Analyse measures for facilitating and assessing the benefits of trans-national collaborative research

Deliverable 1.5

April 2011

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Executive summary

ERA-NET ROAD II aims to strengthen the European Research Area in road research by coordinating national and regional road research programmes and policies.

The first ERA-NET ROAD project, which was funded under the Sixth Framework Programme, made considerable progress towards the networking of road research programmes across Europe. ERA-NET ROAD focused on information exchange between national owners of road research programmes and definition and preparation of joint activities.

ERA-NET ROAD has build on this work, focusing on implementation of joint activities and funding of joint trans-national research. As owners of road research programmes, the partners in ERA-NET ROAD II will ensure that coordination between the owners of the national and regional road research programmes from both within and outside the Consortium is broadened and deepened. They will pave the way towards achieving an expenditure of 10% of their research budgets on trans-nationally funded collaborative research by 2013. They will also liaise with other public and private stakeholders in transport research programming in Europe and encourage collaboration with non-European research programmes. At the end of the project a permanent structure will have been established that will take forward the trans-national coordination of road research programmes after completion of the project and be self-sustaining.

The ERA-NET ROAD II (ENR2) Work Package 1 (WP1) Tasks were to implement Joint Calls (Management Procedure) with cooperation of Work Package 3 (WP3), which is responsible for the identification of common research areas and interest (Coordination Procedure). WP1 Deliverable 1.5 is an analysis of measures for facilitating and assessing the benefits of trans-national collaborative research. Firstly, the D1.5 assesses with the *input-output-outcome-impact indicators* the benefits and added value of trans-national collaboration initiated in ERA-NET ROAD. In ERA-NET ROAD nine joint calls have been initiated and implemented (five in ENR and four in ENR2) and that is the ***input*** of the trans-national collaboration. The ***output*** of the trans-national collaboration are 19 funded projects (without the latest ENR Calls 2011). The ***outcome*** are the results of the 19 funded projects and the ***impact*** is the implementation and using of the projects results within the NRAs and other organisations.

An overview of two finished trans-national projects (PO3 – Maintenance Backlog-estimate and use) and programmes (SRO3 –Road owners getting to Grips with Climate Change) are good examples of trans-national collaboration and **show the benefits and added value** of such collaboration. The benefits are in first term the sharing and exchange of national knowledge (on both sides project and NRA level) and therefore the wider choice of suppliers. Moreover, of most interest for NRAs is the bigger research budgets and better value for money invested by a NRA. Furthermore, duplication could be reduced by sharing finished, ongoing and future national projects and programmes. Some NRA strategies also say to start national programmes only, if no other countries else researches on it. If there are research programmes, than they should seek cooperation with them. Nevertheless, the quality of the projects is high due to access to international data of foreign NRAs and international best practice. Also, problems of project result dissemination and implementation into the National Road Administrations were identified.

The three procedures (Coordination Procedure, Management Procedure and Monitoring Procedure) developed for **the first ERA-NET ROAD-toolkit**, were used to initiate and perform joint calls and in ENR2 the procedures were development further. The Coordination Procedure is defining the common interest and the Management Procedure is performing and managing the calls. The Monitoring Procedure is responsible for the monitoring of the funded projects within a trans-national research programme. The first two procedures were assessed within the Deliverable 1.5 with a SWOT-Analysis to show the strengths and opportunities of such a trans-national collaboration and also weaknesses and threats.

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1 Introduction

ERA-NET ROAD II (ENR2) is a project funded under the Seventh Framework Programme and build on the first ERA-NET ROAD (ENR) project. The first ENR was focusing on information exchange between national owners of road research programmes (ie National Road Administrations) and aimed to define and prepare joint activities. ENR2 is working on the definition of common research needs, implementation of joint activities and funding of joint trans-national research programmes. Therefore, the overall aim is to strengthen the European Research Area in road research by coordinating national and regional road research programmes and policies.

ENR2 is organised into five Work Packages (WPs). WP1 builds on the achievements of ENR project by using the ***Management Procedure*** of the ENR toolkit and further development of it (see Annex I) to initiate cross-border funded trans-national road research programmes, identify and implement Joint Calls with National Road Administrations (NRAs). To these aims, WP2 developed a Road Research Access Facility (RRAF), to enable improved use and faster implementation of the outcomes of the recoomendations that were derived from research; furthermore the exchange of information will help in reducing duplication of assignments by others (*see also Deliverable D2.3, April 2011*). The system of RRAF enabled to collect finished, ongoing and planned road research projects and programmes from NRAs for the work done in WP3. WP3 develops and defines the in ENR developed ***Coordination Procedure*** further to implementing and embedding a Future Model Structure in road research in CEDR to foster the trans-national road research after the finishing of ENR2 project (*see Deliverable 3.1, January 2009 and 3.2, October 2010*). WP4 was liaising with other public and private stakeholders in transport research programmes in Europe (*see Deliverables 4.1, 4.2 and 4.3*) and encouraged collaboration with non-European research programmes (*see Deliverable 5.2 and 5.3*). WP6 is the project management of ENR2 project.

The Work Packages and their interrelationship is shown in Figure 1:

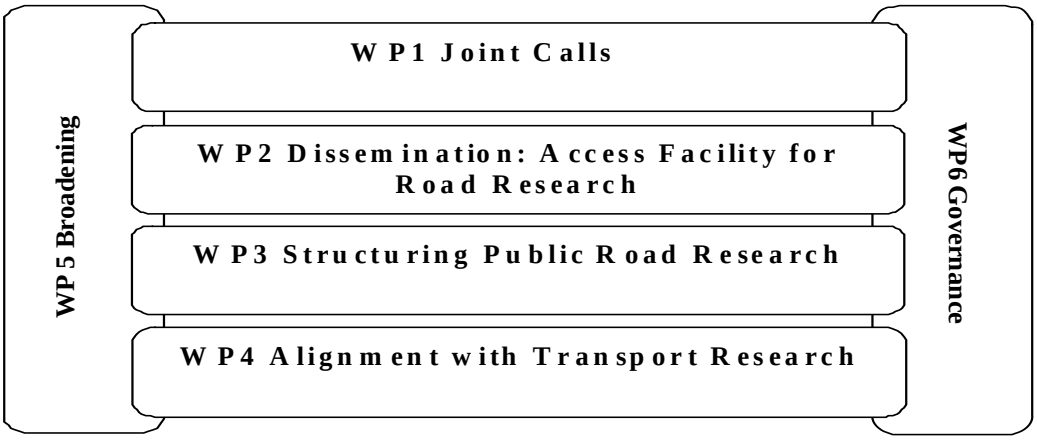


Figure 1 Interrelationship between Work Packages

The Deliverable 1.5 is an analysis of measures for facilitating and assessing benefits of trans-national collaborative research. Firstly, an overview of the implemented road research projects and programmes initiated in ENR and ENR2 is described and the impact of these implementations is analysed. So, that is the basis for the assessment of the benefits and added value of trans-national collaboration. Secondly, the Future Model Structure of road research with the Coordination and Management Procedure (of the ENR toolkit) will be described and assessed. The last section will show the way ahead from ENR2 and how to proceed with the model structure in future and what are the advantages of trans-national collaboration.

2 Assessment of benefits and added value of transnational collaboration

The first ERA-NET ROAD (ENR) project identified within the Coordination Procedure of the ENR toolkit topics (see description of ENR toolkit in Annex I) of common research interest (5 Project Opportunities POs and 7 Strategic Research Opportunities SROs – *see ENR Deliverable 17, March 2009*). Three of the five POs and three of the seven SROs were implemented as actual road research projects and programmes and joint Calls were initiated. In first step current road research topics were identified in different workshops and the common interest of the National Research Administrations (ENR members, CEDR members and other NRAs) have selected five of the topics for trans-national collaborative research in ENR. In ENR2 one of the remaining five SROs was selected for the Joint Call 2010 (*see Deliverable 1.2, January 2010*) and within the new model structure (*see Deliverable 1.4, April 2011 and 3.2, October 2010*) three topics of common interest were selected to the Joint Calls 2011. The following table is an overview of the implemented topics:

Research Projects	**Project Opportunities (PO) identified in ENR:**
	PO2 - Optimisation of Thin Asphalt Layers (finished)
	PO3 - Maintenance Backlog – estimate and use (finished)
	PO4 - Performance-Based Service Agreements in Routine and Periodic Maintenance (finished)
Research Programmes	**Strategic Research Opportunities (SRO) identified in ENR:**
	SRO3 Road Owners Getting to Grips with Climate Change (start 2008 - finished)
	SRO1 Safety at the Heart of Road Design (start 2009 - ongoing)
	SRO4 Effective Asset Management meeting Future Challenges (start 2010 - ongoing)
	ENR Calls 2011 identified by new model structure (CEDR TGR TPM):
	Mobility – Getting the most out of Intelligent Infrastructure (start 2011)
	Design – Rapid and Durable Maintenance Methods and Techniques (start 2011)
	Energy – Sustainability and Energy Efficient Management of Roads (start 2011)

Table 1 Overview of implemented common research topics into research projects/programmes

The **Coordination Procedure** of the ENR toolkit is the identification of trans-national research topics of common interest. The **Management Procedure** of the ENR toolkit is performing and conducting trans-national research programmes (*see Deliverable 1.4, April 2011*). In this chapter the implemented topics into research projects and programmes are assessed with the analysis of the input, output, outcome and the impact of these research programmes. The outcome and moreover the impact will show the benefits and the added value of the trans-national collaboration. Not all funded projects within the research programmes are finished, but at the end of ENR2 there are some impacts, which are showing the benefits and the added value of trans-national collaboration and success stories of finished research programmes can be read.

2.1 Definition of the input-output-outcome-impact indicators for the analysis method

The analysis of the trans-national research programmes initiated by ENR and ENR2 was done with *the input-output-outcome-impact indicators*. This method is very often used for monitoring and evaluating research programmes. In ENR the Monitoring Procedure was developed for monitoring the projects during the duration and work of the projects to anticipate also during the project, if things go in a wrong direction (*see Deliverable 4, May 2008*). Therefore, this method is used for the evaluation of road research programmes, to assess the benefits and added value of the implemented trans-national road research programmes. The figure 2 shows the input-output-outcome-impact indicators and how this analysis method was used to assessing the trans-national research programmes initiated in ENR.

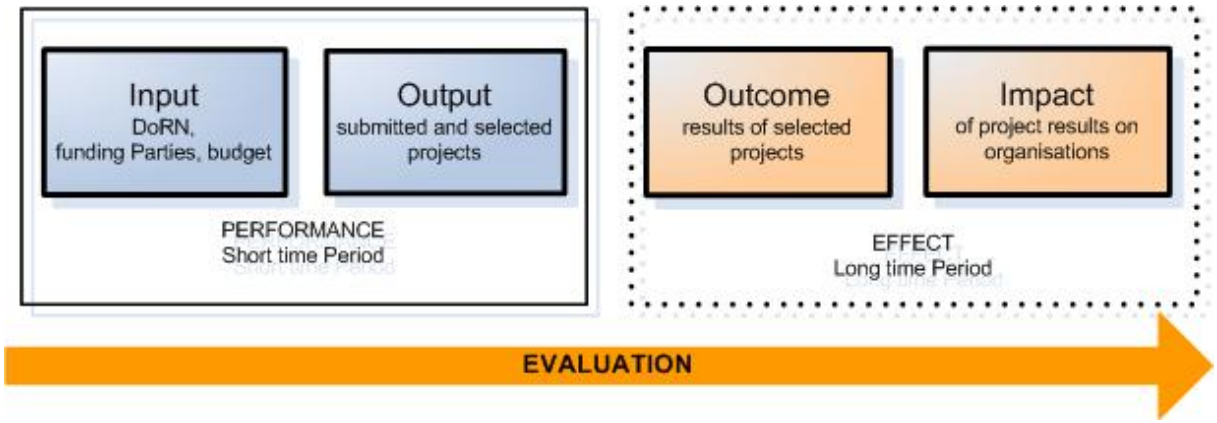


Figure 2 input-output-outcome-impact indicators

Indicators of Performance

The first two indicators input-output are the **performance** of the four indicators and the results of a short term period.

Input

In ENR and ENR2 trans-national road research programmes were initiated, with the finding and definition of common research interests in first place and in second place to narrow down the common research interest into a tentative research programme written in the Description of Research Needs (DoRN). The DoRN written by a neutral Task Force (nominated experts from NRAs) with its programme title and programme objectives is the **input** to the trans-national research programme. Also, the amount of funding NRAs, the total budget is an input into the trans-national research programme.

