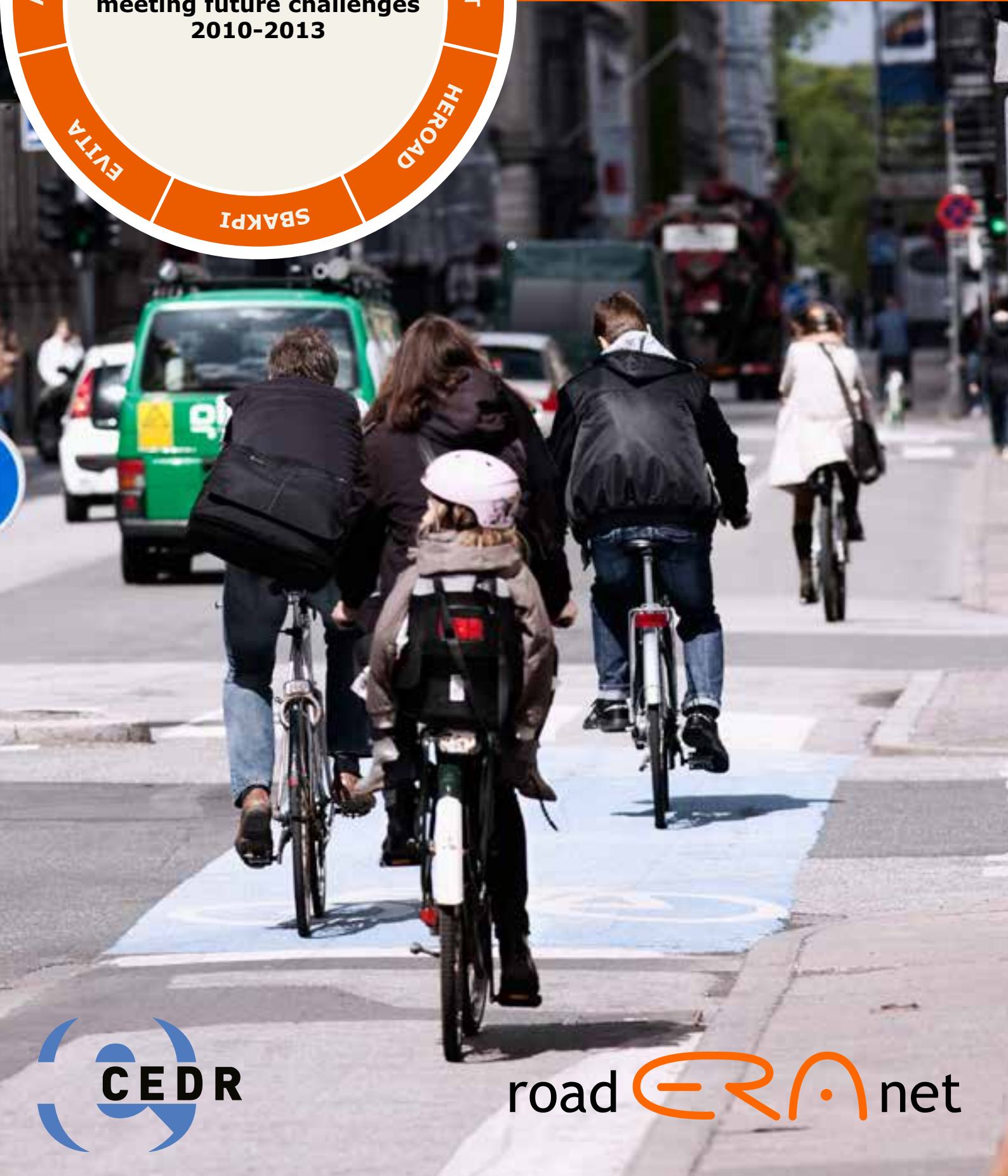


SOCIAL BENEFIT REPORT



◀(cover) Traffic signal in Copenhagen, Denmark
photo: GAB photo

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*<https://sites.google.com/site/assetcall>
www.eranetroad.org
www.cedr.fr*

Giske Bridge in Norway - photo: Knut Opeide

FOREWORD

Road Asset Management is a vital element in keeping the European society in motion. Proper and timely intervention strategies ensure mobility and development across borders.

In a time with many constraints, including the economic and environmental crisis, we must strive to save resources, both in terms of money and in terms of fossil fuels and materials. We face a double challenge: to provide cost-effective solutions to a complex and expensive infrastructure while at the same time servicing our primary clients, the road users, with safe and secure roads that are inter-modal, quiet, carbon neutral, flexible and forever open.

In a sense, the European Road Authorities are stewards of these values and responsible for living up to these expectations. The answer to the challenge is cooperation, and the Asset Management Programme has lived up to this by working together across Europe through the joint research collaborations ERA-NET ROAD and CEDR.

This is an important step forward for the European road research collaboration. And it is a success for the European Union, as well as for all the partners involved.

The next step forward is refining research results and getting them out on the roads to work for society. The AM programme has recognised this by initiating a series of case studies and by incorporating the social and technical benefits in a cross-asset exercise that hopefully will inspire the European NRAs to work closely together towards implementation.

The results of the case studies will be made available following the Asset Management symposium the 22nd – 23rd May 2013.

Bjarne Schmidt

Programme Executive Chairman

May 2013

The social benefits of the Asset Management programme are described in this report.

The technical highlights of the programme are presented in a technical report.

Both reports are available on the website:
<https://sites.google.com/site/assetcall>

EXECUTIVE SUMMARY

- A POPULAR AND TECHNICAL SIDE TO ASSET MANAGEMENT

This document is for all with an interest in managing the road infrastructure of our society in the best way possible.

The report is not a comprehensive reference book, but can instead be viewed as a series of good arguments and benefits of clear and clever decision-making about our infrastructural environment and the need for freedom of movement.

