



INTERREG IIIB NORTHERN PERIPHERY PROGRAMME • INTERREG IIIB NORTHERN PERIPHERY PROGRAMME

**MAIN PROJECT  
FINAL PROJECT REPORT**

**Project Name: ROADX II**

**Project Registration Number: 01/01/09**

**Measure: 1.1**

**Project Website: [www.roadex.org](http://www.roadex.org)**



For completion and submission to the Northern Periphery Programme Secretariat by:

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## Executive Summary

The Project proposed a **3 year trans-national technical collaboration** across the Northern Periphery **to develop ways for interactive and innovative road management of low traffic volume roads**. It builds on the networks created during the successful Article 10 ROADEX project with additional **inputs from local industry involving heavy road haulage**. The Project **deals directly with roads and transport issues** raised by the unique combinations of remoteness, climate, ground conditions, low traffic volumes and long distances to markets. Reports are published through the ROADEX website and presentations have been made to seminars and conferences to spread the assembled knowledge to the fullest extent.

The objectives were to "Develop and Trial Interactive and Innovative Road Management Practices for Low Traffic Volume Roads" through research and application to:

- Map the weak sections of road and focus in on them
- Understand the processes causing the problems
- Innovate - find new 'fit for purpose' construction and treatments

The objectives have been achieved through:

- Close co-operation and understanding of all participants including
  - a. networking between Partners
  - b. sharing in-house information
- Communication with, and involvement of, stakeholders
- Focussed project management and research (using external consultants, universities & technical institutions and partners' staff) through
  - c. Questionnaires, internal and external, and seminars
  - d. Mapping the weak sections of road and focus in on them
  - e. Understanding the processes causing the problems including carrying out trials in the Partner areas
  - f. Innovation - developing new 'fit for purpose' construction and treatment methods
- Providing access to written outputs and the network through a web-site – [www.roadex.org](http://www.roadex.org) and a multi-media DVD

The ROADEX partnership has so far assembled the following "ROADEX knowledge":

- 12 formal reports (totalling over 1500 pages of technical and research information);
- a range of engineering papers presented at international conferences and seminars;
- a multimedia DVD - 2,500 copies being distributed worldwide;
- a regularly updated [www.roadex.org](http://www.roadex.org) website that has had around 90 'hits' per month since it was re-launched under ROADEX II.

Some of the "ROADEX Solutions" developed are:

- New information for political decision makers about the importance of rural road condition
- New survey practices to focus on actual problem sections and making correct diagnosis for the problems
- New models and treatment agents for designing economical structures against permanent deformation
- New fit for purpose road construction designs and life cycle information
- New techniques for real time road condition monitoring
- New ideas for using modern information and sensor technology in rural road network condition management

## Partners

	<i>Name of partner organisation</i>	<i>Partner country</i>
1	The Highland Council	Scotland
2	The Finnish Road Administration District of Keski Suomi	Finland
3	The Swedish National Roads Administration, Northern Region	Sweden
4	The Norwegian Roads Administration, Troms District	Norway
5	Forest Enterprise/Forest Civil Engineering	Scotland
6	Metsähallitus	Finland
7	Lapin Metsäkeskus (Forestry Centre of Lapland)	Finland
8	Metsäliitto Osuuskunta	Finland
9	Stora-Enso Oy	Finland
10	The Norwegian Haulage Association	Norway
11	Comhairle nan Eilean Siar (Western Isles Council), Scotland	Scotland

**Project website:** [www.roadex.org](http://www.roadex.org)

## **Project Information and Objectives**

### **Background:**

The road districts in the Northern Periphery share some regional and environmental characteristics as well as administrative issues which shape and challenge the policies and techniques of road maintenance.

- Winters require resource-demanding de-icing and snow removal service and road users in the regions are constrained by reduced driving speed and temporary road closures as a result of slippery roads, high passes and drifting snow.
- Sparse settlements, long distances, and the location of basic industries
- Roads in the Northern Periphery belongs to the middle or low class road network carrying traffic volumes lower than 300 vehicles per day and not designed to cope with seasonal freeze/thaw cycles nor the heavy axles of modern haulage transport
- The increasing weight of heavy vehicles (up to 60 t in Finland, compared to the average 30 t in the EU at the start of the project) and the use of modern super-single tyres substantially increase the stress put on road structures
- Modern logistics in industry, based on continuous raw material deliveries, requires a steady transport flow in all seasons.
- Society's demand to keep up the level of performance of the road network with reducing financial resources.
- In economical calculations the lifetime of a road structure is generally estimated to be 30-50 years. As many parts of the main road network date from 1960-70's, an accumulation of road rehabilitation works within the next ten years is inevitable.