Output

The **output** of the trans-national research programmes are the selected funded projects with its consortia and content of the projects. Important here to know is, that the output alone gives no indication if there is a benefit out of the projects for the stakeholders. It is a short-term output, how many countries, research providers have submitted, how the project consortia are, which projects (with content) have been selected by the NRAs.

Indicators of Effects

Moreover, the long term period of an initiated trans-national road research programme is essential for the effects of such programme for the funding Parties (National Road Administrations), ERA-NET ROAD and CEDR. The effects are described within the outcome and impact indicators.

Outcome

The indicator **outcome** describes the outcome and moreover the results of the selected projects itself (ie handbook, methods, recommendations, indices etc.).

Impact

The last and most important indicator **impact** is showing how the project with its result has an impact on the stakeholders (funding Parties, National Road Administrations and CEDR or other organisations world wide) with answering the questions of the implementation or utilisation of the projects results.

2.2 Analysis of the trans-national road research programmes initiated in ENR

Section 2.2 will give in the following table 2 an overview with using the input-output-outcome-impact indicators on the trans-national road research programmes initiated in ENR and ENR2. Not all trans-national road research programmes are finished or for a long time period finished to have a real impact to show, yet. On www.eranetroad.org all information concerning the status and outcome (final reports and deliverables of projects) can be found for interest.

Input		Output	Outcome	Impact
PO2	DoRN: The result should be a report with a number of recommendations on how to improve the performance management for thin surface asphalt layers. The result should be a State of the Art report and a best practise of using thin asphalt layers. The State of the Art should cover the whole of the ERA-NET Road country members and not only the participating countries. An inventory of specific problems with the construction and performance of thin asphalt pavements can be restricted to the participating countries. Executive Summary Research Budget: 110.000 EUR 6 Funding NRAs: SE, AT, CH, DK, UK, NO	Submitted proposals: 5 Selected proposal: 1 **OPTHINAL Optimisation of Thin-Asphalt Layers** Consortium: VTI (SE) DRI (DK) BRRC (BE)	**Final Report** from December 2010 **Results:** Thin Asphalt Layers (TAL) are cost- and eco-effective, have excellent skid resistance, abate rolling noise, and can be laid rapidly. They have been used in and outside Europe for some fifteen years, in spite of a few drawbacks such as some susceptibility to fretting and a risk of debonding from the binder course. Projects results optimise knowledge on, and the performance of, these surface courses, present know-how and experience in the field of TAL. It was also investigated how the choice of materials and mix design affect the performance of TAL. Life Cycle Cost of TAL for interest in NRAs	Completed in December 2010 Impact has a long time period **Case study**: TAL in CH **Symposium** - Thin asphalt layer, road surfaces of the future in Belgium in March 2011

Table 2 Analysis with input-output-outcome-impact indicator (PO2)

	Input	Output	Outcome	Impact
PO3*	DoRN: The objective of the project is to present recommendations for comprehensive implementation and use of maintenance backlog indicators ("best practice") based on analysis of experience in studied countries together with available recent reports (also from other countries) and – last but not least – own experience of the consultant. Budget: 126.000 EUR Funding NRAs: SE, CH, AT, FI, DK, NO and UK	Submitted proposals: 4 Selected proposal: 1 **Maintenance Backlog – estimate and use** Consortium: PMS-Consult (AT) Swiss Federal Institute of Technology (CH) DDC Consulting and Engineering LTD (SI) HELLER ENGINEERING LTD. (DE) VIAGROUP LTD.CO. (CH)	**Final Report** from March 2009 **Results:** Indicator for the assessment of the condition of the road infrastructure in the context of financing competition. Further projects recommendations included principles for specification of maintenance objectives; maintenance standards; selection of required data and their acquisition; calculation of maintenance backlog; assessment of its short- and long-term consequences for different stakeholders; presentation of the backlog measure and its impact on different purposes (both in- and outside of road administrations).	**Outcome** is used in **two different areas**: - Definition of the term „Maintenance Backlog" in the context of **PIARC** (including the recommended definition into the PIARC dictionary) and for issues of the **World Bank** - Practical application of maintenance backlog calculation for the assessment of maintenance needs of the **Austrian state road network** - the method is also applied for the **Finnish Road, Rail and Waterway networks** The definition of this term gives a clear understanding of maintenance backlog and how it can be calculated for different sub-assets. It enables comparable calculations for different clients and for different road networks.
PO4	DoRN: The key objective of this research project is to clarify for all member countries involved, the concept of a Performance Based Service Agreement (PBSA). Project report includes evaluation and analysis of how the countries' existing contracts operate in the following key areas: contract type, risk, payment, records and data, quality, tender assessment, partnering and environmental/sustainability. Budget: 204.000 EUR Funding NRAs FI, SE, NO, SI, NL and UK	Submitted proposals: 4 Selected proposal: 1 **Performance-Based Service Agreements in Routine and Periodic Maintenance** Consortium: Halcrow Group Limited (UK)	**Final Report** from October 2009 **Results:** Final Report with the main conclusions from the evaluation and analysis of how the existing contracts in each of the six member Roads Administrations(FI, NL, NO, SI, SE and UK) operate. The figures identify the problems encountered, the mitigation/ action taken to address these problems and areas of shared good practice.	The development of PBSA can offer: - Improvements in monitoring and managing contractor performance - The opportunity to develop a common understanding and learn from others - Encouragement for innovation by contractors - A wider, cross-border, European market in road maintenance

Table 3 Analysis with input-output-outcome-impact indicator (PO3 and PO4)

* PO3 and SRO3 will be described in more detail in section 2.3 as the success stories

Input		Output	Outcome	Impact
SRO3*	DoRN: Road authorities are looking for project proposals that can provide them with tools to identify and prevent problems with the road infrastructure due to climate changes. This includes evaluating the impact of climate on road infrastructure, methods for calculating costs and benefits of adaptation measures and risk management. The specific parameters of the European countries, for instance risk of flooding, snow and winds should be taken into consideration. However, road authorities are interested in a common way of estimating and prioritizing mitigation efforts/measures. **Outcome should be**: Survey of the State-of-the-Art Risk Analysis Climate Impact on Road Infrastructure Road Infrastructure Capacity for Climate Change Risk Management Options Conclusions Budget: 1,65 mio EUR 11 Funding NRAs: SE, AT, DK, FI, DE, IE, NL, NO, PL, SP and UK	Submitted proposals: 19 Selected proposal: 4:	All projects are finished **Final Report** from SRO3 in March 2011 by FEHRL	Participating NRAs were very focused to show the possibility of working trans-nationally, to provide to the consortia as much information, exchange knowledge between NRAs and research providers. Less bureaucracy
		IRWIN Improved local Road Winter index to assess maintenance needs and adaptation costs in climate change scenarios • Foreca Consulting Oy (FI) • Klimator AB (SE) • Department of Earth Sciences, University of Gothenburg (SE) Funding Budget: 320.000 EUR	**Final Report** from January 2010 **Results:** The main development is an improved local road winter index, which is sufficiently detailed and comprehensive that road authorities and owners can use to assess the implications of future scenarios and climate change implications, and perform reliable cost/benefit analyses.	IRWIN index calculation can be considered also as a service for road owners. NPRA and STA take advantages of results RWS investigates using results Other funding NRAs are taken advantage of the project results, implementing them into the NRAs.
		P2R2C2 Pavement Performance and Remediation Requirements following Climate Change • University of Nottingham (UK) • ZAG (SI) • SINTEF (NO) • VTT (FI) Funding Budget: 214.000 EUR	**Final Report** from December 2010 **Results:** P2R2C2 produced a set of 10 reports; the final report providing an overall summary and guidance to road owners on how to deal with the likely impacts of climate change on road pavements.	On national level of the NRAs it would have been much harder to get together the 10 reports, of overall summary and guidance to road owner and how to deal with the likely impacts of climate change on road pavements.
		RIMAROCC Risk Management for Roads in a Changing Climate • Swedish Geotechnical Institute (SE) • EGIS (FR) • Deltares (NL) • NGI (NO) Funding Budget: 366.000 EUR	**Final Report** (Handbook) from October 2010 **Results:** The RIMAROCC Framework is designed for road risk management on all decision levels and on all geographical scales of pertinence. Its main objective is to facilitate the production of a Risk Management Study by or for a road authority.	The method can be used to mitigate threats, reduce vulnerabilities and minimise the consequences of an event. The RIMAROCC Framework consists of seven steps (each with a number of sub-steps – see Final Report):
		SWAMP Storm Water prevention - Methods to Predict damage from the water stream in and near road pavements in lowland areas • **Danish Road Directorate, Danish Road Institute** (DK) • Swedish National Road and Transport Research Institute (VTI) (SE) Funding Budget: 289.000 EUR	**Final Report** from December 2010 **Results:** SWAMP provided an innovative, flexible and accessible approach to help NRAs to identify areas of flooding risk across the network, to enable road authorities to focus on vulnerable locations and identify where action should be taken to reduce the vulnerability. One of the key findings of the project was that maintenance is the primary cause of drainage problems rather than the original design.	The results from SWAMP, especially the Blue Spot model would never been developed in Norway alone with national programmes. NL, FI are implementing also the results of SWAMP.

Table 4 Analysis with input-output-outcome-impact indicator (SRO3)

Input		Output	Outcome	Impact
SRO1	DoRN: The overall aim of the joint research programme "Safety at the Heart of Road Design" is to improve road safety by increasing the awareness and acceptance to implement joint road safety solutions following the concepts of self-explaining roads and forgiving roadsides taking human factors and human tolerance into consideration. Focused on rural roads, for the short-term, appropriate measures need to be evaluated and recommended for common implementation throughout Europe. For the long-term, a systematic, proactive approach to road infrastructure design and renewal is needed. The solutions have to be feasible, valid and cost-effective. **3 Objectives:** A) Development of evaluation tools; B) Assessment of forgiving road safety measures; C) Comparison and Implementation of approaches of self-explaining roads. Budget: 1,65 mio EUR 11 Funding NRAs: AT, BE, FI, DE, HU, IE, NL, NO, SI, SE, UK	Submitted proposals: 18 - Selected proposal: **5**	Final Report is expected in 2010	Projects have NOT finished so far
		SPACE - Speed Adaption Control by Self Explaining Roads • VTI-The Swedish National Road and Transport Research (SE) • BBRC-Belgian Road Research Centre (BE) • CDV-Transport Research Centre (CZ) • FEHRL • kfV-Austrian Road Safety Board (AT) • TRL-Transport Research Laboratories (UK) • UCD-University College Dublin (IE) Funding Budget: 314.730 EUR, 24 Months Duration	**Results so far:** State-of-the-art, Self Explaining Road Treatments	
		IRDES - Improving Roadside Design to Forgive Human Errors • Università di Firenze (IT) • ÖFPZ Arsenal GmbH (AT) • Chalmers University of Technology (SE) • ANAS S.p.A. (IT) • LCPC (FR) Funding Budget: 267.713 EUR, 24 Months Duration	**Results so far:** State of the art report on existing tools for the design of forgiving roadsides [from ARSENAL]. **This Report will be published in CEDR TG Safety series**	
		EuRSI - European Road Safety Inspection • NUI Maynooth (IE) • ITC (NL) • Nast Consulting (AT) • IBI Group (UK) • PMS (IE) Funding Budget: 280.034 EUR, 18 Months Duration	**Results so far:** D3.1 Road Safety Inspection Schemes Review. (NAST Consulting)	
		RISMET - Road Infrastructure Safety Management Evaluation Tools • SWOV – Institute for Road Safety Research (NL) • TUD - Technische Universität Dresden (DE) • LNEC - National Laboratory for Civil Engineering (PT) • TØI - Transportøkonomisk institutt Stiftelsen Norsk senter for samterdselsforskning (NO) • TRL - Transport Research Laboratory (UK) • KfV - Kuratorium für Verkehrsicherheit (AT) Funding Budget: 334.100, 24 Months Duration	**Results so far:** Survey on current data collection systems and data requirements for road network inventory studies and road safety evaluations: Guidelines and specifications	
		ERASER - Evaluations to Realise a common Approach to Self-explaining European Roads • SWOV – Institute for Road Safety Research (NL) • TUD - Technische Universität Dresden (DE) • TRL - Transport Research Laboratory (UK) • KfV - Kuratorium für Verkehrsicherheit (AT) • Lund University (SE) Funding Budget: 287.280 EUR, 24 Months Duration	**Results so far:** State-of-the-art: Overview and evaluation of SER-approaches in Europe	

