CHALLENGES FOR THE SUSTAINABLE DEVELOPMENT OF ROAD SYSTEMS

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STRATEGIC THEME 1
GOVERNANCE AND MANAGEMENT OF THE ROAD SYSTEM

INTRODUCTORY REPORT

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EXECUTIVE SUMMARY

Road transport has become the main constituent of surface transport in most countries today and is supporting the socioeconomic development. Developing countries are anticipating furthering economic development through road development. On the other hand, accompanying issues triggered by the explosive increase of automobiles, such as traffic congestion, road safety and environmental issues, have become very serious and attracted growing social concerns. Many countries are making significant efforts in order to respond to these issues.

The main theme of PIARC Strategic Theme 1 (ST1) is ”Governance and Management of the Road System” which covers major issues concerning road administrations to support sustainable socioeconomic development. Under this Strategic Theme, four technical committees are conducting studies to improve governance and management.

The ST1 Strategic Direction Session at the World Congress is designed to discuss how road administrations should tackle the above issues. 14 countries submitted national reports to introduce their country’s recent challenges to achieving sustainable development of the road system. I would like to take this opportunity to thank those countries that contributed to our session.

According to these 14 reports, the issues and approaches vary from one country to another on how to improve governance and management of the road administrations. This is due to the differences in regional conditions, economic conditions, and the stages of development of the road networks. For instance, in the growth stage the emphasis is placed on road development, thus financing is a major issue. On the other hand in a maturing stage, the attention focuses on recurring activities such as maintenance and operation. Outsourcing to private parties and developing new technologies are also important issues to maintain and improve road assets and operate road systems efficiently.

Although the situations differ, each country recognises the importance of the efficient road network operation and management to achieve sustainable development of the road system, balancing this with economic, social and environmental factors.

The policy issues dealt with in the national reports are classified broadly into two categories: road financing and efficient operation and management.

Many countries secure funding for road system development through taxation. There are two methods. One is that the financial authority will set priority on projects and the fund will be allocated from the general account budget. The other is the earmarked fund to impose tax to the beneficiaries – road users. Another major pillar for road financing is to introduce a toll road system. As for the toll road system, there are also two methods. One is to use external financial resources – private funding – for road system development to cover the budgetary constraints, and the other is to introduce user charging for the main purposes of traffic control in the urban areas. The collected tolls will be appropriated for improving road and other transport systems.

Concerning the efficient operation and management, three areas of activities - strategic planning and policymaking, capital investment, and service delivery - are typically executed by the government organizations (if the organization covers all three activities). The responsibility of road administrations can include any combination of these activities,

and these require different governance structures. In many cases, privatization and outsourcing are used in order to achieve efficiency. Moreover, in order to deliver services to meet the needs of stakeholders at the regional level, decentralization of powers to regional authorities can be observed.

No matter what form the organisations take, it is vital for them to improve performance efficiency and accountability to stakeholders. For this purpose, many countries have been adopting performance measurement for road administrations in economic, social, and environmental fields.

In addition, maximizing the effectiveness of existing systems by applying new technologies such as intelligent transport systems (ITS) has become a new focus. Network operations embraces operation of the road network in the widest sense, including improving safety, ensuring mobility and accessibility, providing reliability, exchanging information with other organizations, managing incidents and disasters for quick recovery, efficient execution of maintenance and upgrading works, and providing traffic information.

Many countries have significant concerns about the environment, and are introducing public consultation in the process of road planning and policymaking. Also efforts are made to improve environmental quality by promoting the efficient use of energy and environmentally friendly life styles.

At this session we will examine, together with the audience, how we can improve our road systems in the different socio-economic and road system development stages.

