is a recognition that transport is but one – albeit important – component of urban society and that responsibilities for meeting city objectives are shared with organizations that address other components.

Transport policy objectives often address more than one city goal and, at times, may conflict with each other. Respondents cited many policy objectives for five issue areas: safety, the environment, the economy, social equity and mobility. The most significant issues for responding cities – those issues that had average rankings of 4.5 or greater on a 1-5 scale –are air quality, employment, business attraction and growth, and accessibility. The emphasis on economic issues among those deemed most significant is likely an indicator of the acceleration of global economic competitiveness in recent years. There were ten other issues that received an average ranking of at least 4.0 out of 5, an indicator of the broad scope of issues that must be considered by transport organizations.

Relatively few policy objectives that were reported focus on outcomes and are truly measurable. For example, an objective to “reduce transport fatalities at least 20% from the year 2000 level by 2020” states exactly what a city or organization is trying to accomplish. Performance can be measured against such an objective on an annual or other basis and interventions, if necessary, can be implemented.

5.1.2. Transport Policy and Performance Measurement

Respondents reported that many performance measures and a substantial variety of data are collected, either by transport organizations or others. The most prominent measures are for safety (injuries and fatalities), the environment (vehicle-related emissions), the economy (employment), and mobility (quantity of travel, speed, delay, modal share and accessibility). The measures and data are used for project and system – not necessarily policy – planning and decision-making.

Responding cities reported few examples of how transport policy objectives and measures are used in decision making at system, corridor or project levels. Their responses indicate that performance information is typically made available to decision makers in the form of reports and proposals. Information is presented to the public using traditional media, although several cities provide information on websites. There were few reported instances of efforts to receive feedback from “customers,” such as through surveys, community consultations, etc.

5.2. Recommendations

Transport organizations need to make significant changes in linking their activities to broader city objectives if these research results are indicative of current practices. Further research is needed in many related areas, in concert with international efforts to collect additional information and present it to transport agency officials.

5.2.1. Strengthening Linkages Between Policy and Performance

It is clear that transport organizations face new and increasing challenges. They also obtain, and use, a wealth of data and measures in carrying out their responsibilities. However, there also appears to be an absence of measurable policy objectives for which these or other data and measures could be used to determine if and how the goals of the city and transport agency are being met. If this is the case, then current transport policies in those cities are not being clearly supported by the data and measures that are currently available. To the extent that these research results are indicative of practices in other world cities, it appears that significant changes are needed in:

- the articulation of measurable, realistic transport policies that support city goals,
- the identification of performance measures and associated data for those policies that can be used to make informed city-wide transport investment decisions, and
- the involvement of citizens and stakeholders in formulating the policies and assessing the results.

This will not be an easy task for many transport organizations. They must take into account planning and data collection budget realities, organizational competencies, and the extent to which decision makers accept a performance-driven approach.

Incremental approaches to improving the linking between policy objectives and performance-driven decision making may be necessary. Improving the links between policy objectives of the city, performance of the transport system and transport decisions can be phased. Existing data can be used now as a start in choosing projects that align with objectives while more reliable objectives and performance criteria are being developed. Policy objectives and measures can be refined and improved over time, as decision makers become more supportive of their use and as data collection and monitoring systems are modified to yield the required information. Elected officials and the public can be expected to support such an approach if it appears that a transport organization is moving at a reasonable pace in the direction of providing more accountability for its actions.

5.2.2. Further Research

Measuring and Monitoring Quality is an area that many transport and city authorities and professionals have found difficult. One of the reasons is the lack of sound research in this field. Modern transport modes have transformed and changed city structures all over the world. Based upon the results of this survey, the following research areas seem to be of importance for the near future:

1. definition of the city as a system – There are traditional cities, agglomerations and Megacities (which are only named, but are not clearly delineated). All of them are urban areas, but of very different kinds. Cities do not end at their administrative borders; they are interwoven with the near and more distant environment. The nature of cities derived from their cultures may differ across continents. Sometimes cities have more interactions with other distant cities than with their neighbours. These relationships should be studied;
2. goals and indicators: the problem of Quality and Quantification – Most city administrations have political goals, which are specified on a qualitative level. Some of these qualitative goals have no useful indicators. Indicators to measure and monitor quality are very often quantitative. This survey has shown that the indicators being measured sometimes have nothing to do with the goals. Some indicators are produced, since they are easy to measure, but important indicators and data are not available. Data about the mobility of non-motorised system users are very rare. It will be necessary to fill the existing gaps in the database. This is an important research issue for the next period;
3. meaning of indicators on different levels – Quality indicators for one mode of the transport system might be in contradiction to quality indicators for the city (e.g., uninterrupted car traffic and enhancement of share of public transport users). It will be of great importance to define the right indicators for the description of the qualitative goals and quality of the city and its transport system;
4. common understanding of the complex system by interdisciplinary cooperation. Achieving quality objectives in social, economic, ecologic and cultural issues is not a traditional aspect of engineering analysis. It will be necessary to cooperate with these other disciplines to prevent misinterpretation and to use the existing research and knowledge base of these disciplines (we should not invent the wheel again);
5. selection of important and unimportant indicators for Quality – Today, things are measured which might be of no importance for Quality, or even misleading, as well as being time and resource consuming. For some areas, long lists of overlapping and redundant indicators have been developed. This should be revised for practical reasons.

In addition, PIARC and other entities can play a major role in assisting transport agencies in measuring and monitoring quality. Key activities that can be undertaken include:

1. a specific program of tracking the development of city objectives and transport objectives within world cities;
2. documentation of "best practices" in cities and regions that have made significant progress in linking policy to performance, including some of the cities that responded to this survey;
3. positive action by PIARC to ensure much broader representation and coverage of African, Asian, Spanish-speaking and transition countries, including:
 - workshops or seminars on the work to date, especially in those areas from which there were limited responses,
 - development of specific surveys and training programs on the significance of transport for developing countries; and
4. another survey of world cities within several years, with improvements in focus and clarity as well as additional efforts to include the perspectives of all transport providers in each selected city.

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