

ROAD ASSET MANAGEMENT: INTEGRATING BEST TECHNICAL AND MANAGEMENT PRACTICES WITH POLITICAL RESPONSIBILITIES

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STRATEGIC THEME 4

QUALITY OF ROAD INFRASTRUCTURE

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SUMMARY

The theme that has been chosen addresses the relationship between and the necessary reconciliation of three perspectives that influence the management of road assets: technical specialists; managers of road networks; and public administrators. These three perspectives must be complementary in terms of analyzing the same subject for the benefit of public service. The objective is to look at the roles and responsibilities of each of the stakeholders involved in the process with a critical eye.

Harmonious relations between these three groups facilitate the sound management of road assets. In order to achieve this type of functionality, the roles and responsibilities of each group must be clearly defined, clearly understood, and perceived correctly by the general public. The distribution of decisional powers must also be well defined in order to avoid fractious situations and to promote efficient action.

The maintenance, improvement, and development of a safe and functional national road network that is in good condition inspires debate and leads to a sharing of functions that promotes decision-making by the individual who is best able to assess and manage the risks that are inherent in the consequences of the decisions that are made. In light of this, asset management systems become essential tools in terms of integration. These tools allow for the emergence of pertinent technical information, which is required for decision-making, and which takes into account the concerns of each group. They also contribute to optimizing network initiatives that benefit users and residents.

FOREWORD

As the Coordinator of Strategic Theme 4: Quality of Road Infrastructures, I would like to thank the PIARC member countries that have contributed to these reflections by taking up the proposed challenge: Austria, Bangladesh, Canada, Denmark, Hungary, Japan, Latvia, Mexico, New Zealand, Pakistan, Romania, Spain and Sweden. This is a delicate subject, because it involves societal choices that have been adopted by and integrated into the governing systems of the various nations. These reflections involve a critical analysis of best practices, considered in their entirety, with the goal of avoiding any value judgments concerning the various systems that are in place. The objective is to spark debate and discussion, in order to contribute to the development of road management practices that respect social will. We are all convinced that best practices contribute to the enhancement of public services.

This text also comprises certain elements that arose from the discussions that took place during the Workshop on the Management of Road Assets that was held in Québec City in August 2006. This activity brought together the members of the various ST4 Technical Committees. Their contribution is of great value, and allows for better integration of the concepts of relations between technical specialists and managers.

Anne-Marie Leclerc, Canada-Québec

1. INTRODUCTION

As part of the coordination meetings for the PIARC's Strategic Theme 4: Quality of Road Infrastructures, a Workshop addressing the subject of Management of Road assets was held in Québec City in August 2006. The goal of this event was to promote the sharing of information concerning the management of road assets and to consider the technical aspects together with the issues involved.

In terms of asset management concepts, the challenge that must be taken up involves integrating the management systems that govern the various road asset components. The Québec City meeting enabled experts in each of the specializations – national highways and urban roads, structures, geotechnical works, etc. – to compare their practices and viewpoints. Discussions that were held during the four workshops allowed participants to exchange ideas and debate asset management issues. Subjects that were dealt with included Promoting asset management methods; The concept of the road corridor; Having indicators representative of the condition of assets; and Taking into account expectations of users and residents.

The sharing of information between technical experts and the managers who make decisions is one aspect of managing road assets that prompted numerous exchanges. Two key elements clearly emerge in the successful implementation and optimal operating of systems for managing road assets: the importance of cooperation between the various stakeholders; and the quality of the data that this exchange of information is based on.

In combination with the work of the Technical Committees, the Québec City Workshop on Management of Road Assets constitutes the foundation for the current strategic session. A detailed study of the August 2006 discussions allowed us to prepare the call for national reports. The reports that address the experiences of the countries that responded to this call have made it possible to examine the subject of integrating technical and management practices into the exercise of political responsibilities in greater depth.

2. MANAGEMENT OF ROAD ASSETS

The management of road assets requires road administrations to use measurable indicators to efficiently manage the road network and to verify the efficacy of decisions that affect user services and the durability of infrastructures. Therefore, expert technical assessments and technical opinions influence decision-making by putting the various perceived difficulties into perspective, and by dealing with issues related to the management of road assets in a rational, rigorous, and structured manner.