A MEMBER WHO CONTRIBUTED TO THE REPORT

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1. INTRODUCTION

1.1. Sustainable development of road systems

By 2004, passenger cars and commercial vehicles totalled more than 850 million, and road transport has become the primary mode of surface transport in most countries. Road transport cannot be effective unless it constitutes a network. As the development of road network takes time, it is essential to make continued investment with a mid to long-term vision. It is also important to secure the necessary budgets to meet the increasing maintenance costs of the existing road systems. Furthermore, accompanying issues, such as congestion, road safety, and environment have become serious and attracted growing social concerns. Thus, road administrations are facing new challenges all over the world. In response to these challenges, we need to improve road network operation through developing new technologies such as Intelligent Transport System (ITS) and to introduce performance measurement to fulfil accountabilities to stakeholders.

Issues and methods of approach for better governance differ in each country according to the region, economic conditions, and development stage of the road network. For instance, in the growth stage, the emphasis is placed on road system development thus road financing is a major issue. On the other hand, in a maturing stage the attention focuses on recurring activities such as maintenance and operation, with outsourcing to private parties and developing new technologies. Such emphases are clearly indicated in the National

Reports. Although the situations differ, each country recognises the importance of the efficient road network operation and management to achieve sustainable development of the road system, balancing with economic, social, and environmental factors.

This introductory report seeks to identify the measures that each country shares to achieve sustainable road system development by analyzing the policy issues dealt with by the 14 national reports.

1.2. Policy issues

Road financing is identified as a common issue in many countries as stated above. It is our mission to meet the challenges in securing funds for developing the necessary infrastructure with a mid to long-term vision, and introducing the framework to efficiently utilize private capital. In addition to the conventional issue of how to implement efficient development of the road network to achieve social goals, more efficient operation and management are also required. In order to meet the diverse needs of stakeholders such as mobility, road safety, environmental conservation, and accountability, these should be achieved through setting goals, measuring performance and publishing outcomes to the stakeholders. Development of new technologies such as ITS, which provides information to drivers and automobiles, is also considered a new challenge for road administrations. Performance should be improved in the field of operation and management with telecommunication technology as an effective tool to resolve road transport issues.

The policy issues dealt with in the national reports are classified broadly into two categories: road financing and efficient operation and management.

This report focuses on the above two issues and analyzes each country's practice for road financing taking into account pertinent benefit and burden relationships, and for business efficiency reflecting the needs of the users.

2. ROAD FINANCING

In most cases, taxation is applied as a measure for road financing. There are two methods. One is to procure necessary funds from the general budget, and the other is from earmarked funds. In the case of road financing from the general budget, it is difficult to secure stable funding in this way as it depends on economic and political stability. It is further difficult to develop the road system with a mid to long-term vision. While earmarked funds have the benefit of clarifying the relationship between beneficiaries and bearers, and it is easier to implement road development with a mid to long-term vision as it provides secure funding. However, it is said to induce fiscal rigidity, thus there is a need to improve accountability to stakeholders for expenditure of the road funds.

As the annual revenue generated by tax has a limit, many countries have been applying the toll road system to further road development though debt loan and to repay the debt by collecting tolls from users. In this case, it is important to develop the necessary legal system and undertake feasibility planning. It is also necessary to establish a toll payment regime which takes into account equity considerations. Furthermore, it is necessary to provide government subsidies for the unprofitable yet politically important underdeveloped routes.

2.1. Taxation system

Many countries obtain funding for their road system development through taxation. There are two main forms of funding allocation, one where the financial authority determines the priority for funding projects and the fund is allocated from the general account budget. The other method is the earmarked (or hypothecated) fund in which the road user taxes are used specifically for the road system development.

General budget

In countries with high economic growth, there seem to be fewer problems for road financing through the general account. However, the road budget is often affected by their economic and political conditions, thus it is difficult to implement road network development with a mid to long-term vision.

For instance, in Saudi Arabia, projects to be financed from the annual budget are determined according to the priorities agreed with the local government. The Ministry of Transport extracts a shortlist of road projects from the master plan and proposes a budget allocation to the Ministry of Finance.