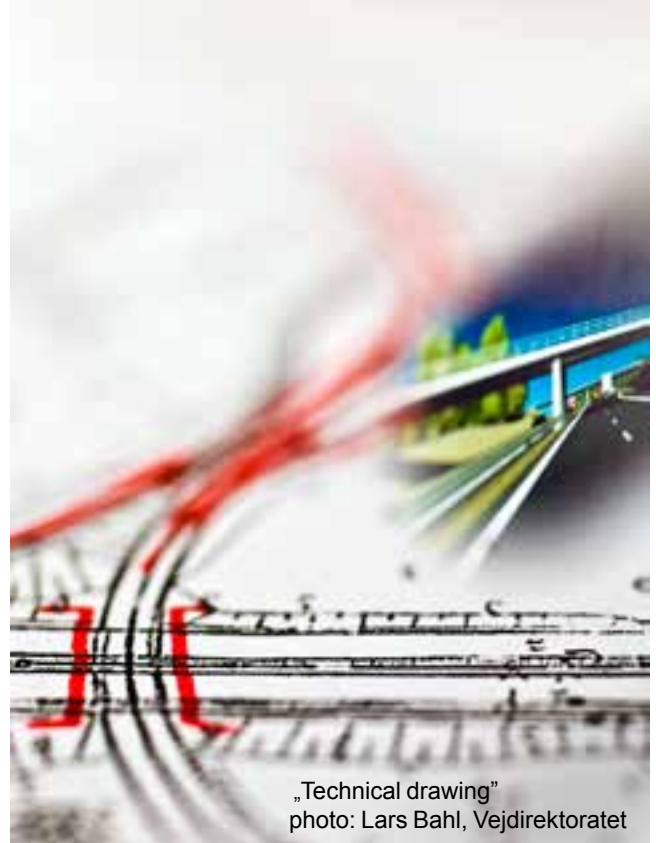
In general the report presents a holistic view to solving common challenges in the European road entities. Also it showcases how innovative cross-border research can be key to learning new things about clients and stakeholders and how new methods, new opportunities and new procedures can provide better quality, not only in research and development, but also in real life solutions for the greater good.

Technology and technical super minds cannot do it alone: we need a new and unique set of approaches, systems and methods to realise the full potential of asset management across Europe. This includes exploring some very concrete as well as some not-so tangible concepts and new ways of handling stakeholder requirements.

The Asset Management programme (AM programme) has done this - and more. This report does not go into details on the methodology and inventories of the projects - for this you have to read the joint technical report or the specific project deliverables, but it does outline how asset management can save a lot of trouble and money - for the National Road Authorities and for society as a whole.



Pedestrian - photo: Vejdirektoratet



„Technical drawing”
photo: Lars Bahl, Vejdirektoratet

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1. WHAT IS ASSET MANAGEMENT AND IS IT IMPORTANT TO SOCIETY?

Roads and bridges are extremely important assets to society. In fact, one might argue that mobility and accessibility are prerequisites for modern civilisation, as we know it.

Transport of people and goods in Europe is predominantly performed by cars and trucks, especially between work place and home and day-to-day delivery of goods, and therefore the condition and performance of the road network is at the very centre of attention for city planners, politicians and commuters all over.

But apart from delivering a vital service to society, the roads also pose an indirect threat to the health and safety of everyone using them or living near them. Accidents, noise, pollution and stress are but a few of the sad side effects that can derive from unnecessary traffic or badly planned or maintained roads.

So for road owners and operators, it is essential to balance the pros and cons of every piece of work up against the greater good: will this effort reduce or enhance CO₂ emissions, fatal accidents, drive time, parking capacity, shopping, business settlement, liveability, happiness? In terms of economy it is fairly easy to express the value of a certain asset and how to maintain or increase this value. Usually, the term asset management is used by investment companies as a method to control investments in property or stock and provide revenue for the client (as well as to the investment company). But for infrastructure asset management, other values than economic growth are also at stake.

As transport infrastructure is of common benefit to society in terms of mobility, leisure and every day supplies, so are the challenges in terms of maintenance and improvement a common issue. The money and efforts put into the infrastructure each year are immense. But so are the profits in terms of a sustainable society with plenty of commodities.

Today, road owners must think and act in a holistic way to ensure a high level of service to stakeholders, while protecting the environment and reducing accidents. All at the lowest cost possible to tax payers. Good road asset management is a solution

to the most important challenges for the lowest amount of money. And preferably the solution should encompass all imaginable scenarios and topics connected with the project or strategy. This job requires a very sophisticated methodology.

The AM programme was initiated to produce a suggestion on how to collect the intricate bits of this puzzle into one comprehensive toolbox. This report is a tool within this toolbox, where other tools include a technical report and a set of methodologies, specified to answer questions on an ever more detailed level. This report provides an overview of the societal benefits of the research undertaken in the Asset Management programme and refers the reader to the sources of knowledge for further info.

1.1 A strategic and practical tool

Asset Management is the optimisation of management, finance, economy, engineering and other practices applied to values to ensure the best handling of these in the most effective manner. It may apply to assets such as buildings and to concepts such as intellectual property. Asset management is a systematic process of operating, maintaining, and upgrading assets cost-effectively.

In road asset management this includes monitoring and management of the whole life cycle of physical infrastructure assets.

One might say, that asset management can be applied in the strategic as well as the practical endeavours towards getting more for less.

On a strategic level, it is important for the road authorities to help fulfilling political expectations and legislative demands. This includes ensuring mobility and safety while keeping maintenance costs down.

On a practical level, the right asset management systems can help to develop timely and sufficient intervention methods that protects the road investments and reduce annoyance to the road users.

A combination of the two approaches is the ability to communicate effectively the benefits and costs of road maintenance, underlining the necessary actions with actual examples. Hence, asset management is not an independent discipline but a tool to ensure and demonstrate the road owners capacity for clever use of tax-payers money.

To complicate things further, two major parameters in asset management: condition and congestion

stand out as very difficult to evaluate and communicate.

The road condition may be possible to measure, but very hard to value and even harder to place in a comprehensive estimate of all costs and benefits to society.

Congestion is another example; maybe one can estimate the loss of work hours due to delays in traffic, but if lives are spared due to slow moving vehicles, then congestion in a moderate form might not be a disadvantage to society.

And into this equation come the environment, goods, noise, mobility, comfort, pollution and many other positive and negative impacts from traffic and transport.

Also, when dealing with societal impacts, the target groups and stakeholders are diverse and ranges all across demographic, economic and professional groups.

1.2 About stakeholders

The AM programme defines stakeholders as four interdependent groups:

A The first group involves stakeholders who directly experience impacts of road infrastructure. These stakeholders benefit from an improvement of the road system, but will also be immediately exposed to any performance loss. Two main categories of directly affected stakeholders can be distinguished: road users and road neighbours.

B The second group involves those stakeholders who indirectly benefit from improvements of road infrastructure, but also indirectly face any performance decrease. A general category of an indirectly affected stakeholder is the human society as a whole.

C The third group involves those stakeholders which have a direct influence on the performance of road infrastructure through their decisions and activities.

Categories of directly affecting stakeholders include:

- National and local road authorities
- Road concessionaires
- Road service providers
- Private and/or public organisations

D The fourth group involves those stakeholders which have an indirect influence on the impacts of road infrastructure through their decisions and activities. Categories of indirectly affecting stakeholders involve:

- Road owners (private and public)
- Banks
- Shareholders

- a directly affected
- b indirectly affected
- c directly affecting
- d indirectly affecting

- a Road users & Road neighbours
- b Society & Organisations
- c Road management organisations & Road service providers
- d Road owners (public & private) & Shareholders & banks

For National Road Administrations (NRAs), based on the above definitions, key external stakeholders therefore include owners (generally government and its agencies), suppliers, and the community from which it draws resources and customers (e.g. tax payers, the users and those affected by the networks). It is also generally recognised that different stakeholders have different impacts and are entitled to different considerations. In a sense this document is meant as a pathfinder for stakeholders needs.