The development of indicators and the related measurements favour the identification of targets. Attaining these targets within a specified time determines the desired performance levels. In all cases, the decisive element remains the reliability and stability of the measurement over time, which allows for comparisons over the long term and makes it possible to assess the development of the performance of a network. The credibility of the data available to decision-makers depends solely on the work of the technical experts, who must always provide validated and verified data for strategic decisions.

In all cases, this data must lead to action on the part of the technician, the manager, or the elected official. This means that everyone's needs must be clearly stated in advance, so that the "right" data are provided – data that will allow for action in keeping with the responsibilities of the various stakeholders.

Data that do not lead to the making of a decision are considered secondary. It is also important to consider the usefulness of such data, because they may be unnecessary!

The selection of the appropriate decisional level must be made after the risks inherent in the decision have been defined. The individual who is in the best position to assume the inherent risks must participate in the decision-making process. For example, in order to determine the best means of rehabilitation, a structural engineer must be aware of the exact damage to a structure; and a manager must have access to a global analysis of the condition of each of a group of structures in order to recommend best investment strategies over time; whereas an elected official must be aware of the importance of a given structure and what becomes of it to the region's economy in order to ensure a public service that is adapted to the expectations of the citizens. Therefore, the gathering of data that is specific to the proper decisional level becomes a strategic element.

The economic sector uses costs and profitability analyses, and not necessarily benefits, which are somewhat intangible. It is important to keep in mind that what is profitable in the case of one road is not necessarily profitable for another road.

A variety of factors are involved at the political level, including benefits, costs, and feedback from users and residents. The public's perceptions, unrealistic expectations, and the tolerance of societies must be reconciled with the measurement of needs or response capabilities. The perception of users and residents becomes a factor that distorts the true performance picture. In fact, the measured performance of a road network often differs from its performance as perceived by users.

The technical and political levels must be connected. The road network manager serves as a liaison between these two levels. For example, it is important to clearly explain the basis of recommendations, the objectives, and the decisions made. Information from an asset management system can serve to explain the effects of the decisions on the combined assets, thereby facilitating the management of the risks associated with the decisions.

Consequently, the keys to managing infrastructures are communication, understanding performance indicators, knowing the needs of users, and taking into account the impact of decisions on the combination of assets. The challenges that must be met include improving internal efficiency (minimal cost for an optimal level of service), maximizing benefits, and ensuring a long-term commitment, which is essential for the successful management of road assets.

2.1. Influence of contexts

The social and economic context within which management of road assets takes place varies greatly, depending upon whether the country in question is a developed nation or developing country. These contextual differences are seen in the perception users with respect to the services that are offered to them.

For example, Japanese society and the economy in that country have attained a certain level of maturity. The birthrate in Japan is declining, and its population is aging. In light of this, network managers must contend with profoundly altered expectations in terms of public mobility, as well as significant changes in transportation models. As a result, the country is in the midst of a period of optimal use of existing roads, rather than a period of construction of new road infrastructures. In addition, Japan is experiencing cutbacks in public budgets dedicated to the support and maintenance of road network assets. However, with the aging of infrastructures, and especially the aging of engineering structures, a strong increase can be expected in terms of rehabilitation and renewal spending.

At the other end of the spectrum, countries such as Hungary are going through a period of accelerated development of their road network, particularly with respect to highways.

In the middle are nations like Bangladesh, which are experiencing acute financing difficulties that hinder the maintenance of the existing network.

In terms of management considerations, road infrastructures are found in the most varied of natural environments. One need only consider the mountainous regions of Japan and Austria, the risk of an earthquake that hangs over the Japanese network, and the extreme weather conditions in both countries.