With high economic growth and rapidly expanding vehicle ownership, road transport has become the major mode of transport in Saudi Arabia. They have nearly completed the expressway network connecting the major urban centres with financing from the general budget alone.

In Bangladesh, the budget allocated to the road sector is the country's third largest budget following those of health and education. Nevertheless, despite the funds allocated by government to the road sector remaining constant, the maintenance funding is completely inadequate. Their biggest challenge is to find a sustainable way to finance the development, maintenance and operation of the national road network by applying the user-pays principle. Currently donor countries are contributing to road maintenance through sector budget support and debt swap arrangements.

Earmarked funds

In case of earmarked funds, the user-pays principle is applied. It is the users who enjoy the benefits from road development, such as reduction of travel time and safety enhancement, and they pay for this generally through gasoline and LPG taxes. As earmarked funds are a sort of user charging system, there are following benefits;

- They can further promote efficient use of roads
- They can provide secure funds, as they are less subject to economy wide variations and other unpredictable factors
- They are easier for the taxpayers (users) to understand.

The earmarked fund system has been introduced in many countries including US, Germany, Japan and China.

In Japan the earmarked fund for road development was initiated in 1954 in order to expedite under development of the road network. The national government earmarked funds for road development from gasoline tax, LPG tax and motor vehicle tonnage tax. Local earmarked funds were from transfer tax collected by the central government and the local taxes (diesel fuel transaction tax, motor vehicle purchase tax) collected by local municipalities.

Due to the current severe financial constraints in Japan, in December 2005 the Japanese Government and the ruling parties announced their "Basic Policy for Reviewing Earmarked Funds for Road Projects" and decided to consider incorporating earmarked funds in with the general revenue pool. However, petitions objecting to this decision were received from a number of car users, automobile related organizations, and local municipalities, who are all eager to expedite road development, but they also argued for a focus on equity. This reflects the strong demands that exist for balanced development of the nation's land by maintaining the system of earmarked funds for road network development.

In recent years, the advent of cars not relying on gasoline but a new fuel (ethanol) and the development of hybrid engines are posing new challenges in securing sufficient revenue for the ear-marked funds. The possibilities of using ITS for travel-distance charging and zone charging systems are being studied in Japan. Therefore, this system of revenue collection is becoming less distinguishable from the toll road system.

In Africa, there is a move to limit the use of the earmarked funds for road maintenance and management costs. In Tanzania, a series of reform acts were enacted, and TANROADS – an executive agency, was established in 1997 to ensure full collection of revenue, and a Roads Fund Board was established to monitor its utilization. The Act has a requirement that at least 90% of the fund be used for maintenance and not more than 10% for development. Unlike other countries in Africa, the Tanzanian Board is following the Ministry of Finance requirements concerning compliance with the legislation regarding channelling revenue directly into the Roads Fund account without it first passing through the Treasury. Due to under-funding caused by losses from fuel levy collections, funding for periodic maintenance has not been adequately provided for, but funding for routine maintenance has been assured.

In Bangladesh, the potential collection of a fuel levy has been researched. The fact that road users are under-contributing to the maintenance of the road network is compounded by the low cost of gasoline and diesel due to fuel prices being subsidized by the state-owned petroleum corporation. However, a target has been set that will see road users bear the full costs of road maintenance by 2012.

2.2. Toll roads

Toll roads are another means for financing road networks, together with revenue from the general taxation system. Toll road systems vary between countries, depending on the political and financial conditions, regional and cultural differences, and stage of development of the road system. Toll roads are often used to enable external funding of projects – mainly through private capital investment – and the toll funds are used for road system development, maintenance, and operation. The toll road system is sometimes used as a network operation measure to mitigate congestion. This should also be regarded as a measure for road financing, as the toll income is often used for road or other transport network development.