Table 5 Analysis with input-output-outcome-impact indicator (SRO1)

Input		Output	Outcome	Impact
SRO4	DoRN:The overall aim of the joint research programme "Effective asset management meeting future challenges" is to improve the management of the European road network. The research will focus on the development of efficient management tools using a holistic approach covering all components of the road network (pavement, bridges, tunnels, gantries, signs, lighting systems, etc) and encompassing the whole service life "from cradle to grave" in order to maximise the potential benefits of these important national assets. The programme is based on the following four objectives which are described below together with the expected outcomes: A: Meeting stakeholders' requirements and expectations B: Understanding asset performance C: Development of suitable Key Performance Indicators (KPIs) for the future D: Framework for optimised asset management Budget: 2,85 mio EUR 13 Funding NRAs: DK, BE, FI, FR, DE, IE, LT, NL, NO, SI, SE, CH, UK	Submitted proposals: 20 Selected proposal: 7	Projects have started in September 2010 therefore only expected outcome is described	Projects have NOT finished so far
		SABARIS - Stakeholder benefits and road intervention strategies • University of Twente (NL) Swiss Federal Institute of Technology Zurich (CH) • French Public Works Research Laboratory (FR) • Katholieke University Leuven (B) • AT Osborne B.V. (NL) Funding Budget: 289.660 EUR, 24 Months Duration	**Expected outcome:** The project SABARIS will produce results that will be of immediate use to infrastructure managers in European road agencies. It is planned that the optimisation tool for the evaluation of intervention strategies is applicable to all road types within the European road network and facilitates the decision making on the network level.	
		EXPECT - Stakeholders' Expectations and Perceptions of the future Road Transport System • The Transport Research Laboratory (UK) • Austrian Institute of Technology (AT) • Belgium Road Research Centre (BE) • The Netherlands Organisation for Applied Scientific Research (NL) • Swedish National Road and Transport Research Institute (SE) • Forum of European National Highway Research Laboratories (B) Funding Budget: 401.940 EUR, 21 Months Duration	**Expected outcome:** The aim is to develop methodologies to help NRAs to determine the requirements of different categories of stakeholders and develop effective strategies that address stakeholder's expectations.	
		HEROAD - Holistic evaluation of road assessment • VTI (SE) • The Transport Research Laboratory (UK) • The Belgian Road Research Centre (BE) • FEHRL (B) • Slovenian National Building and Civil Engineering Institute (SI) • The Austrian Institute of Technology (AT) Funding Budget: 448.000 EUR, 24 Months Duration	**Expected outcome:** Heroad will investigate the holistic process (the combination of individual components, levels of assessment and the inclusion of a life cycle perspective) to incorporate also new challenges in the asset management.	

Input		Output	Outcome	Impact
SRO4	Input is DoRN	**SBAKPI -** Strategic Benchmarking and Key Performance Indicators • The Transport Research Laboratory (UK) • The Technical University of Denmark (DK) Funding Budget: 150.000 EUR, 16 Months Duration	**Expected outcome:** The results will consist of a final report on the development of the benchmarking framework and the results of the trial as well as the final version of the Benchmarking Framework incorporating a set of KPIs.	Projects have NOT finished so far
		EVITA - Environmental Indicators for the Total Road Infrastructure Assets • The French Public Works Research Laboratory (FR) • PMS-Consult (AT) • The Transport Research Laboratory (UK) • Slovenian National Building and Civil Engineering Institute (SI) • University of Belgrade, Faculty of Civil Engineering (SRB) • Portuguese Laboratory of Civil Engineering (PT) • DDC Consulting & Engineering Ltd. (SI) Funding Budget: 291.610 EUR, 25 Months Duration	**Expected outcome:** The primary benefit is to provide an applicable solution for the environmental assessment of different road infrastructure assets and to describe the expectations of different stakeholders in form of objective indicators. Furthermore the results could be used as an integrated part in the asset management processes of the road owners and road operators.	
		ASCAM - Asset Service Condition Assessment Methodology • The Netherlands Organisation for Applied Scientific Research (NL) • VTI (SE) • Institut IGH (SI) • Austrian Institute of Technology (AT) • Slovenian National Building and Civil Engineering Institute (SI) • FEHRL (B) Funding Budget: 315.900 EUR, 18 Months Duration	**Expected outcome:** The aim is to improve technical, economical and sustainable performance of the European road network. It focuses on a cross asset approach, key performance indicators and the incorporation of environmental issues**.**	
		PROCROSS - Development of Procedures for Cross Asset Management Optimisation • The Austrian Institute of Technology (AT) • Trinity College Dublin, Dept. of Civil Engineering (IE) • Consulting Engineers SEP Maerschalk (D) • Slovenian National Building and Civil Engineering Institute (SI) Funding Budget: 336.100 EUR, 24 Months Duration	**Expected outcome:** The main objective of the project is the development of optimized procedures for cross asset management of the total road infrastructure (including all sub-assets like pavements, structures, road furniture, etc.). The project aims at a recommendation for a holistic road asset scheme to balance the maintenance expectations of different sub-assets and stakeholders.	

Table 6 Analysis with input-output-outcome-impact indicator (SRO4)

Input		Output	Outcome	Impact
Call 2011 Mobility	**ENR Joint Calls opened in January 2011, will close 31 March 2011** DoRN: The overall aim of the joint research programme is to improve the management of the European road network. The research will focus on indentifying the challenges faced by NRAs in embracing new techniques to get the most out of the existing network and assist road authorities in identifying feasible, valid and cost-effective solutions for key European roads. The programme is based on four objectives which are described below together with an expected output. The objectives were developed with the concepts of: A) Impact Assessment of Intelligent Transport Systems (ITS) B) Effective Distribution of Road Authority Data C) High Quality Traffic Management/Information Data and Incident Detection D) Implementation of Short Term Prediction Budget: 1,8 mio EUR 6 Funding NRAs: BE, DE, NL, NO, CH, UK	Submitted proposals: 22 Project proposal selection in May 2011		
Call 2011 Design	**ENR Joint Calls opened in January 2011, will close 31 March 2011** DoRN: Overall aim of the joint research programme "Design - Rapid and durable Maintenance" is to improve road conditions for the short- and long-term. The solutions have to be feasible, valid and cost-effective. The programme is based on three objectives which are described below together with an expected output. The objectives were developed with the concepts of: A) Safely Optimising Road Network Availability during Maintenance B) Durable Construction and Maintenance Methods C) Strategies for Reducing Maintenance Costs Budget: 1,98 mio EUR 10 Funding NRAs: BE, DK FI, FR, DE, NL, NO, SI, SE, UK	Submitted proposals: 20 Project proposal selection in May 2011		
Call 2011 Energy	**ENR Joint Calls opened in January 2011, will close 31 March 2011** DoRN: The overall aim of the joint research programme "Sustainability and Energy Efficient Management of Roads" is to improve the common understanding and performance of sustainable development in the context of the road authorities. Develop whole life consideration of sustainability and energy efficiency, developing decision making tools with practical application to all stages of road planning, design, construction and maintenance. Addressing the need to assess the effects of operation, safety and durability, which will deliver improvements in the energy efficiency performance of the road asset. The programme is based on three objectives with an expected output. The objectives were developed with the concepts of: A) Sustainability: Develop a common understanding of sustainability and development of a rating system B) Provide an Energy Efficient Road Infrastructure (construction, maintenance and operation) C) Determine the most important Road Infrastructure Characteristics which influence Vehicle Energy Consumption Budget: 1,35 mio EUR 7 Funding NRAs: DK, DE, IE, NL, NO, SE, UK	Submitted proposals: 12 Project proposal selection in May 2011		

Table 7 Analysis with input-output-outcome-impact indicator (ENR Calls 2011)

2.3 Analysis of "Maintenance Backlog - estimate and use" (PO3)

The trans-national road research project was identified in a series of workshops and narrowed down in a Thematic Workshop into a Description of Research Needs. This section is an analysis with the input-output-outcome-impact indicators of the project and success stories from the point of the project coordinator, the PEB and its NRA..

2.3.1 Input of Maintenance Backlog – estimate and use

The financial input of "Maintenance Backlog - estimate in use" (PO3):

7 Funding NRAs in PEB from AT, CH, DK, FI, NO, SE and UK

Budget of the trans-national Road Research programme was **EUR 126.000**

The contentual input is the Description of Research Needs (DoRN), which was worked out by a neutral Task Force. The purpose of the project was to help road owners and road managers to implement and/or further develop the maintenance backlog indicators as a common and comparable denominator of road maintenance results for different types of road sub-assets and for different management tasks. It would also encourage general use of the backlog including benchmarking between different road administrations. The project will cover all types of road components: roads, structures and road furniture.

The objective of the project was to present recommendations for comprehensive implementation and use of maintenance backlog indicators ("best practice") based on analysis of experience in studied countries together with available recent reports (also from other countries) and - last but not least - own experience of the consultant.

The recommendations should include principles for specification of maintenance objectives, maintenance standards, selection of required data and their acquisition, calculation of maintenance backlog, assessment of its short- and long term consequences for different stakeholders, presentation of the backlog and its consequences for different purposes both inside and outside of the road administration etc. The recommendations should also address of using maintenance backlog in different management tasks.

The analysis should cover pros and cons, successes and pitfalls of different approaches and solutions based on the interviews, public reports and own experience of the consultant.

2.3.2 Output of Maintenance Backlog – estimate and use

The output of the call for tender were **four submitted proposals** with the selection of one project proposal for funding. In a Selection Meeting the best evaluated project proposal was chosen by the nominated experts of NRAs, the Programme Executive Board (PEB).

The selected project met the objectives described in the DoRN and should prepare recommendations for the comprehensive implementation and use of maintenance backlog indicators ("best practice"). Those shall be based on analysis of experience in studied countries, available recent reports, and our own experience in the various consulting projects.

The Consortium had an enormous amount of experiences in the field of asset management in several European countries and trans-national European projects. The following partners build the Consortium:

- **PMS-Consult**, MSc.PhD. Alfred Weninger-Vycudil, Engineering Office for Traffic and Infrastructure in cooperation with Prof. J. Litzka, Vienna, Austria;
- **Institute for Transport Planning and Systems (IVT),** Swiss Federal Institute of Technology (ETHZ), Zurich, Switzerland (co-project leader);
- **DDC Consulting and Engineering Ltd**., Ljubljana, Slovenia;
- **Heller Engineering Ltd**., Darmstadt, Germany;
- **Viagroup Ltd.Co**., Winterthur, Switzerland.

2.3.3 Outcome of Maintenance Backlog – estimate and use

The project outcome is written in a final report of "Maintenance Backlog – estimate use", which is published on www.eranetroad.org (for more details). The main outcome is the provision of an indicator for the assessment of the condition of the road infrastructure in the context of financing competition.

The maintenance backlog can be used for the internal management of the road administrations, in performance based contracts and also for communication with the stakeholders. In the last case it usually requires transformation to measures familiar and relevant for different types of stakeholders. At strategic level the maintenance backlog can be used to analyze consequences of different budget levels and for assessment of preservation of invested capital in road infrastructure. At operative level it can be used for identification of road components that require maintenance measures. Eventually there can be many other applications for maintenance backlog besides these two. Common methods for assessment of the maintenance backlog should also enable benchmarking between different road administrations.

2.3.4 Impact of Maintenance Backlog – estimate and use

Based on the information after completion of this project the outcome was used in two different areas:

- Definition of the term „Maintenance Backlog" in the context of PIARC (including the recommended definition into the PIARC dictionary) and for issues of the World Bank
- Practical application of maintenance backlog calculation for the assessment of maintenance needs of the Austrian state road network
- The method is also applied for the Finnish Road, Rail and Waterway networks

Impact for the Programme Executive Board and National Road Administration

For the funding Parties, the PEB members and other NRAs the transnational benefit could be seen primarily that the definition of this term gives a clear understanding of maintenance backlog and how it can be calculated for different sub-assets. It enables comparable calculations for different clients and for different road networks. Moreover, the development of such a method with a trans-national consortium and international know-how gives a much better credibility and acceptance of that method.

Impact for the project consortium

The project and its consortium itself have also an impact out of the trans-national cross-border funding. The big advantage could be seen in the high number of information from different countries to be included and assessed. Thus, a national financed project would not get such a wide range of areas to be taken into consideration and therefore, such a project and its results would be not possible to get out of a national project.