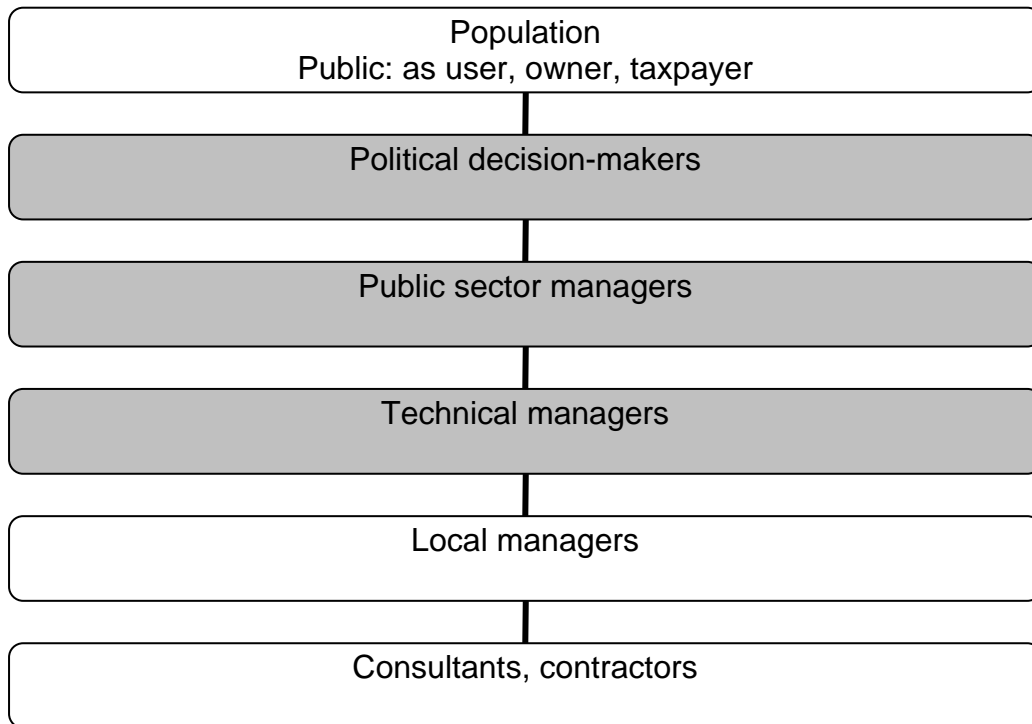
Growth in heavy traffic and increased congestion are factors that are faced by many countries (Japan, Denmark, etc.). In addition, the use of the road network for the transportation of goods is increasing continuously, despite the efforts deployed by administrations to encourage multi-modal integration.

Finally, certain road administrations must deal with major organizational changes, such as the number of administrative levels that manage infrastructures or the transfer of activities to other entities.

These diverse contexts can influence the sharing of responsibilities among the various decisional levels. This reality takes shape most notably in the form of the political influence that is brought to bear on certain administrative decisions, and even technical decisions. Depending on the country and the state of its infrastructures, this influence can become a very significant consideration, as indicated in the national reports that were presented by Hungary and Bangladesh.

2.2. Organizational model

The organization in the majority of countries can be diagrammed as follows [1]:



The roles and responsibilities of each of the levels that are marked in grey are at the heart of the reflections of this strategic session, and in particular, their interactions and the relationships that they maintain in order to ensure efficient management of road assets.

3. ROLES AND RESPONSIBILITIES OF ELECTED OFFICIALS

Within a democratic system, the political decision-makers are the representatives who are elected by the people. The very nature of their duties dictates that they are the ones who set the general guidelines for action, and who make the final strategic decisions. They are responsible for transportation-related matters within the government, and therefore, they must debate these issues and mobilize their colleagues for the achievement of a common objective. Political decision-makers must also balance governmental goals and challenges against the needs of road network management, seeking a compromise between resources allocated to public mobility and those allocated to other public services.

Most often, political decision-makers are the people who debate the extent of the financial resources that will go toward maintaining the road infrastructure and adding road network assets. Of course, this allocation of resources is based on available technical information and best management practices. Therefore, the proposed levels of investment that are suggested by the particular road agency (e.g.: in Denmark) are taken into consideration in determining the annual resources that are earmarked for the road network sector or for longer-term investment projections.

There must be political debate concerning the identified objectives and targets before they can be implemented. These targets are proposed by technical specialists and managers. In addition, an assessment of the risks involved in achieving the various targets must be provided before the final decision can be made, and especially before the public announcement of the decision.

The difficulties involved in this area lie in identifying medium- and long-term targets when attaining these targets depends upon the resources that are allocated in cases where the allocation did not necessarily take into account either unknown factors involved in road network management (e.g.: flooding, earthquakes, storms, premature damage of the given asset, insufficient investment in previous years and accumulated damage, etc.) or changes in action priorities linked to the existing national situation and international dynamics.

In addition, strategic planning and change-of-government cycles are generally not synchronized, which can lead to distortional effects in terms of the “short-term” assigning of resources. Road infrastructure management calls for long-term vision pertaining to the significance of the effects of mobility on the economic development and overall evolution of societies. Political imperatives often impose a shorter-term perspective.