Obviously, the most interesting stakeholders for the NRAs, seen in a societal context, are the road users and neighbours to the road. How to involve the society and the societal needs in the decision-making process, even on a detailed project level is one of the challenges that the AM programme has faced. The programme has investigated the stakeholder perceptions, influence, benefits and tried to apply this approach to a new perspective, where stakeholder requirements are equally important to allocating resources to the infrastructure as deterioration models and monitoring.

Hopefully, the prioritisation of funds to the roads and bridges will be somewhat easier the clearer the benefits are to all stakeholders. For decision-making is a complex process that is influenced by all parts of society, including political, economic and environmental interests across borders and professions. The projects of the AM programme are a small contribution to understanding societal needs and benefits of roads in general and road asset management in particular.



Mjøssund Bridge & the Ibestad tunnel in Norway
photo: Håkon Aurlien

2. COSTS AND BENEFITS - AN OVERVIEW

The most important asset management topics to stakeholders, taken across, are safety and mobility, along with environmental issues. It almost goes without saying that economy plays a major role also, especially since the road infrastructure is used by all imaginable clients at all levels. Few commodities, be it food or culture, work or pleasure, have not at some point been depending on the road performance, either as a means of transporting goods, a recreational drive or as providers of daily commuting. So in order to appraise value for road infrastructure to society, it is not only about (re)investments or maintenance costs, but also about less tangible issues as reliability, freedom and opportunity.

The road capital of Europe represents a vast amount of money. The EU comprises 5,000,000 km of paved roads, out of which 65,100 km are motorways. The total investment on transport infrastructure during the period 2000-2006 was € 859 billion. The cost of EU infrastructure development to match the demand for transport has been estimated at over € 1.5 trillion for 2010-2030 (EC TNT 2009). The concept of ‘asset value’ therefore becomes very important when considering long term sustainability and the measures necessary to ensure that every asset reaches its full expected life.

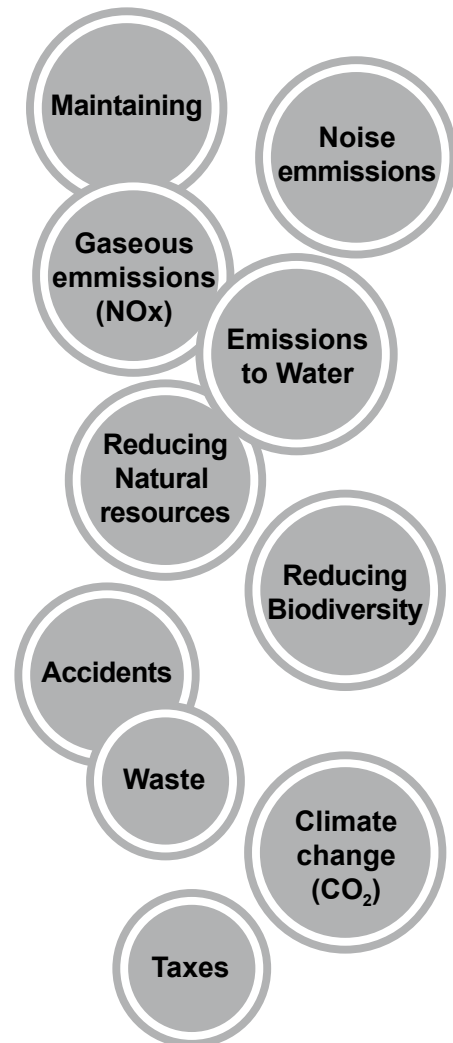
2.1. Impacts on society of road transport

A well-functioning road infrastructure has significant positive impacts on the society. Some of these are shown below. These benefits might easily dwindle, should decision makers not choose to prioritise them. An example is that the number of employees, related to road freight and passenger transport is estimated to be more than 5 mio.

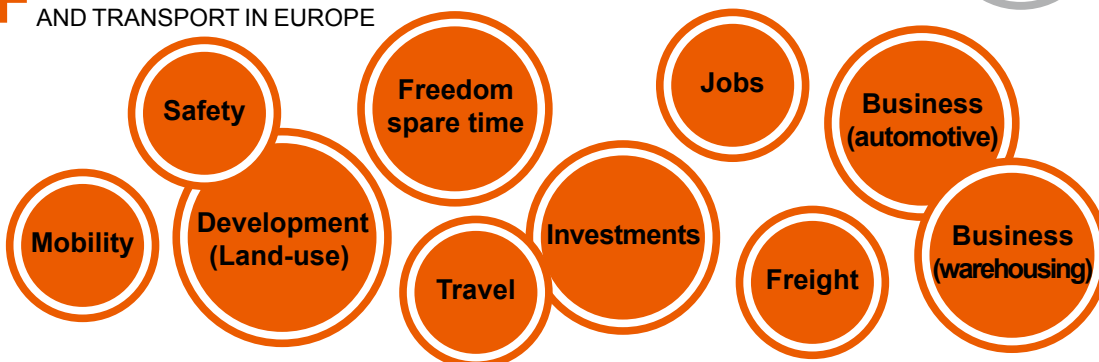
On the downside, traffic and transport contributes to society with impacts that are more negative. According to the European Environment Agency (EEA), the financial cost of air pollution to society from all road transport is estimated at 100 billion euros annually, of which nearly half is from heavy goods vehicles. This equals 3 million sick days and 350,000 premature deaths in Europe each year. (EEA, Feb 28, 2013)

Shown below are more of these less fortunate side effects to road transport:

■ NEGATIVE IMPACTS OF ROAD TRAFFIC AND TRANSPORT IN EUROPE



■ POSITIVE IMPACTS OF ROAD TRAFFIC AND TRANSPORT IN EUROPE



Many of these terms relates to the Key Performance Indicators (KPIs), used in most asset management systems to prioritise investments. Part of the challenge of introducing the culture change within road authorities is to consider road maintenance as an 'investment' in the asset. So, the concept of appropriate KPIs was also investigated by the AM Programme. Two of the projects (EVITA and SBAKPI) examined the possibility to include the environmental impact of road infrastructure in the management systems, expressed as Environmental KPIs.

Most of the projects in the programme recognised the road users as primary stakeholders to road intervention, but the SABARIS project made a slight distinction between directly affected and indirectly stakeholders, where the first group are road users and neighbours and the second the society, represented by governments and organisations. In this respect one might argue that the optimal solution would benefit both groups at lowest cost possible.

