finncontact

FINNISH ROAD ADMINISTRATION

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Quarterly Newsletter of the Finnish Highway Transportation Technology Center, FinnT²

FINNT² - STARTING THE 10TH YEAR IN OPERATION

THE FINNISH HIGHWAY TRANSPORTATION TECHNOLOGY TRANSFER CENTER (FINNT²) WAS ESTABLISHED IN JUNE 1993. FINNT² HAS BEEN AN EXCELLENT TOOL IN CREATING HIGHWAY SECTOR COOPERATION IN THE BALTIC SEA REGION. THE BALTIC T² MISSION HAS BEEN A GOOD REFERENCE IN PROMOTING GLOBAL TECHNOLOGY TRANSFER NETWORKING.

Finnra and U.S. FHWA, in their Cooperation scheme, had from the very beginning common interest to form regional T² network to exchange information, knowledge and technology in road sector with the Baltic countries.

Quite soon the Baltic road sector was in close contacts through the new T² network with Finnra and FHWA. Special Cooperation projects and tailor-made training courses were planned. In the first phase the main goal was to train and familiarise T² contact people in the Baltics with communication systems, English language, expert networking, computers, new technology etc.

Later the main interest in technology transfer was set on detailed technical and practical issues in road and pavement maintenance, working methods, road keeping equipment and materials. Also quality control and total quality management took the key role in training program.

For many Baltic road specialists joint FinnT²/FHWA/BalticT² Centers training courses in early and midst 90´s were the first source of new technology. Technology transfer no doubt had an important role in development of the Baltic road sector.

In the Baltic States the growth of traffic and car park during the past ten years has exceeded all the previous estimates ever. This trend has also reflected on the changes of the issues of interest. Today when all the Baltic states are candidates to join the EU soon, the issues have changed into larger scale topics like organisation, road financing, sustainable development and human resources.

It is obvious that the past ten years T² Cooperation has brought up also for the Finnish Road society enormous amount of ideas and innovations to implement. First of all, it has created an excellent base for personal contacts and expert networking in the future.

ARTO TEVAJÄRVI

Technology transfer with Russia: Finnra's delegation in June visited bridge construction site in Obuhov, St.Petersburg. Pylons of this cable stayed bridge over river Neva will be 128 meters high and the main span length 380 meters. Bridge is on the Ring road that is the largest road project under construction in Russia.

JARMO IKONEN HAS RETIRED

THE KEY PERSON IN STARTING THE PRACTICAL T² OPERATIONS FOR FINLAND WAS MR. JARMO IKONEN. JARMO HAS RETIRED FROM FINNT².

Winter 1992-93 Mr. Jarmo Ikonen took initiative as a first director of FinnT² to guideline the procedures in order to create the regional technology transfer network in the Baltic Sea region. As early as summer 1994 Estonia, Latvia and Lithuania set up their T² Centers in partnership with FinnT².

Jarmo was the first Editor-in-Chief of the Quarterly Newsletter of FinnT². The first Finncontact (VOL.1/NO.1/1993) was published in June 1993.

We all highly appreciate Jarmo´s contribution in developing of FinnT² and making Baltic Regional T² operation known worldwide.

Mr. Arto Tevajärvi is nominated to be in charge of FinnT² and Finncontact newsletter from June 1, 2002.

Also In This Issue:

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NEW VISION OF CAPITAL PROJECT DELIVERY METHODS FOR ROADS

Despite many advances and new developments in the road sector, there are still issues and problematic areas that need innovative solutions to satisfy the needs of public road transportation systems. Countries around the world are attempting to solve the key challenges for the construction and maintenance of roads that are essential to the economic stability and as a valuable transport mechanism.

1. CHALLENGES

Society is rapidly changing and the "Information Super-Highway" is placing additional demands upon the road and entire infrastructure sector. Public sector clients are trying to meet the critical needs of this fast-paced society and the ever changing and challenging needs placed upon them.

Ageing infrastructures, cost escalation, limited resources, future potential reduced labour work force, acute regional development, environmental issues, and sprawling growth are causing concern to the management and administration of roads. These are strong challenges and incentives for seeking better solutions and innovative means to procure one of the main foundations of society, which is "roads". Roads provide accessibility and freedom of movement, which is important to a society's well being.

Some issues and problematic areas need innovative solutions in our road transportation system. Some of the problematic areas that require more attention and lack creative ideas are as follows:

- insufficient funds to meet/maintain satisfactory levels of all roads (global problem)
- very little or slow innovation
- little value-added services for the client
- quality - subjective or lack of understanding
- lack of integration

2. OVERVIEW OF CAPITAL PROJECT DELIVERY METHODS

In the beginning of 2003, Finnra will be required to outsource (purchase from the private sector), all construction work activities for all projects. Outsourcing of capital investment projects to the private sector is not a new or recent practice in road projects and there are basically no significantly new project delivery methods, but merely modifications or slight variations of existing or past methods.