2.4 Analysis of "Road owners Getting to Grips with Climate Change" (SRO3)

The trans-national road research programme was the first call for proposals initiated in ENR. It was also identified in a series of workshops and narrowed down in a Thematic Workshop into a Description of Research Needs. This section analyses with the input-output-outcome-impact indicators the finished trans-national research programme with the selected projects.

2.4.1 Input of "Road owners Getting to Grips with Climate Change"

The financial input of "Road owners Getting to Grips with Climate Change" (SRO3):

11 Funding NRAs in PEB from AT, DE, DK, FI, IE, NL, NO, PL, SE, SP and UK

Budget of the trans-national Road Research Programme was **EUR 1.650.000**

The contentual input from DoRN (for more details see SRO3 DoRN):

The research area is broad and each of the topics could be a research and development area on its own. Project proposals could include some or all of the objectives addressed below. However, each project proposal should clearly state the benefit of the project outcome in the context of adaptation to climate change.

Survey of the State-of-the-Art

- Climate change scenarios (downscaling and specification for roads);
- Inventory of data collections (condition of roads & climate events, meteorological data);
- Inventory of adaptation work on standards and specifications;
- Inventory of current work outside ERA-NET ROAD partners;
- Development of a suitable database for the recording of experiences and solutions

Risk Analysis

Road authorities would benefit from a common procedure for analysis of climate change impact; this includes:

- Risk assessment
  - Methods for risk assessment (probability and consequences) for various types of climate events and associated road-related events
- Risk Management in cost-benefit analysis
  - Methods for calculating and comparing the costs of preventative measures with the costs of damages
- Defining the level of acceptable risk
  - Classification of risk and/or prioritising the roads and structures.

Climate Impact on Road Infrastructure

Climate parameters affect the stability of the road infrastructure and surrounding areas. Within the broad topic below, road authorities would benefit from studies of:

- Direct and indirect effects of climate parameters on roads and surrounding areas (heavy rain fall, soft underground, flooding, erosion protection etc).
- Robustness of infrastructure – structural parameters affected by climate change

- Typology of unwanted events i.e.
  - Dysfunctional drainage
  - Landslides
  - Deterioration of road standard
  - Foundation destabilisation (bridges etc.)
- The need for upgrading of design loads (snow, rain, wind and waves) for various climate scenarios

Road Infrastructure Capacity for Climate Change

Road authorities are seeking a common approach for the mapping of the condition of the existing infrastructure and carrying out practical risk and vulnerability analyses of specific road segments. The content of this work could include:

- Establishing a method for mapping and classifying important/vulnerable structures in a road network (for instance bridges crossing rivers or seas);
- Establishing and classifying vulnerability parameters (e.g. strength, drainage capacity, traffic capacity);
- Link to climate/weather/geological events; defining climate-related parameters (e.g. temperature, rain intensity).

Risk Management Options

Adaptation to climate change could go in two directions, the first involves mitigation and the second involves emergency disaster plans. Road authorities would benefit from a common approach to:

- Identifying the risk that can be managed by improvement and/or maintenance of present infrastructure.
- Identifying the risk which must be managed by emergency actions.

Conclusions

Results of research projects performed in the areas described above should provide the road authorities with new knowledge and decision making tools for:

- Adapting design rules and specifications;
- Updating Data collection, improving data quality;
- Developing risk management methods.
- Formulating quick win measures

2.4.2 Output “Road owners Getting to Grips with Climate Change”

The output of the call for proposals were **19 submitted proposals** with the selection of four projects for funding. In a Selection Meeting the best evaluated project proposal were chosen by the nominated experts of NRAs, the Programme Executive Board (PEB). In the following the projects are described shortly, for more details see www.eranetroad.org and final report from SRO3 (2011).

1. IRWIN - Improved local winter index to assess maintenance needs and adaptation costs in climate change scenarios

Project Facts

Duration:	01/11/2008 – 31/12/2009
Budget:	EUR 320.000
Coordinator:	**Foreca Consulting Oy**, Finland, Pirkko Saarikivi
Partners:	**Klimator AB**, Sweden

University of Gothenburg, Regional Climate Group, Sweden

The main objective of IRWIN is to develop an improved local road winter index, which is sufficiently detailed and comprehensive that road authorities and owners can use to assess the implications of future scenarios and climate change implications, and perform reliable cost/benefit analyses.

To achieve this objective observation from the Swedish and Finnish RWIS stations were collected from national Road Administrations from as long a period as had been archived with homogeneous contents and quality.

2. P2R2C2 - Pavement Performance & Remediation Requirements following Climate Change

Project Facts

Duration: 15/09/2008 – 15/03/2010

Budget: EUR 214.000

Coordinator: **University of Nottingham**, Andrew Dawson, United Kingdom

Partners: **Slovenia National Building and Civil Engineering Institute** (ZAG), Slovenia

SINTEF PNP, Norway

Technical Research Centre (VTT), Finland

The P2R2C2 project investigated the likely impacts of climate change in Europe, from the Alps and northwards, on the moisture/ice condition in the pavement and the sub grade, and the consequential pavement material behaviour and pavement response to traffic over a 100-year timescale. The aims of the project were to:

- study the likely differences in moisture (water) condition in the pavements of roads in Europe, from the Alps and northwards, as a consequence of climate change;
- estimate the likely consequences for pavement and subgrade material behaviour and for whole pavement needs;
- perform this study for a range of representative pavement types and representative climatic zones;
- assess uncertainties to permit risk/vulnerability to be evaluated;
- define options for responding to the changes;
- perform cost-benefit analysis to allow road owners to determine best options for their own situations;

The project was performed by a combination of literature review, laboratory evaluation of materials, computational studies of pavement structural and hydrological performance and by the development of recommendations suitable for implementation by national road owners into their specifications.

3. RIMAROCC - Risk Management for Roads in a Changing Climate

Project Facts

Duration: 01/10/2008 – 31/07/2010

Budget: EUR 366.000

Coordinator: **Swedish Geotechnical Institute**, Bo Lind

Partners: **EGIS**, France

DELTARES, The Netherlands

Norwegian Geotechnical Institute (NGI), Norway

RIMAROCC provides a systematic method for risk management based on three questions;

- what can happen?
- How likely is it to happen?
- If it does happen, what are the consequences?

The RIMAROCC method is designed to be general and to meet the common needs of road owners and road administrators in Europe. The method seeks to present a climate change adaptation framework for roads to help ensure that road networks are more resilient to future climate change. The method is based on existing risk analysis and risk management tools for roads within the ERA-NET Road member states and others. Work dealing with risk analysis and climate change is taking place in many countries. The proposed method is designed to be compatible and function in parallel with existing methods, allowing specific and functional methods for data collection, calculations and co-operation within each organisation to be maintained. The method is also in line with the ISO 31 000 standard on risk management.

The RIMAROCC method consists of seven steps and is a cyclic process to continuously improve the performance and capitalise on the experiences.

4. SWAMP - Storm Water prevention – Methods to predict damage from water stream in and near road pavements in lowland areas

Project Facts

Duration: 01/10/2008 – 31/05/2010

Budget: EUR 289.000

Coordinator: **Danish Road Institute**, Michael Larsen, Denmark

Partners: **Swedish National Road and Transport Research Institute** (VTI), Sweden

The SWAMP project addresses the critical issue of finding the parts of the road network that are most vulnerable to flooding, using a geographical information system as a basis. These parts are referred to as blue spots. It is believed that most resources should at least initially be spent on relatively few blue spots.

The SWAMP project aims to present the crucial issues to consider when creating national or even regional guidelines for inspections and maintenance. The suggestions are geared towards lowland areas that are relatively flat and mildly undulating landscapes, and do not explicitly cover steep, sloping areas.

The project also gives:

- guidance and instructions to engineers and people in charge of inspection, maintenance and repair.
- useful information to decision makers responsible for renewal of the drainage system with the aim to reduce future flooding and damage of the road network. practical suggestions on how to perform field work in a systematic way over the season, and also how to prepare the road system before, during and after a heavy rain event.

2.4.3 Outcome “Road owners Getting to Grips with Climate Change”

The outcome of the trans-national research programme will be published also in a final report. Anther outcome was also the final event of these four ERA-NET ROAD projects, which took place in Cologne, Germany, from 8 to 9 December 2010. The conference was organized around different workshops, reports, and presentations of the projects results. The outcome of this transnational research programme is a series of reports focusing on different aspects of climate change and its effects on the management of national road networks that can be applied across Europe and that will be important in facilitating the understanding of this research across the funding member states. In the following the outcomes of each of the four projects will be described shortly (more details on www.eranetroad.org):

1. **IRWIN - Improved local winter index to assess maintenance needs and adaptation costs in climate change scenarios**

The data collection phase of IRWIN revealed that there was enough archived RWIS data in Sweden and Finland to perform the planned winter index development. The required minimum samples of ten years of observations were collected from 50 road weather stations in Sweden and 49 stations in Finland. Observations in each country were available from three regions with distinctively differing climatic characters, allowing localised climate comparisons. Maintenance actions from the regions of interest were available as well, and were used in the final winter index calculations.

After the tedious but necessary quality control steps, the resulting IRWIN observational database resulted in a set of reliable and unbiased observations. It provides a valuable source for further studies in local road climatology.

The climate database was constructed using well-established and documented downscaling methods, applied on two widely used and acknowledged global climate models CCSM3 and ECHAM5. Thus the IRWIN climate database can be considered as reliable as it is possible in today’s climate research.

2. **P2R2C2 - Pavement Performance & Remediation Requirements following Climate Change**

P2R2C2’s aim was not to produce a tool that road owners could use, but rather to provide information and advice to road owners on how to prepare for, and protect road pavements from, the effects of climate change.

P2R2C2 produced a set of 10 reports; the final report providing an overall summary and guidance to road owners on how to deal with the likely impacts of climate change on road pavements. P2R2C2 also produced maps, based on two emission scenarios and climate models, which can be used by road owners to identify the long-term climate factors that may impact on their road networks. The project team identified actions that would require immediate attention, as well as actions that could be phased in over time.

The project produced several useful outcomes for Road Administrations, which can be read in the Final Report.

3. RIMAROCC - Risk Management for Roads in a Changing Climate

The RIMAROCC Framework is designed for road risk management on all decision levels and on all geographical scales of pertinence. Its main objective is to facilitate the production of a Risk Management Study by or for a road authority. The method can be used to mitigate threats, reduce vulnerabilities and minimise the consequences of an event. The RIMAROCC Framework consists of seven steps (each with a number of sub-steps – see Final Report):

- Step 1 - Context Analysis
- Step 2 – Risk Identification
- Step 3 – Risk Analysis
- Step 4 – Risk Evaluation
- Step 5 – Risk Mitigation
- Step 6 – Implementation of Action Plan
- Step 7 – Monitoring, Review & Capitalisation

Four case studies were run. They were developed to illustrate four different scales: structure (e.g. bridge or very short road section), section (e.g. a motorway section between two interchanges), network (e.g. > 1000 km of interconnected roads), and a territory (e.g. a road network and its associated territory). These case studies show in concrete terms how the method can be implemented, what the possible adaptations of the overall methodological framework could be as well as the method, scope and limitations.

4. SWAMP - Storm Water prevention – Methods to predict damage from water stream in and near road pavements in lowland areas

The SWAMP project was felt to have provided an innovative, flexible and accessible approach to help road authorities to identify areas of flooding risk across the network, to enable road authorities to focus on vulnerable locations and identify where action should be taken to reduce the vulnerability. One of the key findings of the project was that maintenance is the primary cause of drainage problems rather than the original design.

The Blue Spot Concept was also a finding. The blue spot concept is a chain of procedures that can be used by road owners, operators or consultants to systematically analyse, adapt and protect the road network with respect to flooding. It involves computer methods executed at office PCs, followed up by targeted field inspections and actions.

2.4.4 Impact “Road owners Getting to Grips with Climate Change”

Adaptation of the road networks to climate change is one of the important issues facing road authorities in Europe. The impacts of climate change are already been felt and as such urgent actions are needed. The tools and models developed in IRWIN, P2R2C2, RIMAROCC and SWAMP will go a long way to help road authorities:

- identify areas of flooding risk across the network, focus on vulnerable locations and identify where action should be taken to reduce the vulnerability
- plan day-to-day and annual winter maintenance operations, project future maintenance needs and estimate resources that would be required for, for instance, snow removal and de-icing
- prepare for, and protect road pavements from, the effects of climate change
- identify and understand the risks of climate change to road networks and implement action plans that maximise the economic return.