2.2 Key elements in reducing costs

Overall the interest in reducing costs often brings with it the risk of more casualties, more congestion and more deterioration. If society chooses not to invest in infrastructure, not only would prior investments be lost, but also more cars would crash and commuting and job markets would break down. On the other hand we have to invest wisely so the pay-off benefit the society,

The ASCAM project suggests the introduction of a user perspective as a new layer to already existing asset management systems. In another word, ASCAM (together with PROCROSS) suggests a method to quantify societal benefits in order for the road owner or manager to make informed decisions and prioritise strategies across all assets. In the proposed framework, the cost and benefit of maintenance strategies over time is predicted by using societal as well as technical models and comparing output with the costs.

The term End User Service Levels (EUSL) covers the expectations of stakeholders (primarily road users and society). When EUSL are expressed in KPIs and focused on the most important topics (mobility, safety, environment), and if you are willing to look across relating decision triggers (strategy, measurement, prediction) and intervention types (building, maintenance) as well as deployment methods (projects, ad-hoc) the equation is given:

The better planning, the more satisfied customers. Also, one might argue, that saving taxpayer money through decent planning is another societal benefit.

A common conclusion for all projects, though, is that the current stock of compatible data between benefits (reduced number of accidents) and costs (better friction/visibility/winter maintenance) is really low. As ASCAM puts it: "Especially the missing relations between condition and the end user service levels are show stoppers".

Or, as put by PROCROSS: "The value of the asset network is comprised of a number of tangible and intangible factors and their combination. The perceived level of safety and service, the real cost of the network, the life-cycle-cost, the environmental cost the impact on the society and the economy as a whole are the major influencing factors".

To sum up, the main targets for a comprehensive or holistic asset management approach are (as synthesised by the technical advisory board of PROCROSS):

- Maximisation of traffic safety
- Maximisation of riding comfort
- Maximisation of availability
- Minimisation of negative environmental impacts and effects
- Compliance with maintenance budget restrictions
- Other strategic or political requirements and targets.

SABARIS -	Stakeholder Benefits and Road Intervention Strategies
EXPECT -	Stakeholder Expectations and Perceptions of the future Road Transport System
HEROAD -	Holistic Evaluation of Road Assessment
SBAKPI -	Strategic Benchmarking and Key Performance Indicators
EVITA -	Environmental Indicators for the Total Road Infrastructure Asset
ASCAM -	Asset Service Condition Assessment Methodology
PROCROSS -	Development of procedures for cross-asset management optimisation

The projects are further explained in chapter 5

ALARM SURVEY 2013**Quick facts:**

£829 million annual funding shortfall – England and London

£6.2 million annual budget shortfall (per authority, England)

1 in 5 roads with residual life of less than 5 years

12 years to clear backlog (in England)

£338 million – cost of damage caused by 2012 extreme rainfall

£10.5 billion – estimated „one-off“ cost to get roads back into reasonable condition

£32 million – amount paid in road user compensation claims

£2.2 million potholes filled across England & Wales

£113 million – total spent filling potholes – England & Wales

From the British Asphalt Alliance yearly survey on road conditions. Although commissioned by the (AIA) and clearly a policy driver, the numbers are not easily disputed.

Source: AIA press release March 14th 2013.

2.3 Benefits on society per objective

If we turn our attention to the four primary objectives of the Asset Management Programme:

- A. to determine the requirements and expectations of stakeholders,
- B. to improve understanding of asset performance
- C. the development and use of Performance Indicators for managing the network
- D. cross-asset optimisation

Then the benefits to society of using the key findings would be:

A) With the identification of the road users as the key stakeholders, and their expectations primarily being on lowering accidents and enhancing mobility, the NRAs can adopt a new mind-set and new tools to existing asset management systems and projects. The AM Programme showed how the society can be engaged in decision making, for instance by performing accompanied journeys and group interviews as well as including a prioritisation model of stakeholder needs in the planning process. For the road users, here embodying society, the benefits are clear: not only are they given a voice through representative interviews but also they are allowed an important insight into the allocation and prioritisation of their tax money. An added benefit is improved knowledge and acceptance of road intervention procedures.

B) While the holistic or system approach to asset management is partly meant as an internal means to encompass all thinkable parameters and side effects into planning, it also applies to the society as a tool to describe and explain strategic and economic decisions. With an open and embracing approach to allocating funds that are important to society, it will be easier for the NRA to communicate with politicians and organisations the benefits of road transport. A holistic approach allows stakeholders to identify and accept the balance between positive and negative impacts of road transport, which again relieves the NRA from feigning for the need of road intervention and investments.

C) By using logic road maps and by introducing new KPIs the AM programme has laid out a way to put value on societal demands for a cleaner environment, a safer transport system and overall development of infrastructure and social mobility. Following the implementation and framework models allows the NRA to identify from project to project the societal impact and needs as well as performing benchmarking across borders to identify best practise. The European road users will hopefully benefit from this by decision makers paying attention to their needs.

D) The cross-asset management approach focuses on connecting end-user service levels with measurements and strategies while introducing new values and topics to the decision process, irrespective of which particular asset(s) contribute to delivering the service. As end-user service levels can be translated into a satisfied society, this approach is key to work in actual costs to society alongside technical parameters such as deterioration to the infrastructure. Also, the cross-asset approach allows the NRA to work simultaneously on a practical (bottom-up) project level and a large-scale (top-down) strategic level by keeping focus on the objectives, among these the need of the stakeholders, most prominent the society.

„Man in car”, photo: Vejdirektoratet
 Info meeting M3, photo: Pelle P, Vejdirektoratet
 Vejle fjord bridge, photo: Vejdirektoratet
 Cyclists in Copenhagen, photo: Vejdirektoratet





3. NEW ASPECTS IN ROAD ASSET MANAGEMENT

Inventories and research show that the most important issues for the stakeholders as a whole are mobility, safety and resources. But in addition to this the AM programme suggests a number of new parameters that could be taken into account when planning and maintaining the road infrastructure. This includes for instance environmental KPI's (SBAKPI and EVITA), behaviour and perception of the individual road user (EXPECT) as well as different intervention methods and equipment

At the very centre of attention stand the stakeholders to the tasks of keeping efficiency high and impacts low on the roads. Following the conclusions of the seven projects, stakeholders can be either national road agencies (NRAs) or the society as a whole, including the road users.

From a public point of view, however, it is important to stress that the road and transport agencies are sponsored by the tax payer's and road users, and hence these are the primary clients to all initiatives, including improved asset management. The

politicians are basically there to ensure the right allocation and spending of tax payer's money and the NRAs are there to see this done in an efficient way, according to strategic agendas for safety, mobility and resources. In addition, political demand for reducing environmental impacts creates a major challenge for the agencies. In the end it's all about prioritisation, and this is where asset management enters the picture.