The most common practice is the traditional method or **Design-Bid-Build (D-B-B)**, procurement of Design/Engineering services via one contract and another separate contract for physical works/construction. Design-Bid-Build also appears to be the most widely used delivery method quantitatively. **Design-Build** is another method that appears to be a progressing delivery model and has been tested in several countries. Design-Build is simply a project delivery method in which the Owner/Client selects an organisation that will complete the design, engineering, and construction under one agreement. Some of the main project delivery methods utilised are summarised and described as follows:

- Design-Bid-Build (D-B-B)
- Design-Build (DB)
- Construction Management (CM At-Fee (Agency or Advisor))
- Construction Management (CM At-Risk)
- Design-Build-Operate (DBO)
- Design-Build-Operate-Maintain (DBOM)
- Design-Build-Finance-Operate (DBFO)
- Build Own Operate (BOT) & Build Own Operate Transfer (BOOT)
- Full Delivery or Program Management (Rare)

Of course there are many variations or alterations of these methods, but the differences typically are with leasing, operating, owning, etc. The same attributes of Design, Construction, Operations and sometimes Maintenance are common attributes to most of these methods used for road projects.

Some of the main criticisms of the traditional Design-Bid-Build (D-B-B) method are the lack of innovation, delayed completion periods and cost overruns sometimes encountered on projects. Since the client bears most of the risks of both the design and construction aspects, there need to be better practices to assure that the client's criteria are being met through quicker project completion times and cost effective solutions. Many road administrations are seeking better practices and modern solutions, and provide better/more value-added client services. Some additional driving forces for Clients to change are as follows:

- cost savings
- faster completion of projects
- seeking innovation

3. SUMMARY OF INNOVATIVE PROJECT DELIVERY METHODS

A recent report entitled, **"Innovative Project Delivery Methods for Infrastructure - An International Perspective"** compares the different project delivery methods and summarises the results of more innovative methods that can be used for the road transportation systems. The project delivery methods, shown in purple, figure 1, highlight the key phases of the more innovative methods.

The main goals of these innovative project delivery methods are to produce projects that have better quality or longer life cycles, bring cost-savings to the client, transfer risks to the organisation (best able to manage risks), include integrated processes and complete projects faster than the traditional method. However, changing to another project delivery method usually takes time, experience and new approaches.

A proper mix of models is probably a wise decision because it would not

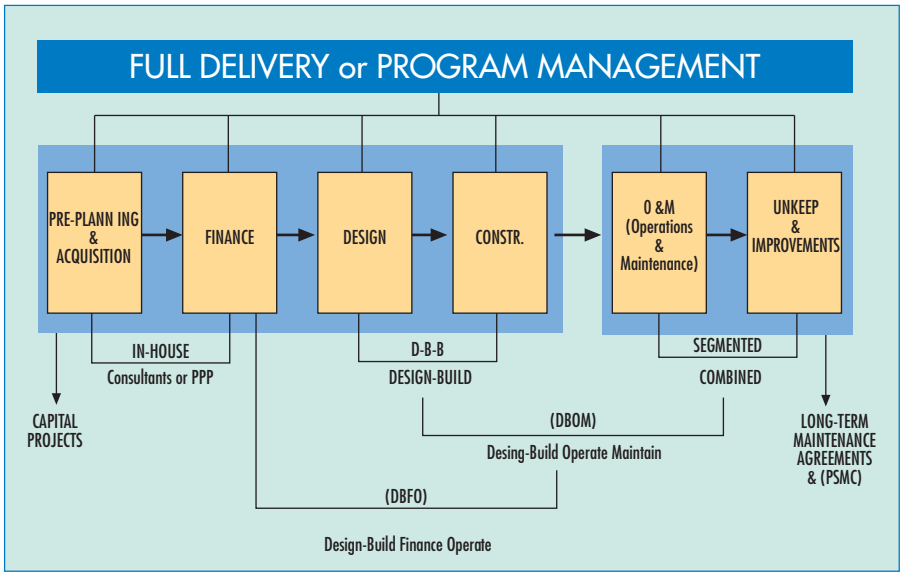

Figure 1. Innovative Procurement Methods

only allow faster completion of projects and more value-added client services, but also would keep the private sector industry balanced and competitive. It is even worthy to consider a procurement strategy mixture that would allow for a smooth transition to a more innovative culture yet seek more benefit for the road user, who is often forgotten during the procurement process.