The road districts with responsibility over a large network of low and middle class roads vital to local livelihood will face a big challenge in prioritising the measures needed to maintain service standards in this context of "making more of the less" with limited resources.

### **Starting Situation:**

The Article 10 Pilot ROADEX project (1998-2001) provided, for the first time, the opportunity for a cross national forum to permit the regular exchange of information and technologies between road districts in The Northern Periphery. This successful Project produced real and tangible benefits, not only in the creation of professional networks which had not previously existed, but also through physical transfers of well working solutions across the participating member states of Finland, Sweden, Norway, Scotland and Iceland.

Under the pilot Project best practice techniques and construction practices were documented and disseminated and as a result many of these have already had direct applications across the Northern Periphery roads districts. For example, innovative road rehabilitation measures from Finland have been applied on the public road network in Caithness in the Highlands of Scotland and conversely surface dressing technology from the Scottish Highlands has been considered for application on Scandinavian roads.

The ROADEX project identified gaps in knowledge that the partners (public road authorities from Finland, Norway, Sweden and Scotland) easily agreed to seek answers for through the ROADEX II project.

### **Project Partnership:**

In 1998 partners from Finland, Sweden, Norway and the Highlands of Scotland (supported by the Scottish Executive) came together to try to create a transnational network of road maintenance managers across the 4 countries with the aim of sharing experience and techniques. Thus ROADEX came into being with the Article 10 pilot project (1998-2001) that created the ROADEX network and commenced the benchmarking process of practices between Partners. The current ROADEX II project

(2002-2005) enlarged on the fledgling co-operation and widened the benchmarking process into the area of joint research into fields of common interest. A new ROADEX III project plans to build again on this evolution and be joined by additional new partners from the north Atlantic to specifically address the implementation of ROADEX outputs.

ROADEX II is a development of the ROADEX project and benefited from having had a successful Steering Committee in that project.

The network of Steering Committee members was already in place at the start of the new project and while some faces and organisations have changed the basis is still there. This has enabled the Steering Committee to come to quick agreement on project plans and budgets without a protracted need to “explore” and learn about each other first. New members and substitutes to the Committee have been quickly made to feel at home and been able to contribute equally.

All the road district partner organisations have been going through periods of organisational change which made it harder for members to concentrate of the project, however the need for ROADEX II was fully recognised by partner organisations and the project has been well supported. Indeed the partners have begun to consider proposals for a future ROADEX III project.

The relationships between the three ROADEX projects are shown in the diagram below illustrating the central role of the established (and growing) partner network in providing management continuity for the three projects. It is this continuity of strong links between partners, aided by experienced project management, that is the strength of the ROADEX network and it is this developed strength that has enabled ROADEX II, and will enable ROADEX III, to run effectively from “day one” and deliver the project outputs in the time available.



Diagram showing the relationship between ROADEX 1, II & III

## Project Objectives:

The high level objectives for the project were as follows:

"Develop and Trial Interactive and Innovative Road Management Practices for Low Traffic Volume Roads" through research and application to:

The ROADEX II Project was tackled in 3 phases:

- Phase I, 'Problem Identification', where problem road sections in the Partner districts are identified by means of questionnaire surveys of local drivers (mainly heavy haulage companies).
- Phase II, 'Understanding and Analysis', where these identified problem sections are mapped and investigated so that their underlying causes are fully understood.
- Phase III, 'Innovation and testing', where new 'fit for purpose' solutions and treatments are developed.