As described in the PROCROSS project, there are basically two approaches to asset management. One is the top-down approach, where research, development and deployment is initiated and guided by strategic agendas, devised by decision makers in- and outside the NRAs. Research collaboration across borders, initiated by the Conference of European Directors of Roads (CEDR), is an example of this.

The other approach is bottom-up, where the road users and society create a demand for changes or new focuses. The intense public debate about road traffic noise during the booming 2000's shows how this works.

All in all the enlarged concept of multiple stakeholders or target groups, combined with more and new demands for tighter budgets and better results calls for new approaches, strategies and methodology. The AM programme answers this call by suggesting a number of new practical guides and procedures.

The SABARIS project developed a step-by-step model with guiding questions and supporting tools to identify stakeholders and intervention strategies (bottom of page).

In this approach, the asset manager can tailor make the given project or strategy to a specific stakeholder (or stakeholder group) and by using supporting tools (inventories, experiences, methodologies) as well as surveys and evaluations, constantly optimize the modus operandi. Also, the EXPECT project suggests surveys and interviews with road users as a mean of managing stakeholder expectations. The SBAKPI project suggests a use of KPIs on certain topics to demonstrate value.

These new approaches of course need new methods or tools. One thing is the implementation of advanced IT-systems, that surpass or correlates with existing systems. But another, perhaps equally important mean to reach a new level of effectiveness, is the deployment of a different mind-set or: holistic view to asset management.

This implies grasping an extremely complicated immense machinery that comprises many different layers and nobody expects the National Road Authorities to be able to foresee all technical, socio-economic or demographic developments and act upon these in advance, but the first step is to recognise the complexity and to begin exploring new territory. To do so, the AM Programme decided to initiate a series of case studies.

The case studies were based on the suggested guidelines and procedures that the respective projects within the programme came up with. Needless to say, a case study is not the same as eventual implementation, but as a trial-run, it can bring the new approach a bit closer to realization, and it can strengthen hypothesis and understanding of methods, conjured by the AM Programme.

These case studies are to be presented at a symposium in Copenhagen in May 2013, and the proceeds of this symposium, along with a detailed description of the methods for measuring and planning asset management from a more holistic approach will form the base for a technical report that will be available shortly after the symposium. This report will enable the technical staff of the European NRAs to consider implementing new KPIs and new road maps into existing asset management systems.

	Directly affected stakeholders		Indirectly affected stakeholders	Directly affecting stakeholders	
	Users	Residents	Society	Road Management	Service provider
Safety	●●●	●●	●●	●●	●●●
Travel time	●●●	●	●●	●●	●
Comfort	●●●	●	●	●●	●
Vehicle operation cost	●●●	●	●	●●	●
Economy	●	●●	●●●	●●	●●
Emission	●	●●●	●●	●●	●
Resource consumption	●	●	●●	●●●	●●●

●●● very important ●● important ● less important

4. THE ASSET MANAGEMENT PROGRAMME - ORIGIN AND PURPOSE

The ERA-NET ROAD II (ENR) joint research programme SRO4 “Effective Asset Management Future Challenges” aims to:

- determine the requirements and expectations of stakeholders,
- improve understanding of asset performance
- develop and use Performance Indicators for managing the network
- optimise cross-asset

The Asset Management programme is also known as the ERA-NET ROAD 2010 call.

This refers to the string of joint research calls, initiated by the European Commissions Research Area Programme, ERA-NET.

The overall objectives of ERA-NET Road programme were to:

- embed the culture of collaborative road research in the partners’ organisations further broaden collaborative road research beyond the current fifteen countries and two regions
- establish a permanent structure that will take forward the European Research Area for road research after completion of the project
- pave the way towards achieving an expenditure of 10% of the research budget of the National Road Administrations on trans-nationally funded collaborative research by 2013
- liaise with other public and private stakeholders in transport research programming in Europe

The ERA-NET ROAD collaboration project spurred the idea and the methods for the European road authorities to join forces and fund large research programs of common interest.

In 2008 the Call “Road Owners Getting to Grips with Climate Change” was established, followed by the 2009 call “People Safety at the Heart of Road Design”

In 2010, thirteen countries produced a call on asset management. This call was recognised as a topic of mutual interest and benefit to the European road owners. Almost 3 mio. EUR was compiled and seven research projects were funded.

In 2011, a joint call was made on three topics: mobility, design and energy. The collective budget was almost 5 mio EUR, and 15 research projects were selected.

CEDR, the Conference of European Directors of Roads, has followed and supported the joint calls, as they have developed from minor trials into comprehensive collaboration programs. From 2012, CEDR has now taken over the responsibility of procuring funds, announcing calls and managing programs.

The Asset Management Programme is driven by the participating administrations, where asset management experts from each funding NRA form an Executive Programme Board, overseeing the projects and the affiliation with the stakeholders.



5. ONE PROGRAM, FOUR OBJECTIVES, SEVEN PROJECTS

The seven projects awarded funding through the ERA-NET ROAD II call, 'Effective Asset Management meeting Future Challenges', addresses important aspects of managing the strategic road networks, through the following objectives:

- A** to determine the requirements and expectations of stakeholders,
- B** to improve understanding of asset performance
- C** the development and use of Performance Indicators for managing the network
- D** cross-asset optimisation

The seven selected projects are:

SABARIS	Objective A
EXPECT	Objective A
HEROAD	Objective B
SBAKPI	Objective C
EVITA	Objective C
ASCAM	Objective D
PROCROSS	Objective D

Objective **A**: SABARIS + EXPECT

Timely intervention strategy for road maintenance + Involving stakeholders in the prioritising of road maintenance

Objective **B**: HEROAD

Hollistic view of road maintenance (provides a new view on effect)

Objective **C**: SBAKPI + EVITA

Finding best methods to assess the value of road maintenance + Thinking about the environment in road maintenance

Objective **D**: ASCAM + PROCROSS

Costs and benefits of road maintenance + Involving all aspects of the road in road maintenance



Timeline Asset Management Programme

- 2009** The European road administrations, under the auspice of CEDR, decides on a set of common strategic agendas within the field of road research. In 2009 the agreed first priority is Asset Management. Subsequently a workshop is held and 14 CEDR entities choose to co-sponsor a call for research on this topic. The joint funding amounts to almost 3 mio EUR. The Danish Road Directorate is appointed programme leader and send out the call.
- 2010** A programme executive board (PEB) is set up, consisting of representatives from the sponsoring road authorities. A selection process leads to the establishing of 7 projects in one programme. 7 PEBs are designated as Project Managers to monitor each project closely. The project leaders of each of the 7 projects participate in PEB meetings to report progress.
- 2011** A dissemination workshop is held in Copenhagen to ensure consensus on common targets, messages and media-relations.
A SWOT analysis is performed to point out gaps and opportunities within the programme.
A communication adviser and a technical adviser is hired to help disseminate and coordinate the technical and societal benefits of the results.
A website is established.
- 2012** An implementation workshop is held in Trondheim
The project deliverables are coming in and being uploaded to the website.
Case studies are initiated to investigate further the findings of the projects.
- 2013** A final PEB meeting in Dublin to discuss final deliverables and reports, as well as the symposium in Copenhagen. A symposium on Asset Management is held in Copenhagen to mark the end of the programme and to present results to stakeholders, sponsors and colleagues across Europe.
Two reports are published: One on technical and one on societal benefits of asset management.