Furthermore, there is a great scope for the implementation of the results of the four projects not only within the funding NRAs, but also across Europe.

Overall Impact to NRAs and PEB from the programme:
Also the trans-national research programme was a success for the PEB and NRAs, because the participating NRAs were much focused to show that trans-national collaboration with cross-border funding is possible and to do it without too much bureaucracy and within the existing legislation. The funding NRAs got useful results out of the projects and good contacts with experts throughout Europe. Furthermore, some funding NRAs are translating the project results into their own language to exploit it more easily in their country.

Overall Impact to project consortia from the programme:
Programmes initiated by ENR are based on procurement and therefore are cross-border funded. That allows having a centralised Programme Management with an outside formal communication to the project consortia and project coordinator. Aim of the programme is to be more transparent to the project consortia (comparing with EU – Framework Programmes) and to finance road research trans-nationally. Project consortia have the opportunity to work with other competent European organisations (SMEs public/private, Universities, etc) on road research projects and getting funding. So, the different trans-national conditions and status on a topic can be reviewed and knowledge exchanged. Furthermore, the trans-national consortia have access to information data concerning a project from different NRAs.

In the following the impact and success stories of each funded project in SRO3 will be described with the using of the results in different NRAs, the benefits and added value for the PEB and also each project consortium.

Only one note is to say, that the project finished in the end of year 2010 and the implementation of the results takes a period of time:

1. IRWIN - Improved local winter index to assess maintenance needs and adaptation costs in climate change scenarios

IRWIN index calculation can be considered also as a service for road owners. A structured self-evaluation of such a service has been performed using ITS service assessment framework developed within the R&D Programme on Real-Time Transport Information AINO, and managed by the Ministry of Transport and Communications Finland.

The Norwegian Public Road Administration (NPRA) takes the advantage of IRWIN how to use Norwegian road weather data and the importance to have good and reliable data series. Also, The Netherlands (RWS) are investigating the possibilities of using the results of the project, nevertheless in The Netherlands such a project would not been funded nationally and there would be no results either. A lot of Swedish data was used in the projects, where the Swedish Transport Administration could take a lot of benefits out of the results of the IRWIN project. Furthermore, the other funding NRAs are taken advantage of the project results, implementing them into the NRAs.

2. P2R2C2 - Pavement Performance & Remediation Requirements following Climate Change

On national level of the NRAs it would have been much harder to get together the 10 reports, of overall summary and guidance to road owner and how to deal with the likely impacts of climate change on road pavements. The identified actions of P2R2C2 are for good use within the NRAs and valid for possible implementation.

3. RIMAROCC - Risk Management for Roads in a Changing Climate

RIMAROCC project highlighted the value of the methodology developed in supporting the assessment of climate risks. Although the approach was used to support the assessment of climate risk to main roads it was highlighted that the approach could also be applied to rural roads.

The Netherlands are now in process to implementing the results of RIMAROCC and explain that on national programme level it would have been harder to get together the various disciplines needed in the studies and the overview of different cases. At the Swedish Transport Administration (STA) it was decided to translate the RIMAROCC handbook and case studies into Swedish language to discuss with the stakeholders of STA for an eventual adaptation in methods and habits. Furthermore, for the Finnish Transport Agency the results of RIMAROCC are of high valid. The Norwegian Public Road Administration has got now a risk manager model from the project and is very useful for immediate use.

4. SWAMP - Storm Water prevention – Methods to predict damage from water stream in and near road pavements in lowland areas

The results from SWAMP, especially the Blue spot model would never been developed in Norway alone with national programmes. The reason is that Norway has very few low land areas like Denmark, but the model and the methods can be used also for areas in Norway. The most important lesson from the projects is the importance of mapping and detailed maps. The results from the SWAMP project will probably be used for making (and testing) the blue spot method/presentation in the Swedish Transport Agency (STA). As today they are progressing in the laser scanning of the country, Sweden will soon have better level data giving better input for the blue spot analysis. It will be possible to use the “blue spot analysis” in combination with the Swedish new “water data base” which we will use for gathering geographical data about water assets in conflict with roads. Most probably a blue spot analysis will be tested within a year from now. The Netherlands (RWS) is implementing the results of SWAMP and as in RIMAROCC would not get access on national level to such results and different case studies.

2.5 Lessons Learned of initiated Calls in ENR and ENR2

ERA-NET ROAD (ENR) and ERA-NET ROAD II (ENR2) have initiated and implemented **more than nine calls** and that is the **input** of the trans-national road research collaboration. More than **19 projects** were selected (without the latest ENR Calls 2011) which are the **output** of the trans-national road research collaboration. The **outcome** of trans-national road research are the results of the selected projects within the road research programme. As not all research programmes initiated in ENR are finished the **impact** of these road research programmes is focused only on the in section 2 described programmes. The first question for many NRAs occurs, why should NRAs initiate Joint Research Programmes. The answer is that trans-national collaboration brings more benefits to the NRAs than procuring research projects alone:

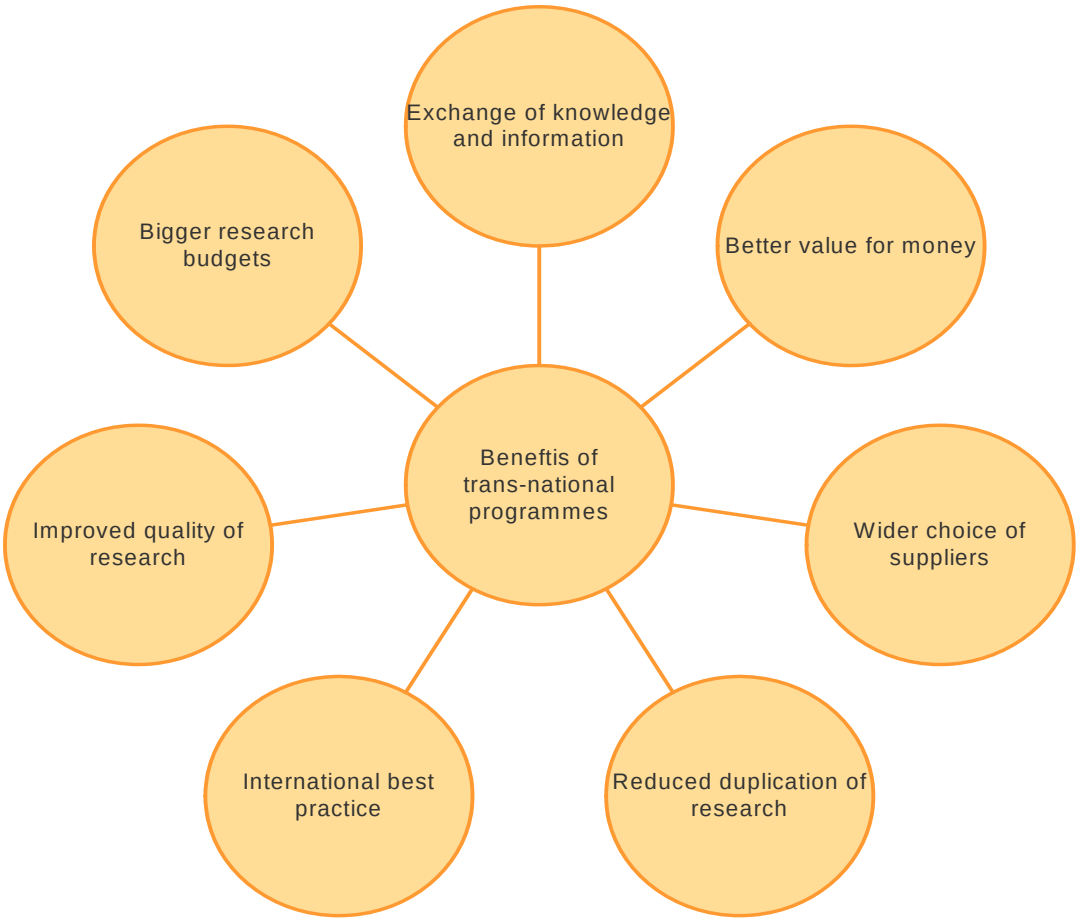


Figure 3 ENR proven benefits

When the question "*Should NRAs initiate joint research programmes?*" is answered positively, the NRAs decide to collaborate trans-nationally and to initiate joint research to gain the benefits of trans-national collaboration. If the question is answered negatively, than the topic of programme is not relevant for the NRAs or it is more positive to initiate it nationally. In the following the benefits of the in ENR and ENR2 initiated Joint Calls are described:

Bigger research budgets and better value for money

ENR and again ENR2 have demonstrated that the procurement of trans-nationally funded research is as simple as procuring research at a national level (and takes less national resource to manage). It is important to understand the benefits of ENRs collaborative

investment and the significant added value for money it represents. For example the road research programme (2009) “SRO1 – Safety at the Heart of Road Design” is funding five projects with a total value of EUR°1.484.000 and one NRA is paying EUR°150.000 for the research programme. The participating NRAs get EUR°1.484.000 of research added to their national programmes for a budget outlay of EUR150.000.

The Table 8 below shows the financial benefits of collaborative research programmes initiated in ENR and ENR2.

Research Programmes[1]	No. PEB	Research Budgets	NRA Contribution	Funded projects	No. of funded Organisations
PO2	6	EUR 110.000	EUR 20.000	1	3
PO3	7	EUR 126.000	EUR 18.000	1	5
PO4	6	EUR 204.000	EUR 34.000	1	1
SRO3	11	EUR 1.350.000	EUR 150.000	4	13
SRO1	11	EUR 1.484.000	EUR 150.000	5	19
SRO4	13	EUR 2.850.000	Min. EUR 150.000 to one objective	7	22
Mobility	6	EUR 1.800.000	Min. EUR 150.000 to one objective	expected 6	Selection May 2011
Design	10	EUR 1.980.000	Min. EUR 150.000 to one objective	expected 6	Selection May 2011
Energy	7	EUR 1.255.000	Min. EUR 150.000 to one objective	expected 4	Selection May 2011

Table 8 ENR financial benefit of performing collaborative research

Reduced duplication of research

Trans-national research collaboration with cross-border funding (see ENR toolkit Annex I) represents investment in good value for money and provides opportunities for National Road Administrations (NRAs) to compare their national programmes and avoid duplication of research. One main focus is to reduce duplication of road research in Europe; therefore the coordination procedure - new model structure (see D3.2) and RRAF (see D2.3) - has to work very closely to define common interest for future calls in road research.

Exchange of knowledge, information and best international practice

NRAs get enhanced access to international best practice, which can be used and compared and exchange of knowledge. ENR encourages NRAs to approach research collaboratively, referring to national research programmes for issues unique to that country. As the problems and challenges are not unique to any nation, neither are the solutions. Moreover, for instance in PO3 five paying NRAs gave the data and knowledge to the project consortium as an input to the project itself and the project consortium could make recommendations and conclusions on that.

In Trans-national Road Research participating countries have also the opportunity to shape the objectives of the joint research to meet their own strategic needs. In this way, not only is the resulting research relevant for the specific country participating in trans-national research, but NRAs also benefit from the objectives of other participants. The benefits are substantial and far beyond the outcomes of a limited national budget.

Improved quality of research

[1] Table 3 is a simplified description of research programmes, SRO4 is based on financial contribution model (D1.2)

The projects and its trans-national consortium have more access to international information and knowledge than national consortia. The high number of information in the projects included and assessed from different countries available to the project consortia is a big advantage. Thus, a national financed project would not get such a wide range of areas to be taken into consideration and therefore, the quality of such trans-national projects can be therefore high enough and will be improved in future. Also, trans-national projects produce results, which would not be obtained on national level. Also, a threat can occur, if the time spent on collection of a lot of data from different countries than on deep analysis.

Wider choice of suppliers and research providers

The community and also ENR itself has grown over the last three years, what gives the added value of a wider change of research providers and therefore for more high value quality of projects. In ENR the procedures are more precise and defined, the community is getting more in contact with the procedures and therefore the quality on both sides has improved. NRAs and its employees get the knowledge and contact as well a large number of potential research providers. The number of the different participants has grown with every call. Also, the research providers can exchange knowledge and see different views in Europe and widen the community of road research in Europe. Furthermore, duplication will be reduced, when NRAs and research providers are aware of trans-national road research in Europe, also with the dissemination and promotion of results.