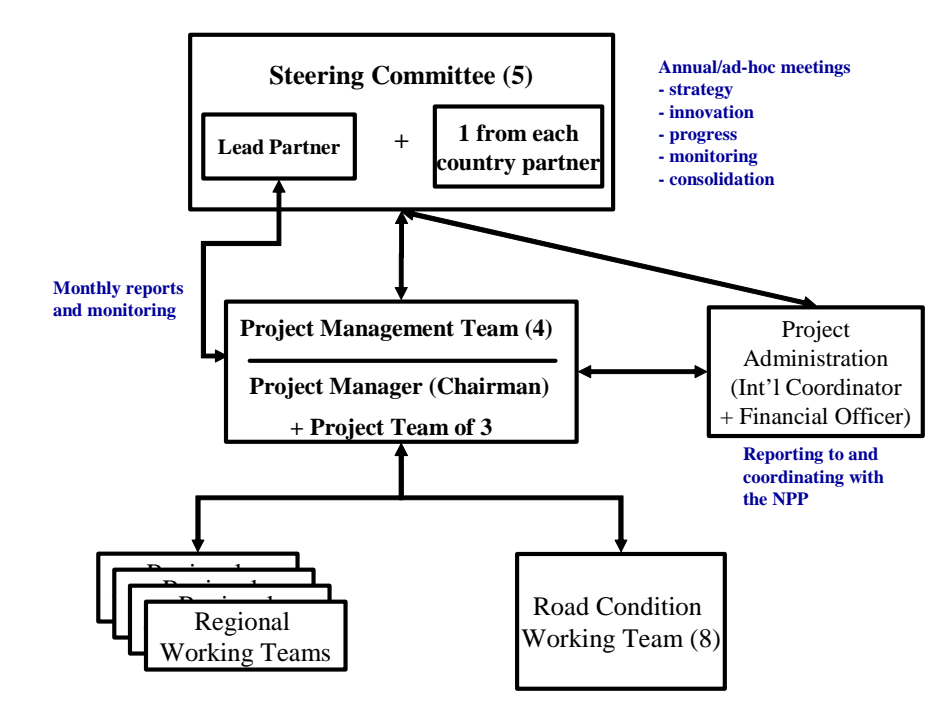
The tasks undertaken are described below following the Project Management section.

## Project Implementation

### Project Management:

The management structure for the project has been largely carried over from the Article 10 pilot with the main change being that a single Project Manager was employed to deliver the main research and associated publications. Roadscanners of Finland won the Project Management contract through an EU procurement process; Timo Saarenketo, Managing Director, was then nominated Project Manager.

The management structure is represented below :-



The project *Steering Committee* comprised a Chairman (Project Leader) and 4 Partner representatives; one for each country involved. The Project Manager, Financial Officer, and International Co-ordination Officer attended to advise the Steering Committee. The meetings were open to all other partners and rotated around the partner countries. The local country partners were especially encouraged to attend those meetings held in their country. There have been 6 meetings of the Steering Committee during the project, one more than initially planned; the extra meeting was scheduled once the time extension for the

project was confirmed in 2004. The Committee was responsible for strategy (including budgets), innovation, and monitoring progress (work and financial) and for ensuring that the outcomes of the project were consolidated within the partner organisations and as widely as possible.

A *Project Management Team* of 4, lead by the Project Manager and involving the Project Leader, International Coordination Officer and Financial Officer, undertook the practical day-to-day running of the project through their links to the partners in each country.

A *Road Condition Working Team* of 8 experts was responsible to the Steering Committee through Roadscanners and the Project Manager for delivering the project research and outputs. The team initially included 1 Consultant and 2 University Academics plus one staff member from each of The Highland Council, Comhairle nan Eilean Siar (Western Isles Council), The Swedish RA and The Norwegian PRA. As the project progressed the team was augmented by 2 members, one from Comhairle nan Eilean Siar and another from the Swedish National Roads Administration. This team successfully provided a direct linkage to the Project Manager for each research task and encouraged sharing of knowledge between the tasks.

### **Phase I Tasks:**

The project has tested the use of a consultative questionnaire amongst “business” road users to identify their needs and their feelings of the service provided by the roads authorities. In Highland the questionnaire was distributed to some 90 stakeholders including haulage companies, bus and coach operators, ambulance services etc. To boost the response rate, follow up telephone calls were made and in some cases the questionnaire completed over the phone. This may well have enabled the smaller businesses to become involved in the exercise.

The questionnaire was used in each partner country with a 30% response rate overall which is felt to be statistically reliable. The responses have been compared to the views of road maintenance managers and a good correlation found. The results are presented and summarised in a formal report which is available on the project web site.