5.1 Projects at a glance

The seven projects within the AM Programme each have their own specific approach to asset management, in method as well as in scope. But during the selection process it was important for the Programme Executive Board to ensure that all four call objectives were investigated.

Hence, the seven projects as a whole were selected to cover the "future challenges", mentioned in the sub-title of the joint research programme.

The projects were selected to jointly work as a conglomerate of topics, each contributing to an overall picture of best practises, combined with measurement methods. Together, this provides decision makers and practitioners with results and guidelines to take road asset management to a new level, for the benefits of the stakeholders.

5.1.1 Stakeholders - SABARIS and EXPECT:

The objectives of these two projects were to identify the road asset management stakeholders, including their needs and expectations of. EXPECT investigated the perceptions of the most important stakeholders in order to provide the road owners with a method to define the correct level of service from project to project. Among the research tools were accompanied journeys and group interviews. The key output of EXPECT is a model for prioritising issues of importance to stakeholders and incorporate these parameters into the overall asset management process. (se chapter 6)

The SABARIS project addressed a specific problem of the road owners: how to accustom the stakeholders of a particular road stretch by choosing the correct intervention strategy. SABARIS divided the stakeholders into 4 categories; directly affected, indirectly affected, directly affecting and indirectly affecting stakeholders. In connection to this, a series of tools were developed to assist the road owner in choosing the right level of service to the stakeholders. This includes a guideline for stakeholder oriented intervention strategies, as well as estimating the impact and satisfaction of the given intervention.

In summary, the projects provides a well-defined starting point to all road agencies and road managers that wishes to consider the stakeholders in their planning. Decision makers have an interest in providing a service that satisfies road users regarding the mobility and safety to society, as well as in terms of money, comfort, flexibility and the transport of people and goods.

5.1.2 Monitoring. SBAKPI and EVITA

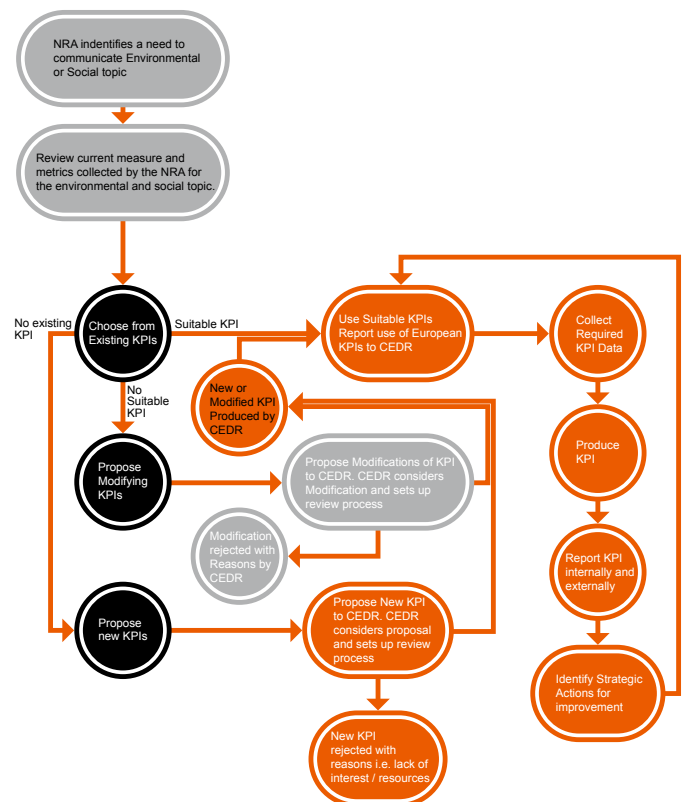
The project SBAKPI dealt with the task of identifying new, measurable parameters for the European NRAs regarding noise, air quality, water quality, waste, climate change, biodiversity, stakeholder satisfaction, safety, development and travel. SBAKPI identified ten topic areas and developed eleven KPIs. A three month trial program was developed that focused on actual implementation of the KPIs into the NRAs systems.

Two key points were found: Firstly that the NRAs of Europe need to dedicate more time and resources to be able to implement environmental and societal KPIs in their asset management. And secondly: that common measurements and metrics are essential

to implementation. However, out of eleven identified new KPIs, only five were actually estimated to be adoptable; water quality, climate change, biodiversity, safety and development.

The EVITA project (Environmental Indicators for the Total Road Infrastructure Assets) had as its main objective the development of new E-(environmental) KPIs. However, EVITA also found best practices on how to perform a more inclusive form of asset management with the aim of providing an implementation strategy for this, as well as to give recommendations to the best practical integration of E-KPIs into present asset management systems.

The SBAKPI advocates a process that ensures the consideration of current practise while at the same time identifying a way of drawing a consensus across Europe on the key topics project To enable benchmarking NRAs should follow a process which ensures they consider current practice, identify a way of drawing a consensus across Europe and build on the current understanding within the priority topics, the environment and social KPIs. This is laid out in the Benchmarking Framework below. (See chapter 6 for further description)



5.1.3 Cross-Asset Management - ASCAM and PROCROSS

According to the diagram of project inter-dependencies, the projects, ASCAM and PROCROSS, each covers a very important aspect of asset management; the decision makers and the practitioners angle, expressed in terms of management procedures (PROCROSS) and measurement models (ASCAM)