Application for road system development

The toll road system is used for road network development in the following countries. Austria is using toll revenue for development, maintenance, and operation of expressways and highways. Japan is in the midst of a revenue shortfall, and in order to expedite expressway development toll revenue is being used to repay the debt incurred for construction, maintenance, and operation. Spain is studying various concession contracts

combined with government subsidies in order to promote private-sector investment in road system development.

The most common practice for obtaining private sector funds is the Public-Private Partnership (PPP) option, including the Build, Operate and Transfer (BOT) option. However, it is important to establish a framework for attracting private sector financing by developing an enabling legal framework and providing appealing projects.

In Bangladesh, an institutional and regulatory framework for private investment in national highways has been established. However, they are facing difficulties meeting the revenue requirements of a commercially funded BOT due to low traffic volumes.

Spain is promoting road financing through PPPs, by making a subsidy available (with the accompanying development of a suitable legal framework) to compensate the operator for the shortage of funds collected from users. The national report from Spain states that a traditional tolling system could be implemented "wherever sufficient traffic is generated and, in addition, an alternative route exists". In cases where no alternative route exists, it will be possible to introduce shadow tolling. And in cases where insufficient traffic exists and there is an alternative route, the state will collaborate to enable the concessionaire to achieve sufficient returns."

There is a significant challenge for countries that wish to develop routes in under-developed regions of their country and which are recognized to be of political significance, yet the traffic volumes are too low to be profitable for toll routes. As suggested by Spain, in such cases a state subsidy will be needed to make the concession viable for such routes.

Application of network operation measure

The congestion charging system introduced in London in the UK is a representative example of the application of a network operation measure. Although the toll road system had not gained acceptance in Sweden, the scheme introduced in London in 2003 changed the situation. A trial implementation of environmental charges was conducted in the Stockholm inner city area in the same year. In 2006 a referendum on the permanent implementation of the Congestion Tax was held in conjunction with the Swedish general election. The Swedish government declaration in 2006 stated, "the government will promote new models for the financing of infrastructure." In addition, the long-term focus is to achieve a fairer taxation of heavy goods transport combined with steering such transport towards a designated trunk road network. A distance-dependent tax system for heavy goods vehicles is regarded as an effective measure for achieving this goal.

The toll road system can include distance-dependent tolls, time-dependent tolls (flat rate based toll sticker) and truck distance-dependent tolls. The National Report written by Austria describes each characteristic as follows:

The time-dependent toll benefits frequent travellers and is a drawback for those covering only short distances within the motorway network. The distance-dependent toll is fair because it is paid only for the kilometres actually covered. Nevertheless, the construction of toll stations is very costly, and more staff are needed for manual toll collection. As distance-dependent tolling is the only fair method of financing the network by the users, ASFINAG (the Austrian state-owned motorway company) is increasingly investing in extending this toll system.

3. EFFICIENCY OF ROAD NETWORK OPERATION AND MANAGEMENT

Almost all National Reports refer to the challenges to improve the efficiency of road network operation and management. Many countries are reviewing their organizational structures to improve cost effectiveness and ensure efficient financing to best respond to users' demand for mobility/accessibility, road safety and environmental quality under severe budget constraint. To meet the needs of users, the know-how of the private sector is being incorporated into the road administrations in setting strategic goals and conducting performances measures to reflect these results in the management. Even if the road network operation is entrusted to a private sector company under the PPP, the road retains its public nature, thus it is important for the government organizations to govern the areas covering such activities as road design and policy-making. This is only possible when the government organizations manage to achieve overall governance to meet new challenges and maximise the use of the road system by applying new technologies.

3.1. Organisational structure

TC1.3 in its report defined the three main categories of activities executed by road administrations requiring different governance structure: strategic planning & policymaking, capital investment, and service level delivery. The three types of activities and organizations could be present within one single Road Administration, and several types of governance structures can and should co-exist for optimal performance by applying the PPP as a measure. These may also include practices of decentralization, transferring the responsibilities and powers to local governments, in order to effectively understand the needs of the stakeholders in each region. On the other hand, the governance is kept by the government in the area of planning and policy making.