The innovative or progressive methods identified in the report are summarised below:

- Design-Build (DB) - because of integration of Design & Construction
- Design-Build Operate Maintain (DBOM)
- Design-Build Finance Operate (DBFO)
- Full Delivery or Program Management

Additional innovative aspects that could be used in conjunction with the traditional and innovative procurement methods are as follows:

- partnering
- value engineering
- construction reviews
- incentive and disincentives
- performance specifications
- multi-parameter bidding (A+B+Quality)

4. PRESENT SITUATION IN FINLAND

As of 1 January 2001, the **Finnish Road Administration (Finnra)** entered into a new paradigm in which it became more of a pure client organisation responsible for tendering all phases of road construction and maintenance activities. Finnra's production branch, today the **Finnish Road Enterprise**, was in the same organisational structure (in-house) and was required to negotiate contract prices for road projects

Finnra will now enhance its role of public procurement of the road infrastructure and be required to tender products and services under existing public procurement law. Also, the strategic role of the client organisation is to insure a safe, reliable and effective network for the transport of goods and people within the road network in Finland.

The existing project delivery methods used today in Finland are *Design-Bid-Build (D-B-B), Design-Build (DB), Construction Management At-Fee and At-Risk (CM).* Earlier, the *Design-Build-Finance-Operate (DBFO)* method, e.g. motorway from Järvenpää to Lahti) was used.

The **Nordic** environment has differing demands compared to warmer climates. Finnish design in roads, bridges and other products are very well known and have high levels of quality designed into the process. Also, the long term experience in design and construction under cold climate conditions has been appreciated globally.

It should be noted that resurfacing and rehabilitation/reconstruction are presently procured as a capital project item and are usually traditionally procured. However, this will probably change as part of the new maintenance contracts, which are proposed to include resurfacing and, at a future period, may include rehabilitation/reconstruction.

5. NEW DIRECTION AND PROCUREMENT STRATEGY

Finnra is planning a new procurement strategy of roads with the intention of delivering better services, which will eventually include the demands/requests of the road user. The main idea is to develop a paradigm shift so more value-added services will be created and include whole life cost considerations. This is not easy to implement and will require several years to develop and refine, but the vision has been established. The next step will be to begin the process and have key innovators make the process a reality. This is the real challenge, and **"change"** seems uncomfortable when it occurs, but will be accepted in due time.

The Design-Build model has demonstrated promising results and is considered a viable delivery method. In the future, when *Information Technology* and *Interoperability* advances are realised, it will be seen that the Design-Build model might be the logical procurement model of choice. This has the potential to become a common project delivery method and widely used tool to procure the future needs for the road transport sector. As an example of this IT development, the sharing of data between differing application software (Design & Construction and others), can be a significant and important tool for the Client prior to the tendering process. If all the detailed information and data are readily available during the procurement phase, then wise decisions can be made to secure cost-effective, quality roads.

Design-Build Operate Maintain (DBOM) includes the maintenance activities and any operational parameters such as real tolls or other services. The goal of this model is to seek more whole life costing considerations. Since maintenance is included into this procurement model, then the design is able to reflect the operational considerations of maintenance and requirements for durable roads. However, this requires a funding stream to allow this model to be effective.

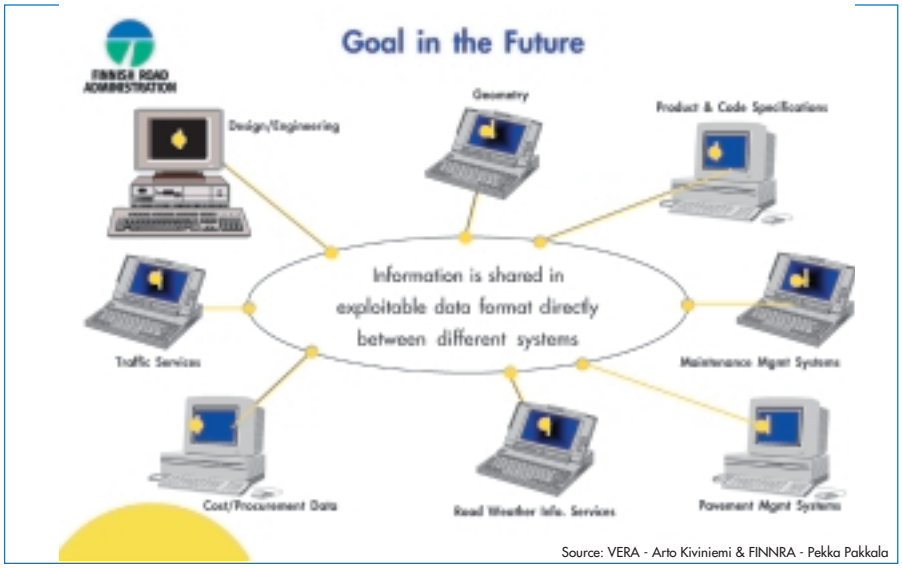

Figure 2. Information Flow for Decision Making.