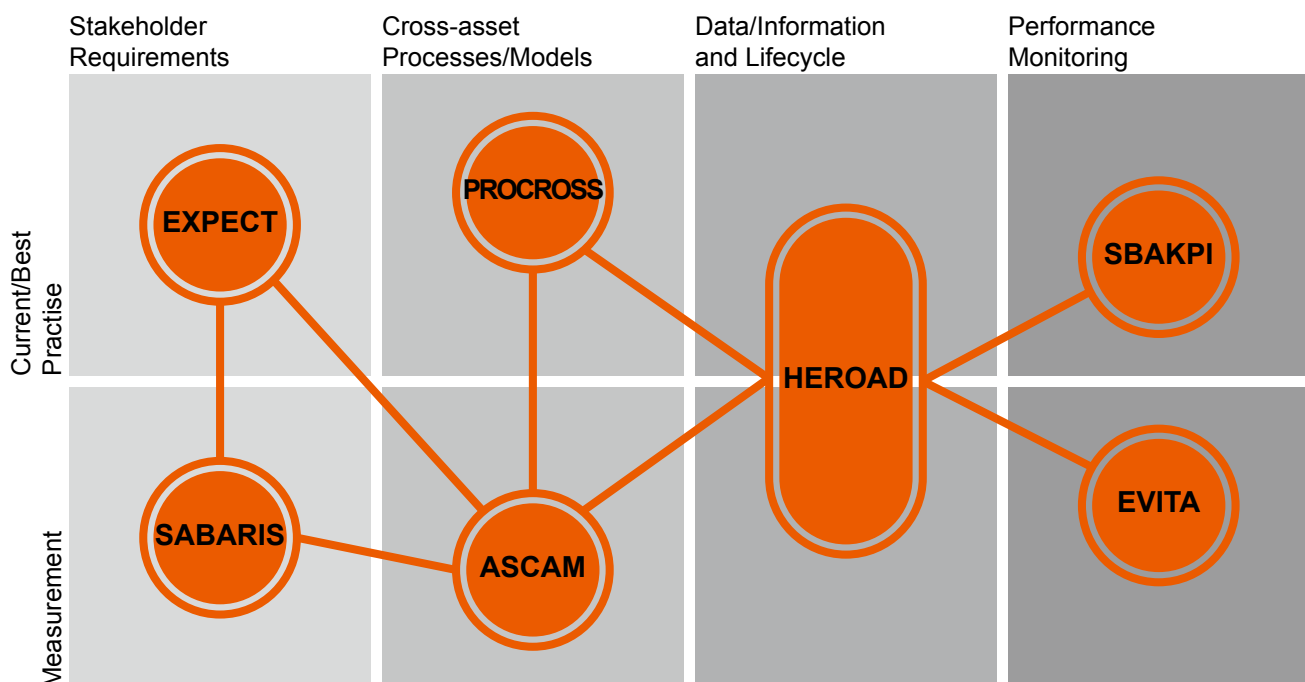
The ASCAM project focuses on a framework for optimized asset management. The central question for the project was if existing asset management practices can be gathered into a holistic, integrated cross-asset approach, and whether this would give added value to the National Road Administration.

ASCAM identified the following requirements for such a network to be realised:

- Connection of technical measures to end-user service levels
- Connection of inspection and monitoring with measurements
- Connection of maintenance strategies and end-user service levels
- Addition of new topics, such as mobility, climate change to end-user service levels.

In the presented roadmap towards cross asset management, the ASCAM project described a series of pilot projects (later converted to actual case studies) that shows the added value of the approach on a small scale. The ASCAM finally developed a tool, the ASCAM Demonstrator, which delivers proof-of-concept regarding the incorporation of end user service levels into asset management. A guide to this is enclosed in chapter 6.

Below, the findings of the seven projects are categorised according to the categories in the diagram.



The Demonstrator allows the user to visualise the consequences of different chosen scenarios to the end user satisfaction. Combined with other parameters, such as durability and safety, this allows the road owner to predict the societal costs over time, thus being able to budget for the adequate level of for instance noise, comfort and pollution.

The goal of the PROCROSS project was the development of asset management procedures for the entire road infrastructure, which includes all sub-assets, such as pavements, structures, road furniture, signs, etc. The project aims at providing a recommendation for a holistic road asset management scheme that balances expectations of strategists and experts.

Within PROCROSS six stakeholder groups were identified: operators, users, neighbours, society, financing body and owners, each with their respective interests.

Altogether, the stakeholder objectives were grouped as:

- safety
- costs
- environment
- availability and
- customer satisfaction (comfort).

These correspond to the five end user service levels (EUSLs) worked with in ASCAM as example EUSL: safety, noise, emission, accessibility and comfort. From a PROCROSS viewpoint this set could be adequate and complete.

PROCROSS recommends prioritization strategies and cross-asset management optimization procedures, taking into account whatever is feasible within an NRA given the boundary conditions (organizational structure, budget source, objectives). The same applies to ASCAM, as the developed tool can be used for single asset maintenance or cross-asset maintenance by entering the respective objects into the tool. This provides a flexible structure to be used by the NRA.

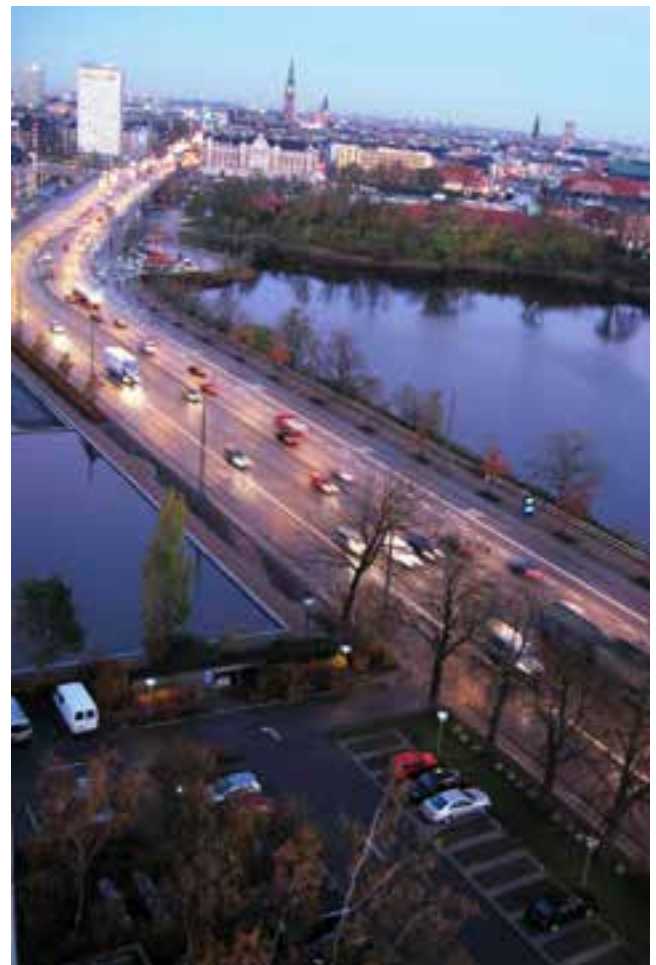
An interesting finding within the PROCROSS project was, that there is a significant difference to how NRAs handle their maintenance; some work on a strict strategic level (top-down), others on a very practical level (Bottom-up) and many in combination. The big challenge for the NRA is to define the

correct strategic performance indicators (PIs) for their purpose, some of which being the most important - Key Performance Indicators (KPIs).

5.1.4 Holistic approach HEROAD

The HEROAD project were commissioned to investigate the correlations of - and opportunities for transcending - the different existing and suggested asset management methods and approaches into a joint systems or holistic approach for the road authorities to deploy prior to strategic and practical decisions.