‘User perspective of ROADEX II test areas’ road network service level’,  
(T Saarenketo, Project manager, Finland)

### **Phase II Tasks:**

This is the “understanding” phase. Research tasks were allocated to experts in the relevant field along with a fixed price budget. Budgets were in the main adhered to although some were adjusted to recognise a better division of work between experts. The tasks and leading expert (\* - partner employee) for each were as follows:

- Task 2\_1 ‘Permanent deformation related to freeze-thaw cycles’  
(A Dawson, University of Nottingham)
- Task 2\_2 ‘New material treatment techniques’  
(P Kolisoja, Tampere University of Technology, Finland)
- Task 2\_3 ‘Managing spring thaw weakening on low volume roads’  
(T Saarenketo, Finland)
- Task 2\_4 ‘Socio-economic impacts of road conditions on low volume roads’  
(S Johansson, Sweden)
- Task 2\_5 ‘Dealing with bearing capacity problems on low volume roads constructed on peat’  
(R Munro\*, Scotland)
- Task 2\_6 ‘Drainage on low traffic volume roads’  
(G Berntsen\*, Norway)
- Task 2\_7 ‘Environmental guidelines’  
(J Ullberg\*, Sweden)

### Phase III Tasks:

This is the “innovation” phase aiming to find new ‘fit for purpose’ management, construction and treatment methods. These three reports pull together the outcomes of Phase II and present them in highly readable reports. The experts involved in each report are identified (\* - partner employee).

- Task 3\_1 ‘Road Management Policies For Low Volume Roads – Some Proposals’  
(Svante Johansson, Seppo Kosonen\*, Eilif Mathisen\*, Frank McCulloch\*,  
Timo Saarenketo)
- Task 3\_2 ‘Monitoring, Communication And Information Systems & Tools For Focusing Actions’  
(Timo Saarenketo)
- Task 3\_3 ‘Structural Innovations’  
(Saara Aho, Timo Saarenketo, Geir Berntsen\*, Andrew Dawson, Pauli Kolisoja, Ron  
Munro\*)

### Other Tasks:

Towards the end of the project a questionnaire and analysis were undertaken to update the descriptions of the road authorities published under the first ROADDEX project. This is reported in the ‘Roadex I Update Survey’ report authored by Timo Saarenketo, Johanna Saari, Saara Aho, Kent Middleton all of Roadscanners.

DVD filming, production and graphic design was carried out by Mika Pyhähuhta of Laboratorio Uleåborg, Finland.

Report Production was coordinated by Roadscanners who also ensured a consistent presentation format was used. Proof reading of reports was undertaken by English speaking partners and Roadscanners. The Highland Council, as lead partner, will keep the original electronic documents so that they are available for future update.

The project Web Site at [www.roadex.org](http://www.roadex.org) was developed and continues to be managed by Richard Evans, The Highland Council. Graphic design was assisted Laboratorio Uleåborg.

### Task Plusses and Minuses:

The ROADDEX team successfully produced their allotted outputs within the project time span. Some tasks required more active management by the Project Manager to achieve that. Slippage, where it occurred, was caused by other non-ROADDEX workload and resulted in a limited reallocation of work around the team.

### Project Management Plusses and Minuses:

Feedback from the Project Manager at the end of the project is summarised below as plusses (+) and minuses (-):

- + Project administration (The Highland Council) well done, allowed project manager to focus to research and reporting
  - Only problems were the cost monitoring delays (4-6 months)
  - + Lump sum budgeting works fine (small problems with universities)
- Too many projects compared with funding level
- + RCWT good and motivated team, slight problems with one project
- + Results great, some topics need more data / more work (Roadex III)
- + ROADDEX movie was a learning experience, great to work with Mika Pyhähuhta
  - In Finland forest partners not very actively involved
- + Steering Committee support was excellent
- +/- Great personal network but should be widened

## **Project Results**

New knowledge has been developed and is reported in 12 reports amounting to around 1500 pages in total. The report titles are listed above in the task descriptions. The Environmental Guidelines task also produced a field booklet intended for use by road maintenance operatives and their immediate managers.