Concerns related to alleviating congestion also take precedence over conservation imperatives involving road assets. In this context, the analysis of investments based on sustainable development principles, or sustainable mobility in the case of transportation activity, allows for the issues to be weighed. Establishing a balance between the optimal use of existing resources, the addition of functionalities, and conserving strategic assets remains a societal issue.

4. ROLES AND RESPONSIBILITIES OF PUBLIC MANAGERS

What clearly emerges from the national reports is the importance of the roles and responsibilities of public managers, including correctly explaining the effects of decisions pertaining to initiatives and investments on the targeted road sections, as well as the repercussions of concentrated investment in a given sector on other road assets. In this way, public managers play a major role in determining investment levels.

The decisions made by these managers stem from the diverse concerns of the various road infrastructure asset stakeholders, societal trends, and other government orientations that have either direct or indirect effects. Public managers must consider all of these factors, and not just the strictly technical ones, and must reconcile potentially opposing demands before ultimately ruling on them. Public managers are also the individuals who take into account the whole question of risk management.

The following stakeholders are generally included in the management of road assets:

- Users of the infrastructure assets (individuals, companies);
- Area residents;
- Lobby groups;
- Local road managers.

Their needs include the following:

- Short- and long-term budgets allocated to road administrations;
- Stability of human, financial, and material resources;
- Respect for the strategic orientations of road administrations;
- Adherence to specific policies, such as the need to encourage innovation, congestion-alleviating goals, etc.;
- Government orientations (reduction of greenhouse gases, commercial corridors, etc.).

The relative levels of influence of the various parties on managers, and even on technical personnel, vary from country to country. In addition, the diversity of the requirements and demands, and sometimes even the divergent nature of these demands, magnifies the complexity of managerial actions. In certain countries, political influence predominates. In others, this influence is less of a factor, and the accent is on finding a compromise between the many requirements that are expressed.

Public managers must illustrate, document, and comment on the evolving state of infrastructures resulting from the investment decisions and strategies chosen over the short-, medium-, and long term.

In this respect, information that is generated by technical activities becomes essential due to its availability and the reliability of the data. This information must be properly synthesized and communicated to the layperson. In this context, public managers serve as interpreters between technical personnel and political authorities.

With the information at their disposal, public managers are able to:

- demonstrate needs;
- attest to the importance of providing adequate budgetary resources for the maintenance and development of infrastructure assets;
- illustrate the consequences of a given level of financing – if the level is insufficient, this entails demonstrating the consequences of a lack of maintenance;
- ensure transparent decision-making, which is a necessity in terms of public accountability.

On this basis, public managers can have a significant impact on the level of investment in the road network sector.

Once the credits are allocated, public managers must ensure the efficacy and efficiency of the administrative units that are responsible for carrying out the work and for securing the investments. In this role, managers are responsible for communicating with and providing a link to the various administrative units. They must oversee the maintenance and development of expertise among these units.

In terms of the processes involved in the management of road assets, public managers are expected to assume a leadership role, so that the implementation of these processes is possible and profitable. As indicated in NCHRP Report 20-68 [2], which deals with best practices for the management of road assets in America, in order for a management system to function properly, managers must be involved with both financial and human resources on a long-term basis. They must take on the role of “champions”, and prioritize this system over more established empirical methods or simple managerial habits.

Even then, the real scope of sound infrastructure management must be recognized. This is not always the case, as reported by certain countries, where lack of commitment among managers is a major obstacle to implementing an asset management system.

Countries that have implemented this type of management system point to the success of these methods in order to justify the requested budgets and to persuade decision-makers that the proposed investments are the most profitable ones possible.

5. ROLES AND RESPONSIBILITIES OF TECHNICAL AUTHORITIES

Like managers, technical authorities take on a variety of roles and responsibilities, which range from measuring the satisfaction of road infrastructure users and thinking through the often-complex issues of the type and quality of data needed to properly manage road assets, to communicating engineering matters to managers and elected representatives in layman’s terms.

It is clearly becoming more important for technical authorities to be able to display responsible technical judgment in order to influence the decision-making process in road system management.

5.1 With respect to the population

For users, road infrastructures are a convenient means of getting from one place to another, whereas for residents, they can be a source of annoyances such as noise, traffic, and pollution. Managing road assets is not simply a matter of functionality. It must take into account the effects on users and residents.