The Design-Build Finance Operate (DBFO) was utilised in Finland to procure the delivery of a two-lane motorway from Järvenpää to Lahti. This was a **"shadow toll"** because a real toll is not acceptable to the Finnish culture and by the road user. Presently there are several projects under consideration and the DBFO model is being analysed as a potential procurement model candidate. This also requires a favourable political climate because these decisions are made at a higher political structure. The main reasons for the consideration of this procurement model are to complete roads and projects that could not even be considered due to the lack internal funding levels.

Some view Construction Management At-Risk (CM At-Risk) as a new and improved method, but Design and Construction is not integrated into this method. Those public clients who have downsized their organisation or experience a lack of management capabilities and resources mainly use it.

As part of the new change to the construction of capital projects there are other development issues that increase value added services. Some of these ideas are under development and are listed as follows:

- outcome-based criteria & performance specifications
- procurement strategy
- value engineering
- proper incentives & disincentives
- partnering

As a final thought, these so called innovative methods are not to be considered lightly. They require pilot testing, considerable planning and internal development and continual refinement. It might appear that these innovative delivery methods are simplistic to utilise and easy to develop, but it requires a significant amount of effort to develop and a significant change in the client organisation. These project delivery methods are actually tools that can be utilised for a project, and the client organisation needs to be educated and sophisticated to utilise the best ones for a given project. A spectrum of models can be utilised and will depend upon a strategic mix and a proper balance that can be managed by the client organisation.

6. PARTNERING AND TRUST

The formal definition of partnering is a long term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. For most public road administrations, this is not possible or may even be considered illegal to make long-term partnering arrangements. But, project partnering can be utilised and can be a very beneficial tool for capital contracts. Some of the goals or reasons for partnering in capital projects are listed below:

- obtain open and fair specification interpretations
- create win-win thinking
- resolve differences
- remove roadblocks
- build & develop **trust** and commitment

Figure 3 shows the partnering situation and how it can be used in the supply chain management. It should be realised that innovation typically comes from the "bottom up", or through the contractor and supplier network. The R&D budgets of most client organisations are focused on safety and traffic issues rather than material, product and IT developments. Therefore, partnering could provide the potential to maximise innovation or at the minimum, share in the risks/rewards to stimulate innovation.

A report published in the USA by the National Co-operative Highway Research Program (NCHRP), called "Guidebook to Highway Contracting

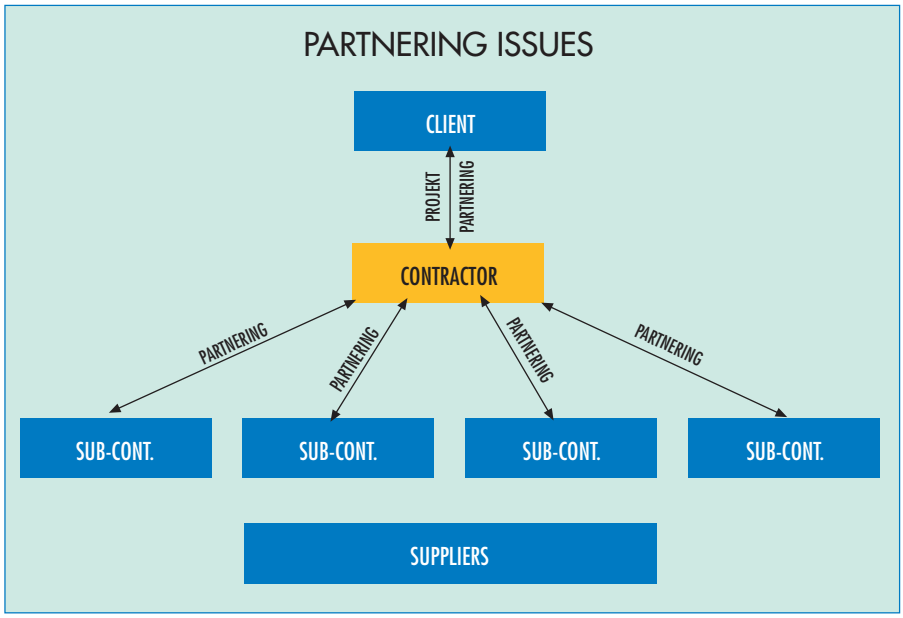

Figure 3. Partnering issues Scheme

for Innovation: The Role of Procurement and Contracting Approaches in Facilitating the Implementation of Research Findings" (NCHRP Report 428), shared the results of a survey and revealed that **"Partnering"** was the number one approach to creating innovation. This report was based on a research study on capital investment projects.