Privatization

Many countries share a number of points in common with regard to privatization. Privatization is promoted in Australia, Japan and Latvia from the viewpoint of enhancing profitability for road investment and effectively delivering services.

In Austria an extreme rise in construction costs, together with the introduction of vignette system, led to a reorganization of its corporate structure. Currently, ASFINAG – a 100% government shareholding company – received the rights to all properties and assets of the primary road network, and is in charge of its operation, maintenance, financing and development.

Austria highlights the economic benefits gained by the new organizational structure that include short decision paths, high flexibility, simple organizational hierarchy and clearly defined organizational structure, that enables assigning specific tasks (construction management, maintenance, toll service, traffic telematics) to group companies. Another merit of the new structure is that they were able to expand the international business activities in the field of consulting.

In Japan, unprofitable routes increased due to the construction of local expressways with low traffic volume, coupled with the soaring construction costs. This led to a gradual increase of tolls in order to maintain the project pooling system: whereby revenues from profitable expressways were allocated to cover the deficits of unprofitable expressways as well as the cost of new expressway construction. This system met with the strong opposition from road users and the toll rates remained unchanged since 1995. This has resulted in debt totalling 40 trillion JPY (about 250 billion EURO) being generated by the four road-related public corporations which construct, maintain and operate the

expressway systems. Under these circumstances, expressway construction via the toll road system faced extreme difficulties and the four corporations were criticised for not repaying the debt and for poor economic efficiency. Consequently, the privatization of the four related public corporations became the top priority for the purpose of administrative and financial reform, and the four corporations were privatized in 2005 with the following main objectives:

- to ensure repayment of 40 trillion yen within a certain period
- to develop truly necessary routes at the minimum cost, and
- to introduce private-sector know-how in order to put into practice flexible pricing and improved services.

In Latvia after the creation of the State Road Fund in 1995 the financing of roads improved. On the other hand, they had to face new challenges, such as the outflow of road engineers to the private sector and interference in the procurement procedures. With support from the Ministry of Transport and the Government, the State joint stock company, “Latvian Road Administration” (LRA) was established. Recently the LRA was renamed “Latvian State Roads” (LSR) as a joint State - Stock commercial company.

Basically all activities of the commercial company are oriented to one main client – the Ministry of Transport – which includes road users as clients. LSR is getting more goal oriented to satisfy the mobility needs of society. With the conclusion of a five-year agreement with the Ministry, based upon its’ requirements, LSR needs little time for coordination of inner activities with the Ministry. The company’s resources are directed to performance of work tasks. By the reorganization of the road administration, the LSR is able to provide more competitive salaries to specialists, and funds needed for the purchase of necessary resources became available.

Spain in its effort to enhance business efficiency, created a public trading company which is fully empowered to act in the entire infrastructure generation process, excluding infrastructure planning or policy which are the work of the Ministry for Development. It was set up with a dual purpose, on the one hand to develop road and rail infrastructure in an efficient manner and, on the other, to create a framework for the participation of private capital.

The Public Overland Transport Infrastructure Company (SEITT) was created in November 2005 to facilitate financing for road and rail infrastructure without affecting the general budget balance. SEITT is legally constituted as a limited liability company with the particular feature that the Spanish State owns the whole of its shares, and carries out viability studies in technical, economic and financial fields, preliminary plans and construction plans, manages contracting, executes the works and operates the infrastructure generated.

The company's trading nature also allows it to set up appropriate partnerships on a case by case basis with private investors, public agencies, financial institutions, and beneficiaries of the infrastructure. SEITT can act in the different infrastructure stages ranging from design, operation, and signing agreements to promoting the creation of mixed companies and any other legal form of collaboration with entities from both public and private sectors with an interest in developing surface transport infrastructure.