In summary the headline ROADEX knowledge and solutions that have been developed are:

- New information for political decision makers about the importance of rural road condition
- New survey practices to focus on actual problem sections of road and making correct diagnosis for the problems
- New models and treatment agents for designing economical structures against permanent deformation
- New fit for purpose road construction designs and life cycle information
- New techniques for real time road condition monitoring
- New ideas for using modern information and sensor technology in rural road network condition management

A ROADEX II DVD has been produced containing an hour long video; this was not planned at the time of writing the application. The problems faced by road users and managers in the partners' regions, the research undertaken and the solutions developed by the project are introduced on the video. It also contains electronic copies in "pdf" format of the 12 formal reports and booklets produced. Their titles and authors are listed in Appendix 1 to this report. These are also available via the project web site at [www.roadex.org](http://www.roadex.org) and are available for inspection in the Member's Lounge. The website has been live throughout the project and provides a gateway to the ROADEX projects, the people involved and all the outputs.

The Project has produced new theories and techniques in the science of road construction and a potential new methodology for the design of road embankment and pavement layers.

As a direct result of and during the currency of ROADEX real, tangible, cost saving and innovative roads projects have also been delivered in the Partner areas. For example Finnish techniques of steel reinforced road carriageways have been introduced to Scotland, thereby saving expensive excavation and filling exercises, and in turn prototype road embankment construction using waste tyre bales from Scotland have been transferred into central Finland, reducing the need for new quarry materials and increasing the use of recycling waste products in an environmentally sensitive and cost effective manner. (The project in Scotland used 4% of the Scottish waste tyres that year.)

## Expenditure/Task linkage:

The following table identifies the expenditure made against each task:~ direct; project management; administration.

Task:	Approved Budget Feb-05	Total Expenditure	% task budget spent	% phase budget spent	Budget remaining
<b>SUMMARY OF COSTS BY TASK</b>					
<b>Steering Committee</b>	77,854	76,831	99%		1023
<b>Project Management</b>	107,151	117,954	110%		-10803
<b>RC Team Meetings</b>	55,831	52,722	94%		3109
<b>Phase 1 - Problem Identification</b>					
Task 1_1: Field tests	23,377	23,377	100%	100%	1
Task 1_2: Interviews	3,387	3,387	100%		
Task 1_3: Analysis	18,082	18,082	100%		
<b>Phase 2 - Understanding &amp; Analysis</b>					
Task 2_1: Permanent Deformation (F)	24,464	24,464	100%	101%	-1003
Task 2_2: Material Treatment (F,Sc)	27,296	27,296	100%		
Task 2_3: Spring Thaw Weakening (F;Sw;Sc)	44,838	44,960	100%		
Task 2_4: Economic Impact (Sw)	26,845	26,845	100%		
Task 2_5: Peat Roads (Sc)	14,225	14,304	101%		
Task 2_6: Drainage (N)	11,575	11,518	100%		
Task 2_7: Environmental Guidelines (Sw)	7,721	8,580	111%		
<b>Phase 3 Innovation and Testing</b>					
Task 3_1: Basis of Road Management Policies	8,997	9,304	103%	125%	-7388
Task 3_2: Tools for focussing actions	12,224	16,373	134%		
Task 3_3: Structural Innovation	7,943	10,875	137%		
Task 3_4: Monitoring & Communication	0	0			
<b>Final Reports, CDROM and Website</b>					
ROADEX I Update	9,616	8,932	93%		684
Update Web Site	2,962	3,068	104%		-106
Final Reports	4,723	3,662	78%		1061
DVD	32,660	32,765	100%		-105
<b>Seminars and Conferences</b>					
Finance Charges	2,730	3,948	145%		-1218
Audit Charges	750	809	108%		-59
	6000	3,150	53%		2850
<b>Total</b>	<b>531,251</b>	<b>543,206</b>	<b>102%</b>		<b>-11,955</b>

## **Sustainability**

The project contributes indirectly to sustainable development. However the outputs of the project are expected to directly contribute to improving the environment through:

- Encouraging the involvement of communities, road haulage companies and other road users in the sustainable management of their local road network; e.g. the Phase 1 questionnaire exercise can be used in other areas and could be repeated in the areas already exposed to it.
- Encouraging the re-use of waste materials in road construction; e.g. in the B871 test waste tyre embankment in the Highland area.
- The implementation of the ROADEX II Environmental Guidelines for road maintenance.
- Better understanding by road managers of the problems for low traffic volume and potential solutions, including:
  - Better understanding of the “freeze/thaw” process and frost susceptible materials
  - Innovative material treatments to reduce frost susceptibility and improve the performance of the road construction layers
  - Increased awareness of how to deal with peat in road construction
  - Increased awareness of the importance of drainage to the life of the road
- Encouraging more holistic road management techniques that recognise the longer term whole life costs and implications of today’s repairs.
- Promoting appropriate strategic analysis taking into account the socio-economic effects of different levels of road maintenance standard.

## **Transnationality**

Roads authorities in the Scandinavian partner countries work together through the Nordic Road Association (NRA). The NRA did not want to include Scotland in its organisation. In Scotland one of The Highland Council staff had taken part in the Winston Churchill Foundation and made contacts across the NPP/NORA area in the early 1990’s. Through these contacts, in 1998, partners from Finland, Sweden, Norway and the Highlands of Scotland (supported by the Scottish Executive) came together to create a transnational network of road maintenance managers across the 4 countries with the aim of sharing experience and techniques. Thus ROADEX came into being with the Article 10 pilot project (1998-2001) that created the ROADEX network and commenced the benchmarking process of practices between Partners. The current ROADEX II project (2002-2005) enlarged on the fledgling co-operation and widened the benchmarking process into the area of joint research into fields of common interest.

Transnational working had a number of benefits that added to the results of the project :-

- Access to a broader pool of knowledge and experience than was available nationally
- Exposure to different ways of thinking and delivery for road maintenance, including winter road maintenance
- Higher profile for the project due to its support by national road maintenance authorities

The Steering Committee represented all partner countries and the project involved the use of working groups with team members from each country. Communication within these bodies was promoted to ensure that everyone could contribute and be involved.

There were no major difficulties due to transnationality. In the early stages of “getting to know” each other the differences in use of English occasionally required more explanation and discussion of issues.

The co-operation is continuing with new individuals being introduced by partners as others need to move on through career moves and retirement.

## **Dissemination and Transfer of Experience**

As the project progressed its public profile was encouraged through presentations at :~

- technical seminars and conferences – national and international
- professional body group meetings
- internal technical group meetings
- press releases
- a closing seminar

The project produced a DVD with an hour long film introducing the partner regions, their problems and the research followed by ROADEX II. The film also highlighted the main findings of the project and the future vision of the partners. Copies of the 12 reports in 'pdf' format were also distributed on the DVD. 2,500 copies of the DVD have been issued to partners who have been distributing these to interested bodies and people within each country through personal contact and technical group meetings.

The project web site provide a gateway to the project from across the world and included contacts for all participants. All reports produced by both the ROADEX projects are available on the site and instructions for obtaining copies of the DVD are given.

The partners have shared their experience of running an NPP project by giving presentations to NPP organised seminars and at the June 2005 INTERACT Conference and Exhibition in Prague.

Towards the close of ROADEX II the partners realised that the huge body of ROADEX knowledge could not be transferred to all those who should know of it. A future ROADEX III project is proposed to do this by making the information more easily accessible. Delivery of seminars, e-learning tools, extended web site etc. is proposed in a two year project to start in January 2006 subject to gaining sufficient funding.

## **Conclusions**

The main outcomes of the project are the development and delivery of new knowledge and techniques, case studies and guidance relating to road maintenance, policy and management. This has been published electronically in the form of 12 reports (>1500 pages) through the project web site ([www.roadex.org](http://www.roadex.org)) and the project promotional DVD.

If we had our time again on ROADEX II we would have committed a bigger budget or reduced the number of research strands. Either of these would have enabled earlier completion of the research and more promotion of the findings.

Transnational working has been very worthwhile in enabling "out of the box" thinking. It has also levered in funding to enable a project that could not have been delivered by any one partner on their own.

Wide promotion of the project has been achieved and many people now know at least the name of the project. The challenge facing us is how to encourage road managers and their staff to discover the new ROADEX knowledge and then to learn and apply the techniques in their every day work. We look forward to completing the challenge over the next 2 years through ROADEX III.