Results from most countries indicated that the client organisations had more difficulty in understanding and practising the project partnering concept. This is probably due to the dramatic change from the role of decision maker to a more negotiating (management) type of role.

The report titled: "Innovative Project Delivery Methods For Infrastructure - An International Perspective" can be downloaded in pdf format via www.finnra.fi (English Pages /Finnra Today).

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Mr. PEKKA PAKKALA, Finnra

New innovations:

MOBILE PHONES IN TRAVEL TIME MEASURING

Reliable and real-time data regarding the current traffic situation is the prerequisite for other functions in traffic management, such as the provision of traffic-related information and traffic control. In order to create the basic structure for traffic management, the Finnish Road Administration (Finnra) has profiled the development of traffic monitoring as one of the main objectives within the traffic management. Recently Finnra conducted a pilot project to collect traffic data through mobile phone positioning. The preliminary field test results proved to be very promising and reliable. This innovation may be revolutionary in future traffic monitoring.

1. BACKGROUND

Traffic management remains a task of the Finnish Road Administration (Finnra), while traffic control, as well as the part of informing, will be conducted by the authorities. Traffic monitoring in Finland is based on two main techniques: the older method, used since the late 1980´s, collects point-specific traffic information, such as traffic density, speed and types of vehicles, by means of inductive loops; the other method is based on identification of registration plates by cameras and image interpretation techniques. This produces link-specific data on travel times and speed. The method is used on various sections in southern Finland on Ring Road 1, Highway 4 - between Lahti and Heinola, and Highway 7 - on the road section leading through the border station in Vaalimaa to Russia.

The data produced through these systems has been good and their functioning has been reliable, but identification of registration plates is largely dependent on weather conditions. Moreover, the construction and maintenance of the existing systems has proved to be rather expensive. It has been estimated that to equip the main roads to correspond to the quality requirements of traffic monitoring needed for the basic traffic management services, would require a minimum of EUR 50 million overall financing with the current technology. Therefore, Finnra is carrying out a survey on new methods for traffic monitoring.

2. NEW PROPOSALS

In 2001, Finnra conducted a preliminary study on the possibilities of utilising mobile telephone positioning for collecting real time traffic data. The study report was compiled by the Technical Research Centre of Finland (VTT). The report focused on, among other things, different positioning technologies and legal issues. On the basis of this study, it was found that the preconditions for testing the system existed.

Collecting traffic data through mobile phone positioning can be conducted anonymously, so that it does not threaten privacy. On the basis of an invitation to tender, Finnra assigned a Finnish mobile operator, Radiolinja ltd. to implement a travel time service based on mobile positioning in two pilot target areas: Ring Road 1, and Highway 4 - between Lahti and Heinola - from 25 March to 30 June, 2002.

3. FIELD TESTING

In Finland there are excellent possibilities for using mobile phones to collect

traffic data. At the end of August, 2001, almost three out of four Finns had a mobile phone subscription. It is not even necessary to detect all mobile phones in order to form a reliable estimate of the traffic situation. It has been estimated that, with regards to the most crowded main roads, it will be sufficient if mobile phones are detected in five per cent of the vehicles.

Travel time is a clear indicator for determining traffic flow or for detecting possible incidents in traffic. Mobile phone positioning offers, in measuring travel time in particular, an alternative for the method of identifying registration plates based on image interpretation techniques. For the road users, real time travel time data also brings benefits through more efficient road user information services on traffic flow.

Protection of privacy is not threatened by using mobile phones in travel time service, since mobile phones are monitored with changing codes completely anonymous in predetermined locations. The system monitors when the code passes starting point A and termination point B of the monitoring link. After the travel time has been calculated, the code is no longer needed. This solution has also been assessed by the data security experts engaged in the special NAVI programme of the Ministry of Transport and Communications.

Operation of this system is based on the method that a mobile phone travelling on a certain route always changes the base station at almost exactly the same point. To some extent, the location of the base stations restrict the placing of the points, but it can be adjusted, for example, by altering the direction patterns of the base station antennas. This way the checking point can be located more precisely to the selected point. Otherwise, the method utilises regular data communication in the mobile network and does not require changes in the network or mobile phones. Travel time observations can be made from all mobile phones switched on.