Users and residents have expectations and perceptions that must be measured with a view to integrating them into the practices of managing road assets.

5.1.1 Measuring and considering the public's needs and expectations

Considering the population as a whole as users of the road infrastructures, the technical authority seeks to employ a variety of means to obtain information concerning their usage levels, their needs, and their expectations, and in a more general fashion, how satisfied they are with the infrastructures that are available to them.

In their national reports, New Zealand and Hungary mention periodic surveys of users, and how the conclusions that are drawn from the survey results are used to adjust intervention strategies.

In New Zealand, various mechanisms are used to consult the public and other parties such as industry that are affected by decisions pertaining to the management of road assets. The challenge is to turn the findings of these surveys into action. A concrete example of how survey results have been used is the development of the *Truck Ride Index*, which combines the factors of roughness, geometry, and driving speed. This index is used to pinpoint places where road improvement work is required in order to make it easier and safer for heavy trucks to travel.

Another interesting example of public consultation comes from Hungary, where bus drivers who work for a public transport company in one of the country's departments were regularly surveyed about the condition of the roads that they were driving on. Their opinions are taken into consideration when the short-term maintenance program is prepared. In addition, complaints registered by road users are also taken into consideration when the network maintenance policy is developed. Plans for new infrastructures (e.g.: a new section of expressway) also take into account requests from users, through a series of public consultations that give all stakeholders, including ecologists, an opportunity to express their opinions.

Finally, it is often necessary to consult the public in order to determine whether users are prepared to pay more for better road infrastructures or not. Survey results can provide valuable information for a road administration that is considering implementing or extending the user-pays principle for its infrastructure system to a greater or lesser degree.

5.1.2 Informing the public

Citizens can validly claim a degree of ownership of a country's road assets, and therefore, they must be kept informed. In Austria, for example, the public can access information on the country's roads via the Internet.

Public information supposes that the technical authorities are capable of translating concepts into terms that everyone can understand, and that they will make an effort to present technical information in a comprehensive manner.

5.2 With respect to managers

One of the important roles that technical authorities play with respect to managers is providing them with the information they need to make decisions and to communicate effectively with policy makers in an accurate and timely fashion.

This underscores the importance of consulting managers in order to evaluate their needs, and ensuring that these needs are clearly stated so that the technical information that gathered for them is actually of use in the decision-making process.

It is important to know that the right data are being gathered, that they are being aggregated and summarized at the appropriate level, and that management processes are effectively meeting the needs of decision-makers.

In this context, Mexico conducted a survey aimed at determining the opinions of decision-makers with respect to the country's asset management systems. A questionnaire was drawn up and sent to a number of federal and local road authorities. The questions addressed the type of information they needed to manage and how much importance they attached to the management systems throughout the decision-making process.

The survey revealed that a very large majority (82%) of decision-makers felt that the contribution of technical data to the decision-making process was "extremely important". They saw a need for data not only concerning pavements and bridges, but also concerning other components of the road system. The survey also revealed that, despite considerable efforts to strengthen decision-making on the basis of adequate technical information, there are a number of unfavourable factors that can hinder the consolidation of a modern system for managing road assets.

According to the survey, 46% of decision-makers see management systems as computer tools, which significantly limit the impact of the projects resulting from the management process. In addition, one-third of the respondents said that management systems should be implemented in specialized departments within the organization, without affecting the organization as a whole. This perception is supported by the fact that the respondents did not see reconfiguring the organization as a priority.

It is worthwhile to note that there is a very real risk of inaccuracy in the technical data that is collected in Mexico as a result of the lack of established procedures for validating the measurement equipment. Mexico is working toward solving this problem by rewriting its data collection contracts.

5.3 Job-specific technical roles and responsibilities

In general terms, technical authorities are called upon to design, develop, implement, support, and evaluate the efficiency of asset management systems. In some cases, this can even entail quantifying the benefits of using management systems.

They are responsible for collecting the data, which they must optimize by making decisions pertaining to the frequency of collection, the tools and methods, the quality control mechanisms, etc. For example, they are asked to develop techniques and protocols for inspections and condition surveys, and in the interest of cutting costs, they seek to simplify and streamline the processes wherever possible, while ensuring that the data gathered is useful for decision-making (over the short, medium, or long term). In other words, they guarantee the efficiency of the overall process by turning disaggregated technical data into information that is useful for decision-making purposes.