This includes all types of surface transport infrastructure encompassing transport centres and accesses to the infrastructure for the other transport modes such as ports and airports, as well as the areas of public domain service areas, and associated functional elements.

Decentralization

France, through decentralization in January 2006, has transferred 18,000 kilometres of roads and 30,000 government officers to the Districts. The application of this constitutional principle, which is based on the idea that a closer proximity between decision makers and citizens improves the quality of decisions made, leads naturally to a strengthening of the powers of local governments.

Districts are given the three main categories of activities executed by road administrations. However, the State will keep the responsibility for carrying out such primary tasks as strategic planning and policy making. The State now has a dual role. Firstly, it assumes a legal responsibility to ensure the integrity and effectiveness of the overall road system. Secondly, it is responsible for the administration of major routes, road axes of national or European interest comprising 11,800km.

Currently, the State maintains, develops and distributes rules for industry practice using a scientific and technical network comprised of central technical services, regional engineering units and laboratories and public teaching and research institutions. The scientific and technical network is to remain entirely with the State to preserve knowledge and know-how.

Furthermore, the State must ensure that there continues to exist supplementary or emergency routes to provide for congestion relief, hazardous or wide-load freight transport, military convoys and transports, and economic servicing of the territory. The State also exercises a “legal control” over projects submitted from the local government on their compliance with the law.

France considers infrastructure to be a support to a transport service. This also promoted the concept that the definition of network development projects should be guided by the needs of maintenance and operation, the priority for which must be affirmed.

3.2. Performance measurement

Although approaches for performance measures vary in each country, there is potential to improve performance and accountability to the public through performance measurement. To this end, road administrations are applying performance measures for assessing economic, social, and environmental impacts.

Canada reports on the survey conducted in Canadian provincial and territorial jurisdictions regarding current practices for performance measurement of road networks, and provides an overview of the literature available on the subject.

“When developing performance measurement programs, outcome measures should be included, where these relate the activities an agency undertakes to its strategic goals. Output and input measures, which reflect the resources that are dedicated to, and the products of, a program may also be included in a performance-based management program.”

“The number of measures included in a performance-based program should be limited to those that reflect the issues that are important to an agency to simplify data collection.”

In Canada, safety is the important outcome for which agencies have commonly established practices of performance measurement. On the other hand, the outcomes of cost effectiveness, reliability, and mobility/accessibility were subject to performance measurement in some Canadian provincial and territorial departments of transportation. There was, however, little consistency in application. Not all agencies measure these outcomes, and among those that do, different measures tend to be used in different agencies.

The environment – its protection and sustainability – is cited as an important goal However, the identification of effective measures for environmental protection seems to be challenging and further work is necessary in this area.

Canada-Quebec has implemented a new management framework that commits all departments and agencies to the pursuit of sustainable development objectives. With the introduction of its environmental management system, the Ministry of Transport Quebec (MTQ) is ensuring that sustainable development is given due consideration in the day to day management of its activities, products and services.

The MTQ is preparing a sustainable development action plan, in keeping with the principles set forth in the Act and the objectives of the government strategy that will be adopted in 2007. It is also preparing an integrated plan respecting climate change and energy efficiency. Harmonizing these action plans, along with others involving biodiversity, public transit, etc., will enable the MTQ to measure its progress toward attainment of these objectives.

The fact remains that taking into consideration the fundamental principles of sustainable development, such as equity, cost absorption and polluter-pays, and the objectives related to external factors, environmental conditions and responsible consumer choices, requires a significant degree of coordination among stakeholders in both government and society.

Transit New Zealand (Transit) is an executive agency in New Zealand. Transit started using ‘Triple Bottom Line’ reporting in 2002 to balance environmental and social considerations alongside economic factors when setting and reporting its performance objectives. Transit’s performance measures were set to reflect the organisations’ environmental, social and economic objectives in a transparent, accurate and comparable format. Transit’s measures have evolved to better reflect their vision and aims.