The more traffic there is along an observation link, the more reliable the travel times are and the significance of deviation is reduced. Other factors that may interfere with measuring accurately would be a railroad line close to the road or a bus with a large number of mobile phones switched on inside the bus.

4. CONCLUSIONS

The system has been in use since 25 March this year and so far the preliminary results have been very promising. In order to create the good conditions for comparison, totally eighteen monitoring links have been formed. And they are set as close to the monitoring links of the existing travel time monitoring systems as possible. The Technical Research Centre of Finland will draft an assessment report on the system, mainly consisting of the comparison of data acquired from the registration plate identification system with the data produced from the mobile positioning system. See attached Figures 1 and 2.

The assessment report will be completed by the end of November, 2002.

If the system proves to be functional, it will be utilised in locations where travel time measuring is currently not available. Furthermore, in the future this system can be used for detecting traffic disturbances caused by incidents that can be estimated in advance to have an impact on the traffic flow, such as holidays, road construction work, special transport operations or events attracting large audiences.

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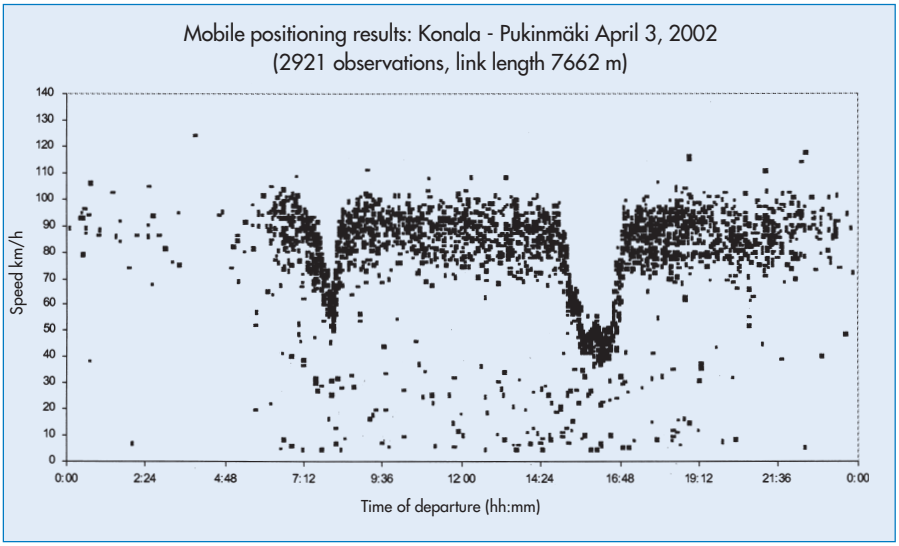

Figure 1. Mobile positioning results: Konala - Pukinmäki April 3, 2002.

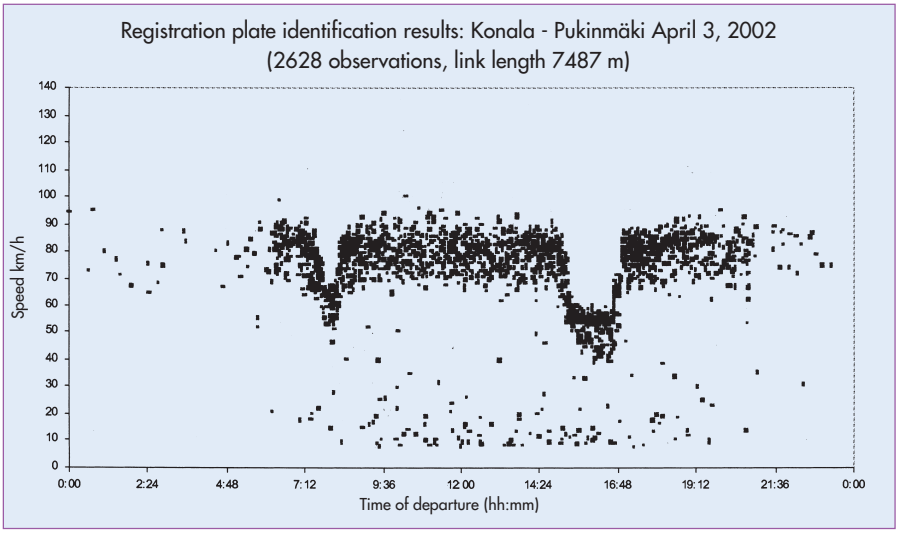

Figure 2. Registration plate identification results: Konala - Pukinmäki April 3, 2002.