Using this information, technical authorities develop methods for diagnosing the condition of road infrastructures by evaluating performance and proposing avenues for improvement.

They are also involved in the development of network-level intervention scenarios, which are dependent upon previously gathered information and on models of the physical evolution of roadways and structures that they are asked to define and refine. In addition, as experts in setting priorities for interventions, they are asked to comment on and improve the quality of proposed plans.

Their responsibilities also include developing more general orientations in terms of managing road assets.

Finally, technical authorities draft technical standards and application guides, and are frequently called upon to provide explanations and training for fellow technicians, managers, and elected representatives.

6. ASSET MANAGEMENT SYSTEMS AS AN INTEGRATING TOOL

The diversity of road system stakeholders and their often divergent demands, combined with the obligation to ensure that people have the means to move around at all times, are powerful incentives for road authorities to design asset management systems that facilitate decision-making. The word "system" is being used here in its broadest sense of "overall management process", as opposed to the more restrictive sense of a software program or computer system.

Several national reports described interesting experiences in using these systems as a tool for communicating with elected representatives. These systems make it possible to explain the possible results of a given investment strategy in detail, to justify increased budgets, to demonstrate the consequences of not managing the infrastructures properly, etc.

However, asset management systems can only fulfil their integrating role if certain preconditions are met:

- The quality of the data collected must be good.
- The performance indicators must be adequate and properly understood.
- The analysis must be objective and based on realistic hypotheses (performance models).
- The results must be presented in the appropriate format for the intended audience.

Each of these aspects will be discussed in more detail in the following sections.

6.1 The quality of the data

The various types of inputs received by asset management systems can be roughly categorized as follows:

- Road equipment inventory — guardrails, signage, lighting, etc.
- Geometric characteristics — including information concerning system-wide capacity or the capacity of individual components, along with topographical information
- Condition of the infrastructure — condition of pavement surfaces, results of inspections of engineering structures, tunnels, etc.
- Infrastructure loading — traffic flow measurements, weigh-in-motion data, composition of the car and truck fleet, hourly-weekly-seasonal traffic patterns, etc.
- Work history
- Environmental conditions — climate, weather station measurements
- Administrative data

These data must be collected in order to support the decision-making process **and** to ensure the day-to-day management of the infrastructures. Therefore, it is imperative that each piece of data is the best possible match for a given set of decision-making mechanisms and levels. One way to improve the quality of decisions pertaining to infrastructure management is to use increasingly detailed and reliable information.

It is widely recognized that asset management systems can only fulfil their integrating role if the data are reliable, stable, and credible. Ideally, the reliability of the data should be validated before they are used as the basis for a decision. Once it has been lost, credibility is very hard to regain.

More specifically, measurements must have the following qualities:

- Relevance and the appropriate level of coverage, according to the use to which the data will be put (measuring what is important and what will be used, measuring factors that can trigger action);
- Reliability — accuracy and precision based on minimal variability;
- The proper level of detail, according to the needs of the various users;
- Frequency of updates; and
- Availability and accessibility for stakeholders — the public, technical personnel, administrators, and politicians, according to their diverse needs.

The challenge of obtaining high-quality data lies in the time and the resources required to manage them. Designing efficient and effective collection processes, developing and building databases and software, and producing and maintaining quality control tools add up to a major technical responsibility.

Given the increasing pace of technological development and the attendant possibilities in terms of data acquisition (one need only consider the automated roadway condition survey equipment or the weigh-in-motion systems that are already in use), some countries report that they are having difficulty devoting the resources that are required in order to ensure the quality of their data. The concern related to quality is justified, but devoting the human resources that are needed in order to do the job can be hard in countries that face workforce shortages or labour qualification problems.

It is also possible that not enough importance is placed on the quality of data by upper-level managers, whose tendency to take the tasks involved for granted devalues the job, and makes it difficult to recruit and retain competent staff.

However, a consensus seems to be emerging to the effect that the data used in asset management systems, or at least in the pavement and bridge management subsystems and other operational systems, are increasingly seen as part of a country's road assets. In Japan, maintaining an inventory of road assets has even become a legislated obligation.