Performance targets relate to:

- Road safety
- Noise and water
- Energy efficiency and waste disposal in Transit offices
- Completion of capital projects as forecast
- Delivery of economic benefits
- Road conditions, etc.

3.3. Improving the network operation

For many authorities, maximizing the effectiveness of existing road systems, including capitalizing on new technologies such as ITS, has become a new focus. The new

technologies are “platforms” to find solutions for system wide issues, and improve road administrations’ performance.

Network operation is about optimizing the overall performance of the network and satisfying user needs. The scope of objectives and activities includes:

- Ensuring safety,
- Mobility/accessibility,
- Reliability,
- Quick recovery from accident/disaster,
- Efficient execution of maintenance and upgrading works,
- Disseminating information.

In order to improve network operation, PPP solutions have been introduced in Sweden for the implementation of Intelligent Speed Adaptation (ISA) and alcohol ignition interlocks. Through systematic collaboration with a diversity of stakeholders and introduce innovative technologies, road administrations can reduce the cost for road development.

Ensuring mobility / accessibility

The main area of challenges for network operation is mobility and accessibility.

In Austria, traffic management and information systems have a considerable role in the optimised utilisation of traffic routes and in securing mobility. They introduced the traffic management and information system based on “Traffic Telematic Systems” which combine information technologies, telecommunication technologies (e.g. mobile radio, satellite based positioning systems), and automation technologies (control technology).

In Japan, with the introduction of electronic toll collection (ETC) employing ITS technology, traffic congestion was remarkably reduced. Also, by increasing the number of interchanges (IC) with less construction and maintenance costs for ETC users, and utilizing the ITS technology, it has contributed to enhancing user-friendliness and accessibility, and more efficient regional development.

Sweden has introduced the National ITS Stretegy in which the main focus is placed on more efficient commuting and people’s mobility. One of the aims is to facilitate accessiblity to public transport for disabled persons.

Providing information

Providing information has also become part of the main foci for network operation. As seen in Austria, the most representative example is to create the traffic management and information centre for centralised data handling, processing and monitoring.

Sweden puts a specific emphasis on in-vehicle technology, the infrastructure–related system that will allow communication between vehicle and roadside systems. The future of co-operative systems should offer the opportunity to develop new services which enhance the value of already existing services, such as traffic monitoring.

In Saudi Arabia, the Ministry is interested in establishing high quality navigation facilities and is lending support to navigation system providers by sharing its GIS data, since navigation tools are offering great assistance to road users.

Miscellaneous

ITS technologies are adopted in diverse fields to solve traffic-related issues. They are used for such areas as safety, maintenance and operation, decision-making, and environmental protection.

In Japan, research is conducted to enhance users' comfort and safe driving through VICS, ETC, and safe driving support system called AHS (Advanced cruse-assist Highway Systems) under the concept of "Smartway".

In Austria and Saudi Arabia, ITS technologies are used for road section operation to improve planning of resources. In Austria, it is used for winter services and construction site management. Also by dynamic control of speed limits with ITS technologies, Austria is trying to enhance smooth traffic flow which can further reduce noise and pollutant emissions. Saudi Arabia is using special measuring vehicles to monitor road conditions. The information is then visualized by a Geographical Information System (GIS data base), thus providing the best possible assistance for decision-making.

4. ENVIRONMENTAL MANAGEMENT

Finally, many countries expressed their concerns on environmental preservation. Austria, Canada-Quebec and Denmark are making use of public participation/consultation in the road planning and policy making process. Denmark has commented in their National Report on their efforts for improving environmental quality. Also Canada-Quebec and New Zealand in their Reports recognize energy efficiency as a key to achieving sustainable development.

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DRAFT CONCLUSIONS

Every country requires road network operation and management. Thus it is all the more important to meet the changing needs of the society by securing funds and seeking operational efficiency.