ROADEX – LOW TRAFFIC VOLUME ROAD CONDITION MANAGEMENT IN EU NORTHERN PERIPHERY AREA

In 1998 – 2001 the road regions in Lapland, Finland, the Northern Region in Sweden, Troms County in Norway, and the Highlands in Scotland have initiated a technical, transnational collaborative project called ROADEX under European Union Northern Periphery Program. The aim of this collaboration is, through the exchange of experience, to identify the best practice strategies and develop procedures for dealing with common challenges associated with the maintenance of low traffic volume road networks in sparsely populated northern regions.

1. INTRODUCTION

The main inter-urban highways of Scotland, Norway, Sweden and Finland are recognised by road users to generally be in satisfactory condition. In comparison, the less frequently trafficked rural roads have suffered from financial neglect and are falling well below modern standards. They have not been designed to cope with the combination of seasonal freeze/thaw cycles of the northern climate and the heavy axle loads of modern transport. Recent developments in transport and industrial logistics have substantially increased the stress on road structures as the total weight of heavy transport has been increasing and modern super-single tyres are replacing traditional twin tyres on heavy transport vehicles.

The focus of ROADEX sub project A (SPA) was the low traffic volume roads of the partner districts of Lapland, the Northern Region, Troms County and the Highlands, which have less than 1000 vehicles average daily traffic (AADT). In the four partner districts, these roads total 32,800-km, which accounts for 85% of their total road network (Figure 1). Gravel roads are also given special attention, as they have some distinct characteristics and a significant role in the local road networks of the Nordic partner districts. More than 11,000 km, approximately 29 % of the road network in the NP area, are gravel roads.

One of sub project A's special interests was the use of traffic restrictions. Especially during the spring thaw period, a road structure can deteriorate dramatically in a very short time. Traditionally the road district administrations have dealt with the problem in two ways:

a) by imposing load restrictions for sensitive road sections, or
b) by improving the road structure layers.

Reductions in financial resources have prevented strengthening of the road network. There is increasing pressure to set load restrictions to keep the road network performance at the current level. On the other hand traffic restrictions can cause major logistical disadvantages for local livelihood. According to the calculations done in Sweden, load restrictions generate annually extra transportation costs of 900 million SEK (99 million Euro) to the Swedish paper industry.

2. LOAD RESTRICTION POLICIES

The majority of load restrictions and also the most difficult bearing capacity problems are related to gravel roads. Genarally, those roads are not properly designed and constructed. During the spring thaw it is almost impossible for cars to pass through some of the worst road sections and occasionally the roads must even be closed.

The policies of the national road authorities, on load restrictions, vary a great deal, as do the practices in each ROADEX partner districts. Finland and Sweden allow the heaviest total weights (60 tonnes) on almost all-public roads. Only some temporary load restrictions are set especially during the spring thaw.

Finland has implemented permanent load restrictions only on roads with weak bridges. The Northern Region in

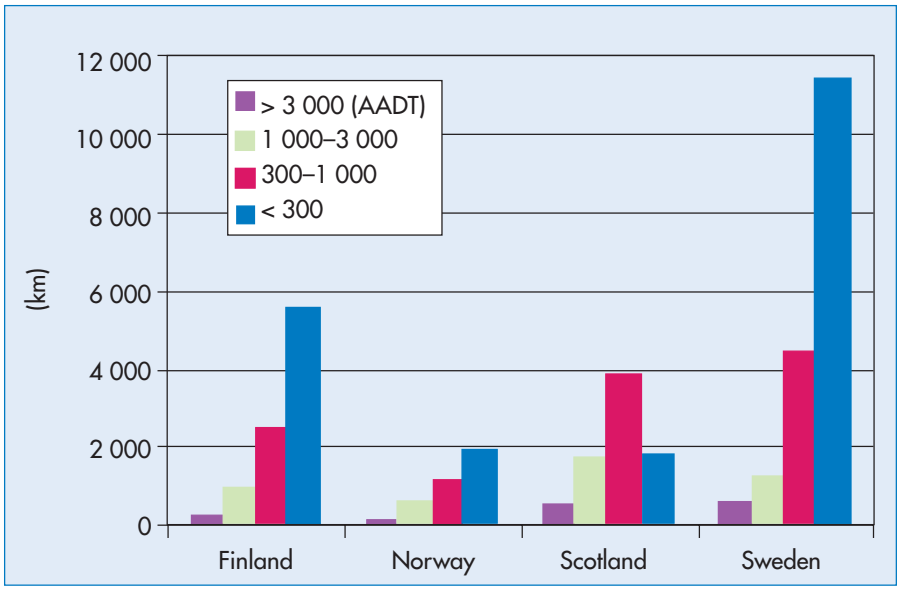

Figure 1. Traffic volume (AADT) in ROADEX project partner districts: Lapland in Finland, Troms in Norway, the Highlands in Scotland and the Northern Region in Sweden.