Other benefits from trans-national collaboration

It is essential to disseminate the progress of the co-funded projects and to make information available for NRAs, CEDR and for other interested stakeholders. Sharing of the acquired research and, implementation of knowledge are the end results and one of the main objectives of collaborative work. In ENR Deliverable 16 *Guidelines for Dissemination* outlines the methodology and identifies possible dissemination activities. The procedures of dissemination, promotion and communication are not in practical use, yet. It is a slowly process and with the growing awareness of trans-national road research a bigger exchange of knowledge, information and results between NRAs, CEDR, research providers and other stakeholders in Europe is assumed.

Problems

Beside the benefits, D1.5 assessed also some problems, which occur when deciding to initiating a call trans-nationally. The problems are the human resources or human capital, the right person with enough time to make the Programme Management of a call. With the person the leading country with the knowledge is difficult to identify. Therefore, time and resources are an essential issue not to forget. The budgets of the projects are also higher, due to the travel costs between the consortium members. The technical issues (video or telephone conference, mails and meeting platforms) enable to reduce the amount of physical meetings, but physical meetings are essential for working in a trans-national project consortium. Estimated project meetings for a trans-national funded project with duration of 24 months are about four to five meetings for project duration. The travel budget will increase than, is the value of project really higher than? Do the funding parties (NRAs, CEDR or other stakeholders) get the same quality of results with the national money?

Also, the question occurs, if the funding parties have chosen the best quality project proposals and if the quality of the best proposals is really improved. These questions are not answered, but should be in mind of every funding party. Furthermore, the impact of the implemented programmes is not possible to evaluate now, because it is a more long time period indicator. Therefore, it is very essential to ask the question "*Should NRAs initiate joint research programmes?"* in the beginning or before initiating a trans-national programme. On both sides, from project side and NRA side, there exists a lack of implementation plans of the projects results into the NRAs. It was the first trans-national road research programme,

where all participants learned a lot about collaborative research and the individual funded projects (eg in SRO3) where not really part of the R&D plans within the NRAs. For instance the individual projects of SRO3 where very diverse, fitting in different research areas in the various R&D plans within the NRAs. In future it is recommended to have a better dissemination plan, the Future Model Structure is the first step into it, a closer cooperation between NRAs and CEDR. It is also not a must have to initiate every year a Call.

3 Assessment of the benefits of the Future Model Structure

ERA-NET ROAD (ENR1) produced the "ENR-toolkit", three procedures to work trans-nationally and to encourage joint research to increase benefits of joint collaboration. The procedures are described in detail in ENR1 Deliverable 4. ERA-NET ROAD II (ENR2) developed further the three procedures, based on the lessons learned of using the three procedures (see D3.1, D3.2 and D1.4 of ENR1):

The ENR-toolkit is based on the ENR success factors: Trust, Understand and Commit.

The ENR toolkit introduces the **Coordination Procedure** to identify research needs of trans-national interest. The provided tools to define such topics are templates for questionnaires, reviews and workshop programmes. In ENR2 this was developed further by establishing a model structure within the the CEDR Technical Group Research (TGR). The result of the Coordination Procedure is the identification of trans-national research topics of common interest. It is the decision to collaborate.

The **Management Procedure** introduces Models of Collaboration in seven steps. When a topic of trans-national interest is identified, the funding NRA's establish a Programme Executive Board (PEB) which owns the Programme. It consists of one representative of each *participating NRA*. PEB members are experts in the topic of the Programme. The result of the Management Procedure is a successful collaboration on conducting trans-national research projects and its results. It is mainly governance.

The **Monitoring Procedure** introduces three ways to monitor the initiated trans-national research projects. For smaller projects it is advised simply to use the usual national monitor procedure of the Project Leader (one of the NRA's), for medium trans-national projects a standardised, periodic Monitoring Progress Report is suggested and for larger projects the Risk-Log Management is introduced. The result of the Monitoring Procedure is a schedule when and on what stages to check the quality of the trans-national research projects. It is risk management and evaluation of the benefits of trans-national collaboration.

These three procedures were developed further in ENR2, based on the lessons learnt in ENR and on the initiated calls in ENR2. The following sections will describe the benefits and assess the Coordination and Management procedure. The Monitoring Procedure is describing the way of monitoring the projects by the Programme Executive Board and is not an issue for the Future Model Structure. Therefore it is not assessed in the Deliverable 1.5, but is mentioned due the completeness of the three procedures developed in ERA-NET ROAD and content. The Deliverable on the update of the toolkit will include the Lessons learnt on the Monitoring Procedure.

3.1 Description of Future Model Structure

The **Coordination Procedure** is the first step to identify common research topics for a possible joint call. ENR2 Work Package 3 is responsible for the future structure model continuing after ENR2 (see Deliverable 3.1 and 3.2, January 2010, October 2010 for more details). The aim of the model structure pursues the aims of the Coordination Procedure, to identify common research topics for future joint calls on a regular basis. Therefore, the Trans-national Programme Meeting (TPM) was established by WP3 to invite research programme managers from the NRAs and other CEDR members to jointly review their strategic research priorities and programmes. TPM is part of the CEDR Technical Group Research (CEDR TGR) members, so, CEDR TGR is working very close on identifying common research topics, to increase European collaborative road research and to promote jointly funded research. The identified research topics are listed on the web-based tool "Road Research Access Facility" or "RRAF" (http://rraf.info), being developed by ENR2 WP2, dealing with Dissemination (Access Facility for Road Research). The output of the Coordination Procedure is a topic of common interest with a high probability that more than 5 NRAs will be willing to contribute funds to open a joint call. A Description of Research Needs is produced. Then the Management Procedure starts.

The **Management Procedure** starts with getting commitment of the NRAs based on the Description of Research Needs. The NRAs that committed funds and experts are establishing a Programme Executive Board and the arrangement of a joint call starts. The following Table is an overview of a ***possible time schedule*** of these two procedures and short explanation of the tasks within them (all details to the Management Procedure see ENR1 Deliverable 4 and D17 and ENR2 D1.2 and D1.4):

Time-Schedule				
Months	Coordination Procedure		Management Procedure	
	Strategic Body CEDR TGR TPM	Administrative Body		Strategic Body PEB
		CEDR TPM Sekretariat (TPMS)	Programme Management (PM)	
Year 1				
1		Organisation TPM 1/1X		
2	Trans-national Programme Meeting with CEDR TGR **(TPM 1/1X)**			
3		Organisation TPM 2/1X; Data Collection of past/present/future national projects (➔ RRAF)		
4	**TPM 2/1X** Identify commonalities on past/present/future research projects (long list, short list, final list); RRAF	Checking short list with other European Research Organisations (FEHRL, ERTRAC etc.)		
5		Questionnaire on short list, checking with other Organisations (ERTRAC, PIARC)		
6	**TPM 3/1X** to propose possible Call topics; RRAF	Presenting final list on 3 topics		
7		Concretise call topics, Preparing and Organising Thematic Workshops		
8		Concretise call topics, Preparing and Organising Thematic Workshops		
9	**Thematic Workshops** with nominated experts from NRAs to narrow down the Call topic, define objectives and expected outcomes and to set up a specific Task Force to develop the **DoRN**	Administration Thematic Workshop/Task Force		
10	**Task Force** (by nominated experts) working on the DoRN	Administration of DoRN and Task Force		
11	**TPM 4/1X** final Agreement on DoRN; RRAF	Presentation DoRN Commitment on DoRN	Organisation PEB Kick-Off Meeting, Call process	
12			Providing Call documents, Timetable, etc.	PEB Kick-Off Meeting 1 PEB-Chairs (one of NRA) Collaboration Agreement

Year 2				
13			Administration of Call 1	CALL1 opens
14		Organisation TPM 1/1X		
15	**TPM 1/2X** compile a Joint priority list of common research themes, RRAF	Checking Joint priority list with other European Research Organisations (FEHRL, ERTRAC etc.)	Dissemination/Promotion of Call results	CALL1 closes
16		Checking Joint Priority List	Providing Evaluation documents	Evaluation of projects
17		Organisation TPM2/1X	Organisation Selection Meeting	Selection Meeting and Joint selection of projects
18	**TPM 2/2X** to agree on Call topics; RRAF	Presenting finalised Joint Priority List	Negotiations with project coordinators	Negotiation input to project coordinators
19	→ **if** there are research needs and **call topics identified** than a call will be launched	Concretise call topics, Preparing and Organising Thematic Workshops	Contracts with project coordinators	Contracting approval
20		Concretise call topics, Preparing and Organising Thematic Workshops	Promotion/Dissemination of Selection process	
21	**Thematic Workshops** with nominated experts from NRAs to narrow down the Call topic, define objectives and expected outcomes and to set up a specific Task Force to develop the **DoRN**	Administration Thematic Workshop/Task Force		
22	**Task Force** (by nominated experts) working on the DoRN	Administration of DoRN and Task Force	Monitoring/Instalments	Monitoring of projects
23	**TPM 3/2X** – final Agreement on DoRN, RRAF	Presentation DoRN – Final Agreement on DoRN	Organisation PEB2 Kick-Off Meeting, Call process	
24			Providing Call documents, Timetable, etc.	Kick-Off PEB 2 PEB2-Chairs (one of NRA) Collaboration Agreement
				PEB 2
Year 3				
25			Administration of Call 2	CALL2 opens
26		Organisation TPM 1/1X		
27	**TPM 1/1X** to compile a list of common research themes; RRAF	Checking Joint priority list with other European Research Organisations (FEHRL, ERTRAC etc.)	Dissemination/Promotion of Call results	CALL2 closes
28	**Etc.**			

Table 9 Overview of a possible Time Schedule of Coordination and Monitoring Procedures

3.1.1 Benefits of the Coordination Procedure

The Coordination Procedure relies of its development in ENR on the three key success factors "**Trust. Understand. Commit."** and conducted to successful trans-national collaboration in past. Therefore, it is essential to ensure that these key success factors are the basis and with them to develop further, what was done in WP3 (see D3.1 and D3.2) and implementing into CEDR TGR to be continued after ENR2. CEDR TGR is meeting on a regular basis as a sub-group, called the ***CEDR TGR Trans-national Programme Meeting (TPM).*** WP3 Deliverable 3.2 deals in detail why CEDR TGR will work in future on the TPM, therefore this chapter is not going into detail with it and describes the benefits of the Coordination Procedure, the new structure continuing after ENR2. The themes of the Joint ENR Calls 2011 are the first results of this TPM (*see D1.3, January 2011*).

The fundamental idea of the Coordination Procedure was the process for strategic alignment of road research across ENR partners. In ENR2 the players are widened up into CEDR and all interested National Road Administration in Europe into the TPM. The aim of such a TPM is to table objectives and predicted outcomes of NRAs finished, ongoing and planned research programmes or projects and to identify (and reduce) possible duplication of road research programmes in Europe (and outside) and therefore identify commonalities being planned, which could be co-funded by interested National Road Administrations (or other interested organisations) within a Joint Call. These aims have economic and financial benefits for the participating NRAs, reducing research duplication and getting valuable results for a much smaller investment (see also section 2.4).

TPM is also a step to promote a culture of willingness analysing the first time European road research programmes together and raising the visibility of individual national programmes. . Moreover, the web-based tool "Road Research Access Facility" (RRAF - http://rraf.info), which is collecting from the NRAs their finished, ongoing and planned road research programmes into one database is a step to developing an appreciation and understanding of research activities across Europe. These benefits of exchanging and sharing knowledge demonstrate the benefits to all NRAs of the increased earning power of their research budgets, giving better value for money for tax payers. The most important step within the Coordination Procedure is the step before the Thematic Workshops. Thematic Workshops aim is to narrow down the tentative programme, to define the common research needs with programme objectives and output. Thematic Workshops benefits the most, when the right experts of the topic from NRAs are participating to analyse, discuss and define the common research needs.

3.1.2 Benefits of Management Procedure

The Management Procedure describes how to collaborate by performing a trans-national programme. It introduces in the ENR toolkit four models of collaboration and seven steps to solutions (see Deliverable 14, May 2008 and Annex 1). The Management Procedure with the ENR toolkit was used in all joint Calls initiated by ENR. All joint research activities in ENR were cross-border funded, that means the NRAs decided to collaborate jointly and to fund jointly all research providers (common obligation programme model) with cross-border funding. That is why, the value of the research programmes is much higher than the contribution of one NRA and the benefit of better value for money. The benefit of the cross-border funded model is the Programme Executive Board (PEB) with a PEB Programme Manager (PM) and PEB members, who are the national experts of the programme. The PM is responsible for the execution of the call and other administrative issues (see table in 3.2) the PEB members are a strategic body of the projects. So, they are able to manage the projects on a scientific level and the PM is the organisational part of it. NRAs are supporting financially without using extra human resources for administrative work and doing the

procurement extra (organising call, processing the proposals, awarding contracts, etc.), what is also a (financial) benefit for the NRAs. The PM uses its national laws and regulations.