6.2 Performance indicators

Performance indicators are data aggregation mechanisms that serve to characterize, monitor, and forecast the condition of road infrastructures, and to calculate the investments that are required for maintenance or upgrades. They are a critical starting point for any program aimed at managing road assets.

Work is underway to define the nature and measurement components of performance indicators that can be used in managing road assets more precisely. A more comprehensive discussion of this issue is beyond the scope of this introductory report. However, it is worthwhile to mention that the choice of relevant performance indicators is critical in terms of improving communications among the various levels of infrastructure management.

During the cycle that just ended, Technical Committee 4.1 (Management of Assets) addressed the issue of developing a hierarchy of indicators for the precise purpose of aligning the level of indicators with the levels that exist within decision-making hierarchies.

Although technical indicators are useful for certain management activities, they can only be meaningfully read by individuals who have a considerable technical background (such as engineers), and therefore, they are of limited effectiveness as a means of communicating with road users or elected representatives.

One of the solutions that may be effective in addressing this problem is to express technical information in terms of costs. This approach provides for a certain democratization of the information, and facilitates communication with those who are responsible for administering public finances. In this context, Sweden's national report proposes an asset-accounting system based on the concept of "road capital", in which the contribution of technical data is factored into quality indicators. This is an alternative to traditional accounting methods.

6.3 Analyses

The ability of management systems to promote integration depends largely on the quality of the analyses that they make possible, which must be objective and based on realistic assumptions.

In light of this, it is necessary to develop methods for predicting the evolution of the condition of infrastructures over time, as a function of changing loads and all of the other parameters that are recognized as determinants in condition modelling. This is how we will improve the accuracy of our trend forecasting, and therefore, become more effective in terms of identifying long-term needs.

The analyses that we are referring to here draw upon objective assessments that summarize not only the current condition of road infrastructures, but also their foreseeable condition.

6.4 Presentation of results

Most of the respondent countries find charts and maps to be useful tools for communicating the results of the analyses that they perform within the framework of their asset management programs to politicians and to the public.

Several road authorities produce annual assessments or reports on the condition of their infrastructures (especially their road networks and engineering structures). These reports rely heavily on charts and thematic maps to describe current state of the infrastructures; to show the projected outcomes of various scenarios, such as budget cuts; to explain the level of funding that is required to maintain a given level of quality or to make improvements, etc.

For more specific projects, such as major development projects, cross-sectional summary diagrams are used to present an overview of the key facts and figures that can be used to support the decision-making process.

6.5 Use of asset management systems

For many countries, systems for managing road assets are the primary means of forecasting budget requirements for the development and maintenance of their road assets. They also serve to convince decision-makers of the cost-effectiveness of a given investment, and are frequently used to measure the consequences of choices, such as the failure to provide for timely infrastructure maintenance.

Thanks to their ability to project a range of different investment scenarios, these systems help to optimize road system interventions, to the benefit of users and residents.

A number of countries report that they are using management systems to demonstrate the need to shift from curative interventions to preventive maintenance.

BIBLIOGRAPHY

1. HENRIKEN, A., and LARSEN, E.S. "Asset Needs from the Bottom Up: 9th International Bridge Management Conference", *Transportation Research Circular*, April 2003, p. 139-148.
2. MEYER, M.D. "U.S. Domestic Scan Program: Best Practices in Transportation Asset Management", *NCHRP Project 20-68*, February 2007, 182 p. [http://onlinepubs.trb.org/onlinepubs/trbnet/acl/NCRHP2068_Domestic_Scan_TAM_Final_Report.pdf]

PRELIMINARY CONCLUSIONS

The national reports that were submitted have been analyzed and summarized in order to highlight the various technical and management practices that are used in the decision-making process pertaining to the management of road assets. The reports addressed this point either as a specific item or as part of a more general description of the road infrastructure management processes in their respective countries.

As was the case at the end of the August 2006 Workshop, it is clear that we must develop a connection between the technical and political levels, and that this connection must pass through the road manager, who acts as an interpreter between the two levels. The choice of means for communicating and visually representing the information is a determining factor. It is also clear that public managers can influence the amounts that their administrations invest in road infrastructures.

Another concept that stands out is the importance of the quality of the data upon which decisions are based, which reinforces the idea that asset management systems must be fed with reliable data that are useful both in day-to-day management and in strategic decision-making.

Finally, satisfying the needs of users and residents must be a key consideration throughout the process of managing road assets.