Sweden faces the most difficult situation among the partner districts. About 1/3 of the road network there has permanent or temporary load restrictions.

Norway has adopted another policy and temporary load restrictions are not used. Troms County roads have permanent load restrictions of 40 – 50 tonnes throughout the year. The Highlands has implemented permanent or temporary load restrictions on only a few roads. The maximum total weight permitted in Scotland is 41 – 44 tonnes.

The maximum tyre pressures permitted are basically the same in each country. However, there is general consensus that these pressures are too high and that modern super single tyres especially are causing problems for pavement structures.

Sweden and Scotland have more protective policies regarding road structures. The Northern Region uses temporary load restrictions, if there are indications of pavement structure defects. On gravel roads damage must appear on more than 1% of the road before temporary load restrictions are imposed. Scotland sets permanent load restrictions, if there is concern that increasing heavy traffic might break the road.

The enforcement of load restrictions also varies in each country: while the Troms county road office can impose fines or other sanctions for overloaded trucks the Highland Council and Lapland region can only report the offenders to the police.

3. MAINTENANCE AND REHABILITATION TECHNIQUES

The ROADEX project did not reveal any major new in maintenance techniques. However, there were numerous special rehabilitation and repair techniques and materials used successfully in some districts that could easily be transferred to the other partner districts and other countries. These techniques can be further improved. The ROADEX field tests provided some interesting results and also showing new problems with these techniques.

In maintenance and rehabilitation there are several techniques, materials and practices used especially for stabilising the pavement and base course, as well as reinforcing and insulating the road structure. In discussions with the district staff, and in the replies to questionnaire, the road mix, remix stabilisation and steel mesh reinforcement techniques were especially mentioned frequently. One of the more interesting findings with maintenance was the surface dressing technique. That was used commonly in Scotland and Norway. It seems to be an economical method for protecting pavement structure against water and at the same time adding pavement friction.

4. CONCLUSIONS

The results of the ROADEX project have shown that the problems related to low traffic volume road condition management were surprisingly similar in ROADEX partner districts. The main problems are related to poorly functioning drainage. Especially, roads located on transversely sloping ground, permanent deformation due to freeze-thaw cycles, poor quality road materials and road sections constructed over peat were problematic. A special structural problem with some gravel roads in Norway, Finland and Sweden is that they lack a proper structure. During the spring thaw those roads may loose their stiffness, forcing road officials even to road closures.

In spite of similar problems there are different road condition management strategies and techniques in partner districts. When load restriction policies are compared, Finland is mainly using temporary load restrictions during the spring thaw. Norway does not apply temporary load restrictions at all but uses permanent axle load restrictions on its weaker roads.

There are also some differences in road condition monitoring systems and rehabilitation methods. Troms in Norway and the Northern Region in Sweden mainly monitor road surface performance through roughness and rutting measurements. Lapland measures structural condition using FWD and GPR systems. The Highlands in Scotland, does not have any systematic road condition monitoring system. Decision-making in rehabilitation is based on visual inspections.

In rehabilitation project bitumen stabilisation and pavement remix recycling have become more and more popular in Norway, Sweden and Finland. Steel reinforcement against longitudinal cracking and permanent deformation is widely used in Sweden and Finland; applied in some projects in the Highlands but not at all in Troms. The Highlands and Troms are successfully using the surface dressing technique as a preventive maintenance method. That method is not at all used by Lapland or the Northern Region.

One significant problem for low traffic road management, shared by all partner districts, is that almost all the structural maintenance funds and resources are allocated to main roads. Thus the performance of main roads has been improving over the last few years, while the state of low traffic volume roads has turned worse. More publicity and pressure on road districts has also set by the industries using the lower class network for their transport operations. These industries make complaints on load restrictions and poor condition of low traffic road network.

Within this setting, road authorities have been challenged to:

a) develop new and innovative techniques for monitoring road structure and road condition in order to focus rehabilitation measures on just the weakest road sections;
b) develop cheap "fit for purpose" rehabilitation techniques for these roads, and
c) develop new methods for real time monitoring of road conditions during the spring thaw period in order to optimise the time when the load restrictions should be applied.

R&D work required to meet these challenges will be done within the ROADEX II project. That is already well underway and will be completed in 2005.

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