The possibility to have a cross-border funding of projects in a joint call in ENR is due to the European Public Procurement Directive (EPPD – see *chapter 5.1 in Deliverable 4, May 2008 for more details*). It enables the NRAs to buy research and own the rights of the results.

3.2 Assessment of the benefits of Future Model Structure

The benefits of the future Model are assessed in a SWOT – Analysis, describing shortly the strengths and weaknesses, the opportunities and threats of the benefits described in 3.1.1 and 3.1.2:

Strengths	Weaknesses
• National influence to direction and strategy of European Road Research (programme and project level) • Avoiding duplication of Road Research (resulting duplication could lead to unnecessary work and expense) • Share and exchange of knowledge on strategic level (CEDR TPM, NRAs) • Administration and coordination of Call is by one Party (Programme Management) • PEB members support financially and jointly • PEB members support project monitoring at the overseeing level • Easier access to ENR Calls than EC FP7 Calls for research providers • Road Research is a Niche • Exchange information on research level and providing information from NRAs to international research providers • Success factors Trust. Understand. Commit	• share completed research results with other NRAs • different national laws and regulations • no coherent European legacy for all NRAs • PEB members have only scientific guidance • Number of participating NRAs is equal – broadening of participants is very slowly • Dissemination of research results to right persons is in progress • Identifying the right persons for Workshops and monitoring the projects
Opportunity	**Threats**
• Limit the amount of national research procurement within reduced national budgets • view of future budgets, resources and spending controls • cost-effective, efficient, good 'value for money' • develop a means of procuring research / technical development • Valuable project results implementing in NRAs (or other organisations) for informing future guidance/policy.	• No common interests identified • no commitment of NRAs (or not enough) to identified common interest • not enough budget or too low budget • To find the right person for programme management with easy adaption of ENR toolkit into national laws and regulations • Project results are not valuable with low quality • Different views of different international experts • Lack of NRA experience by research institutes and consultants

Table 10 SWOT-Analysis of benefits of Future Model Structure

3.3 Lessons learned on Future Model Structure

In section 2.3 Lessons learned of initiated ENR Calls were described in general, why to initiate trans-national calls. In this section the concentration is more on the lessons learned on the Coordination Procedure and Management Procedure, also answering the points occurred in the SWOT-Analysis in section 3.2. WP1 also proved the way to identify topics of common interest and needs in two Joint Calls initiated in ENR2.

Coordination Procedure

- Coordination and with the procedures **well experienced human capital** is recommended. CEDR TGR TPM is the road research coordination group for identification of research topics of common interest. A driving group of persons working closely together as an administrative body (a secretariat) is needed.
- A **strict time-schedule** containing the decision bodies, their time schedules and decision regulations should be provided by the secretariat. Also, more transparency between NRAs and decision rules should be provided.
- CEDR and ENR have created and worked out **working procedures**. The consolidation of both organisational procedures should be agreed on both sides. Adaptations on ENR procedures were established in WP3 (see Deliverable 3.1. and 3.2).
- CEDR TGR and the different CEDR Technical Groups should **share and exchange information** concerning a present joint call and future joint calls. It is also recommended to invite these experts to the (thematic) Workshops to get expertise knowledge.
- Roles and responsibilities were developed and it is important to be aware of the different **roles and responsibilities** in different groups and procedures (NRAs, CEDR TGR TPM, TPMS, PEB, PM, etc).
- Implement **Trust. Understand. Commit** within NRAs. In ENR these success factors were identified, now it should also be implemented into the TPM and NRAs not confident with the ENR schemes but interested to participate.
- The web-based tool "**Road Research Access Facility**" (RRAF) is a part of the Coordination Procedure collecting research programmes/projects from all NRAs. It is recommended to give input from NRAs into tool and to use it as well (TPM and NRAs). Also, an administrative body (TPM Secretariat) should take care of the RRAF and take it as an input to TPM.
- The RRAF should be the input to the TPM and workshops **identifying common interest** to a possible call. It is recommended to arrange a TPM workshop a minimum of once a year to get the possibility to find common research topics.
- The time-schedule of the two procedures (**Coordination and Management Procedure**) in section 3.1 is recommended to use. The schedule for the Management Procedure was used now more than three times and it has worked very well. The time schedule for the Coordination Procedure with CEDR TPM was used for the ENR Calls 2011 the first time. It is recommended to start the TPM workshop to find a research topic/theme mininum 11 months earlier before the call opens. That is due to the high level decision bodies and the procedures developed. It is also considerable not to arrange a Call, if there is less person power from NRAs, less budget or less time. It is not obligatory to open a Call every year, it is up to the NRAs and CEDR members to decide to open a Call.

- The second step, when a common research topic is identified, **Thematic Workshops** are recommended to arrange. In the Thematic Workshops participants elaborate the common research needs on a topic in working groups. It is essential that the NRAs nominate appropriate participants and have good workshop facilities to create a good spirit of co-operation. As this step of the Coordination Procedure is the most essential one, due to the definition of the common research needs of the road research programme.
- The **timeframe** in past between the invitation to the Thematic Workshops and the Thematic Workshop itself was very short and in summer months for the NRAs to define the appropriate experts to the Thematic Workshop. Country specific internal procedures should be taken into account and therefore a longer time period of about three months is recommended. Hence, the TPM Workshop shall be 11 months earlier, before the call opens.
- Common Obligation Programme Model (see details in Annex I) was and will be used in the **Joint Calls initiated in ENR**, due to the possibility of cross-border funding between NRAs. Therefore, it is recommended to use this model for future cross-border funding calls.

Management Procedure

- Collaboration Agreement and **Call documents**: On behalf of the Programme Executive Board (PEB), the Programme Management (PM) finalises the Collaboration Agreement and the other Call documents (Guide for Applicants and Application forms). The agreements and the input of the PEB is negotiated during the PEB Kick-Off Meeting. The time of the signature on the Collaboration Agreement should be before the Call opens, or a scanned copy should be mailed to the PM.
- The **Collaboration Agreement** shall be sufficient for the participating NRAs as the signed official document within the trans-national cross-border funded research programme. The Collaboration Agreement is based on the success factors Trust. Understand. Commit. and the national law of the PM.
- The **financial contribution model** focusing on one or more objectives of the call topic is recommended to use for further Calls. Details of the financial contribution model are in D1.2 and D1.4. It is a good method to get a wide range of knowledge on one specific topic as well as to increase the number of participating countries within the PEB. The pre-payments of the financial contribution amounts should be proportional (eg. 40/30/30% of financial contribution budget).
- It is recommended that the **participation** within a joint call costs a minimum of EUR 150.000 per objective of a call topic. It was also decided to undertake and perform a call when a minimum of 5 NRAs are participating in one topic call.
- Identification of the optimal key person and country to do the management. The **Programme Management** is based on national rules and regulations. The Road Research Programmes are usually based on the European Public Procurement Directive (EPPD) and the exception clause for R&D, therefore it is possible to undertake cross-border funding. Every European country interprets the EPPD differently and adapts it to its national laws. So, it is recommended to find the optimal country with the most flexible interpretation of EPPD. Also, the optimal human capital entrusted with ENR procedures and neutral position is recommended.

- Much attention should be paid to creating a **promotion and dissemination** process to make information on the call itself, on the project reports and the outcome of the projects visible to the community. **ERA-NET ROAD** has crystallise as a logo, a brand mark were people know that it is dealing with road research. Therefore, it is recommended to use ERA-NET ROAD as a brand for further calls, initiated by the future structure after ENR2.
- In the Work Package 1 Deliverable 1.4 Report on Joint ENR Calls 2011 section 6 Lessons Learned, Conclusions and Recommendations detailed information of lessons learned of the **Calls 2011** is described.

4 Conclusions

ERA-NET ROAD II WP1 has achieved its key objectives to initiate and perform Joint Calls with a quite high research budget. The Deliverable 1.5 is an assessment of the work done in WP1 and WP3, where the Future Model Structure is going to be implemented in CEDR after ENR2 is finished. The process is not finished so far, after implementation into a new organisation, such as CEDR, things will occur, which where not thought about it in ENR2. Nevertheless, CEDR was involved into the procedures and process of ENR2 very early to avoid most of problems in future and tried to create trust. understand. commit (the success factors) to the delegates for future work. The structure is being trialled throughout the remainder of ENR2 and supported by WP 3. A good measure of its success is that the subject areas of the ENR Calls 2011 on Mobility, Design and Energy have been identified and implemented using the new structure. The Future Model Structure is continuing its activities.

In ENR and ENR2 nine cross-border funded research programmes (PO2, PO3, PO4, SRO3, SRO1, SRO4, Mobility, Design and Energy) were and will be successfully running. The Coordination Procedure and the Management Procedure have shown cross-border funding and trans-national collaboration is working. The ENR Toolkit includes three procedures (Coordination, Management and Monitoring Procedure) with models for the trans-national co-operation and special tools that have been tested on the Joint Calls initiated by ENR. Before the establishement of the processes of ENR and ENR2, the question for many NRAs occured, why should NRAs initiate Joint Research Programmes. The answer is that trans-national collaboration brings more benefits to the NRAs than procuring research as Deliverable 1.5 was assessing. Regarding the outcome and impact of the joint calls, the participating NRAs can summarise that trans-national collaboration is definitely beneficial. As the problems and challenges are not unique to any nation, neither are the solutions.

4.1 How to proceed

In ENR the three Procedures were developed and in ENR2 developed further. Due to the trans-national benefits identified during the last 5 years, it is recommended to collaborate trans-nationally using the in ENR developed Procedures. The Coordination and Management Procedure are working and will give the benefits described in Deliverable 1.5. The next step for further development is the implementation of these successful project results into the National Road Administrations (NRAs). Following figure 4 is showing how it should work theoretically:

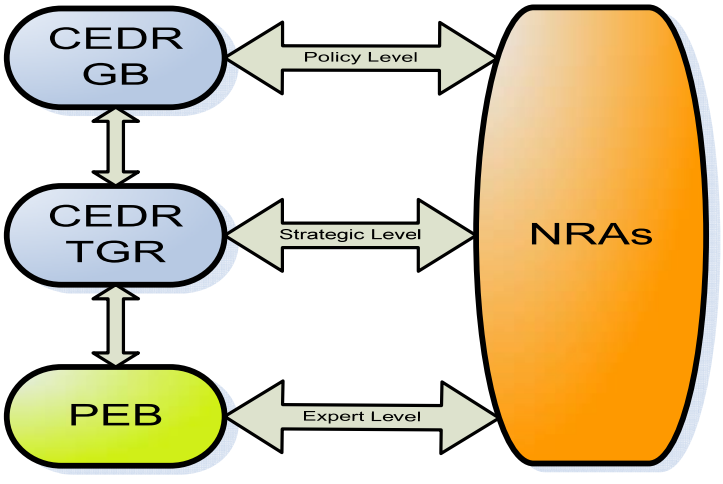


Figure 4 Overview of how to disseminate project results

The Programme Executive Board (PEB) consist nominated experts from National Road Administrations (NRAs). These experts are evaluating, selecting and monitoring the projects of a Joint Call and have close contact to the project consortia. Therefore, they can interfere and steer the projects into the research programme and NRAs objectives on expert level. The PEB is communicating and disseminating the results to the NRAs bottom up and also to CEDR TGR, the strategic body. CEDR TGR is also working as sub-group CEDR TGR TPM identifying topics of common interest. CEDR TGR is a strategic body and also disseminates the results to the NRAs and to the CEDR GB. CEDR GB (high level group and members of NRAs) should also decide on the policy level of the implementation of these results. This is a top down approach of promoting the results into the NRAs. This process is now in first stage and it is recommended to define further to get a dissemination of the successful project results and the implementation into the NRAs. Both approaches of bottom up and top down are needed to implement the project results into NRAs, because every NRA is structured differently and of various cultural issues. Moreover, the CEDR Technical Groups (CEDR TGs) should be involved into the process, as it is as an example in SRO1, where the communication between PEB and CEDR TG Safety is working. It is a learning process and this section gives an outlook how to proceed further.

4.2 Outlook to the future of trans-national collaboration

CEDR TGR TPM will analyse, identify finished, ongoing and future road research topics to define common research topics for future joint calls regularly. The tools of the Coordination Procedure (TPM Secretariat, see D3.1 and D3.2) will administrate the TPM. The way to narrow down the widen topics into a road research programme within the Thematic Workshops and setting up neutral Task Force is working and should be used. The time frame was very short and for future collaboration should give more time and excepting the internal decision processes of NRAs. It should also be taken into consideration the time span of the Calls and it is not obligatory due the Coordination and Management Procedure to initiate every year a trans-national Call on road research. This decision is applied to CEDR members and to the NRAs. The Collaboration Agreement should be the legal binding document of every trans-national research programme, signed by the funding Parties. The performing and managing of the joint call is based on the Monitoring Procedure, which was adapted and working in all nine calls. The Monitoring Procedure is working on PEB level very well and all road research programme objectives could be achieved by the project results. The dissemination and implementation of the project results is done with the first finished projects, nevertheless, the budgets could be higher and than more project results will be

Annex I: ERA-NET ROAD Toolkit

The ENR-toolkit was developed by ENR to achieve and support the 'trans-national research programmes, which are strategically planned and trans-nationally funded'. The ENR-toolkit is underpinned by four fundamental questions: Why?, What?, How? and When?:

- First you have to know WHY you want to collaborate trans-nationally.
- Then you have to define WHAT the research topic of common interest is.
- Next you choose HOW to organise that trans-national collaboration.
- And finally you decide on WHEN results have to be available for progress monitoring and evaluation of the research projects.

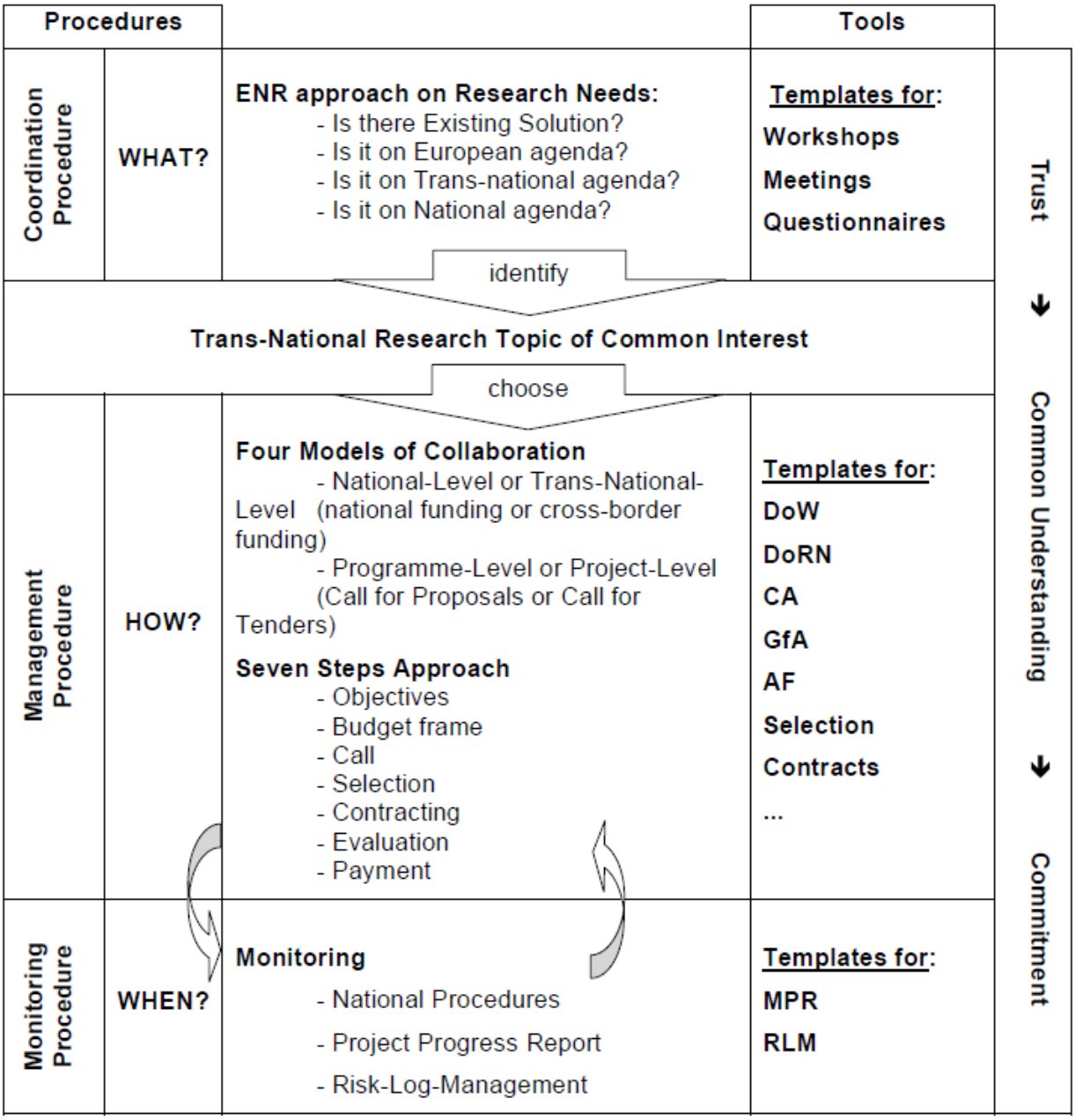
The ENR-toolkit can be described by its basic elements: the three procedures, the four models of collaboration, the seven steps to solutions and the tools (more details about the ENR-toolkit are available in its Deliverable 4 Final Report consolidating model procedures, practices and rules developed).

The ENR-toolkit is based on:

Trust. Understand. Commit,

and addresses the collaboration of funding sources to initiate trans-national Research Projects or Programmes, and within its "Management Procedure" provides collaboration models and is used in the undertaking of joint research activities.

Figure V: The scheme of the “ENR-toolkit”



Models of Collaboration

The Management Procedure introduces four models of collaboration:

- on National-Level or on Transnational Level
- Project-Level or Programme Level

When a topic of trans-national interest is identified, a decision on the type of financing of the activity has to be done. The financing can be either at the national level (national funding) or at the trans-national level (cross-border funding/common pot). On National level funds stay national and the money does not cross borders. In ENR it emerged very soon that cross-border funding is more efficient which resulted in developing trans-national collaborative research. ENR is one of the few ERA-NETs in the 6th Framework Programme, where the primary objective was to achieve trans-national programmes that were trans-nationally funded. Cross-border funding is based in ENR on the Common Obligation Model, described in the following sections. Furthermore, the scope in ENR can either be at the project level (call for tenders) or at the programme level (call for proposals).

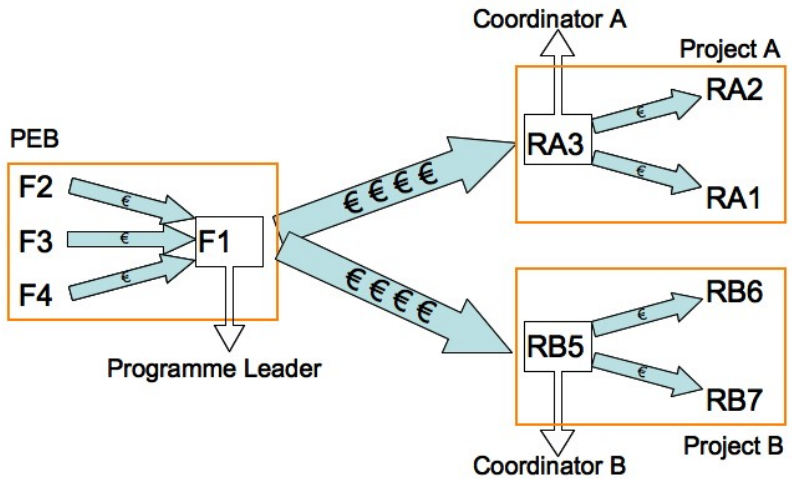
The following chapter describes the Management procedure and the Common Obligation Programme Model, which enables cross-border funding and used in the last Joint Calls successfully, in more detail.

Common Obligation Programme Model

The collaboration according to the Common Obligation Model starts with the decision of some NRAs (ENR countries, non ENR countries) to collaborate on a certain topic for a joint research programme. The objectives for the joint research programme are set out in the Description of Research Needs (DoRN). The programme ownership is formalised by the Programme Executive Board (PEB) made up of delegates of the participating NRAs. They agree on a Programme Leader (PL), who is responsible for the programme management, and a PEB Chairman (PEC) and sign a Collaboration Agreement (CA) in which several items (roles and responsibilities, committed amount of funding, duration, language, and the ownership of IPR and project results) are regulated. The PEB members jointly agree on the budget that is contributed by each participating NRA. The PEB contributes their share to the PL and the PL pays the contractors. The PEB members become undivided joint owners of information, results and IPR of the projects that were selected.

Table I.XI: Characteristics of the Common Obligation Programme Model

Model	**Common Obligation Programme Model**
Scope	NRA's collaborate on programme level and define objectives in a Description of Research Needs (DoRN) to make a call for proposals
Funds	**Cross-border funding**. Any contractor is paid by the Programme Leader, who requests and receives payment from the other PEB members
Recommended calls	Open call for proposals (performed as "design contest")
Roles & Responsibilities	**Programme Executive Board (PEB)** is a board at the expert-level with one responsible officer from each funding NRA **(programme ownership)**. **Programme Leader (PL)** has the responsibility for the administration and procurement of the programme **(programme management)**. **Programme Executive Chair (PEC)** chairs the PEB meetings **Project Manager (PM)** are PEB members from the same country as the projects coordinators. They support the PL in negotiations and monitoring **Contractors** are the research providers who do the contracted research. **Coordinator** is the leading researcher of a consortium.



1, 2, 3 etc…different countries F…funding NRA's R…research providers

Figure VI: How funds flow in the Common Obligation Programme Model

The Seven Steps Approach

Seven Steps from the identification of research needs to the delivery of a project within the project and programme model were identified. The table describes the tasks and features of each step in each Common Obligation Model on Project and Programme Level. The tools provided in the ENR-toolkit are listed as well.

Table II.XII: Tasks and features of Common Obligation Model

7 steps	Common Obligation Project/Programme Model - What to do?	Tools
Objectives	The 1st step is to **define the expected outcome**, the purpose of the research. What objectives shall be achieved? What is the research need? On project level objectives are defined in more detailed in the DoW to make clear what outcome is expected of the project. Thus the researchers can make a bid how they would realise the tendered project. On programme level the objectives are more generic within the DoRN, they just give an idea of what is the expected outcome, so the researchers can propose projects that meet the objectives.	Description of Work Description of Research Needs
Budget Frame	To formalise the collaboration all participating NRAs sign a Collaboration Agreement (CA) that describes all responsibilities within and outside the project or programme. Project/Programme ownership is formalised in a Project/Programme Executive Board (PEB) made up by one member from each participating NRA. One NRA takes the Project/Programme Leadership (PL) and has the project/programme responsibility. Another becomes PEB chairman (PEC) and chairs the PEB meetings. PL and PEC are approved at the kick-off meeting of the PEB. The project/programme is financed jointly, so each NRA commits a fixed budget. NRAs are responsible for making the budget available following a request from the PL.	Collaboration Agreement
Call	Depending on the scope of the activity (project or programme level) a call has to be made. Either a **call for tender** to find the most suitable research provider to perform the project or a **call for proposals** to find most appropriate projects to meet the objectives.	Call for Tender/ Proposals
Selection	The PEB agrees on the procedure and criteria for selection of project proposals and jointly selects the most suitable research provider or appropriate projects. All Applicants are informed about the result of the evaluation and get feedback to their project whether they were selected or not.	Selection Procedure
Contracting	The PL makes the contracts with the jointly selected research providers following its national law and regulations. The research providers are formally responsible to the PL.	National Procedures of the PL
Evaluation	The monitoring of the progress and the evaluation of the results follows the Monitoring Procedure from the ENR toolkit. The research provider presents reports and final results to the PEB. The PEB jointly approves the results and reports.	Monitoring Procedure
Payment	The funds flow according to the programme budget plan. The PL pays the research provider at certain stages on delivering the corresponding report after they have been approved by the PEB. The PEB members provide their contributions to the PL following a request for payment. The participating NRAs become undivided joint owners of information and results of the different projects. The results are published.	National Procedures of the PL

Index: Tables

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Sources

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