The project provided an analyses of the stakeholder expectations in connection to pavement management, including a guide to the ideal measurement for each parameter. (See appendix) HEROAD also investigated quality assurance procedures in data collection, analysing a number of European countries approach. A third survey was done on structures performance and a fourth on equipment. Finally the project looked at environmental impacts of noise, water- and air pollution and greenhouse gas emissions in a context of integrating this into asset management.



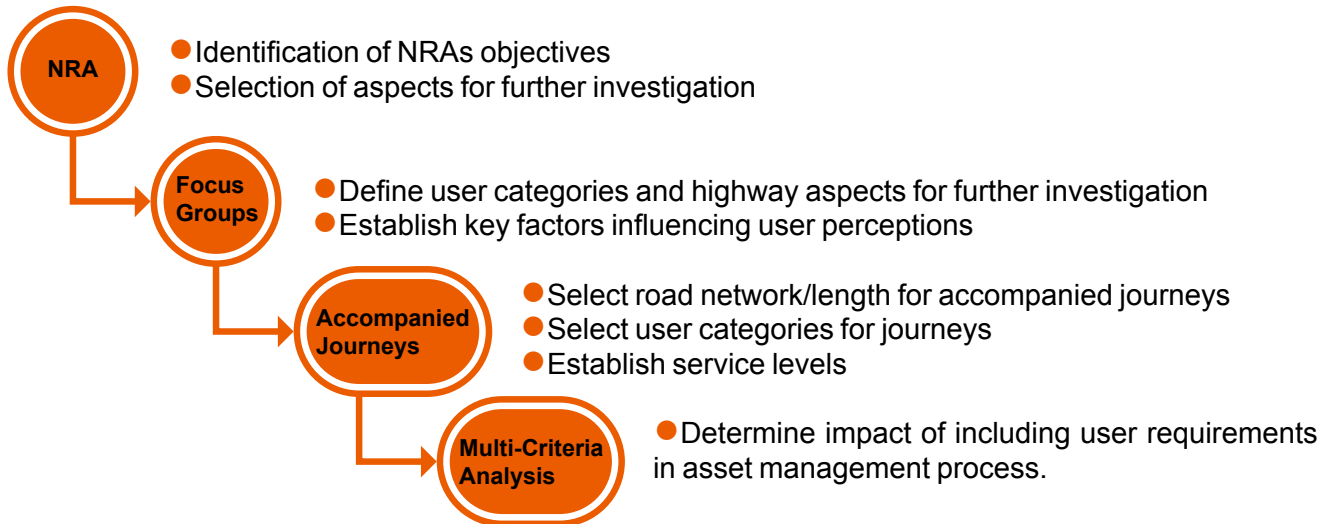
6. GUIDES AND PROCEDURES

Following are examples of models that were developed in the AM Programme:

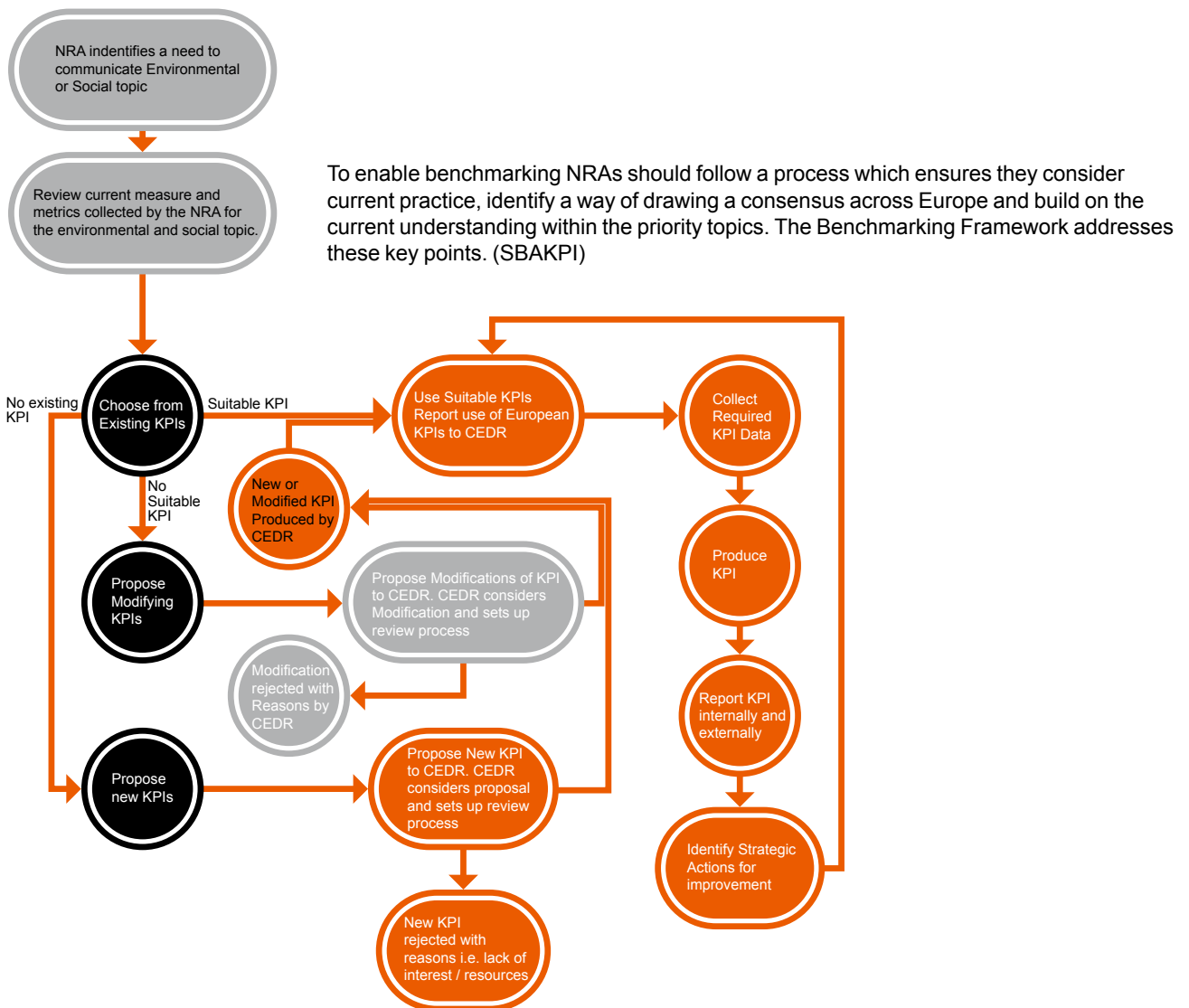
For more information, please consult one of the experts, found in chapter 8 or go to the Technical Report. Below each model you will find a very short description along with a reference to the project title.

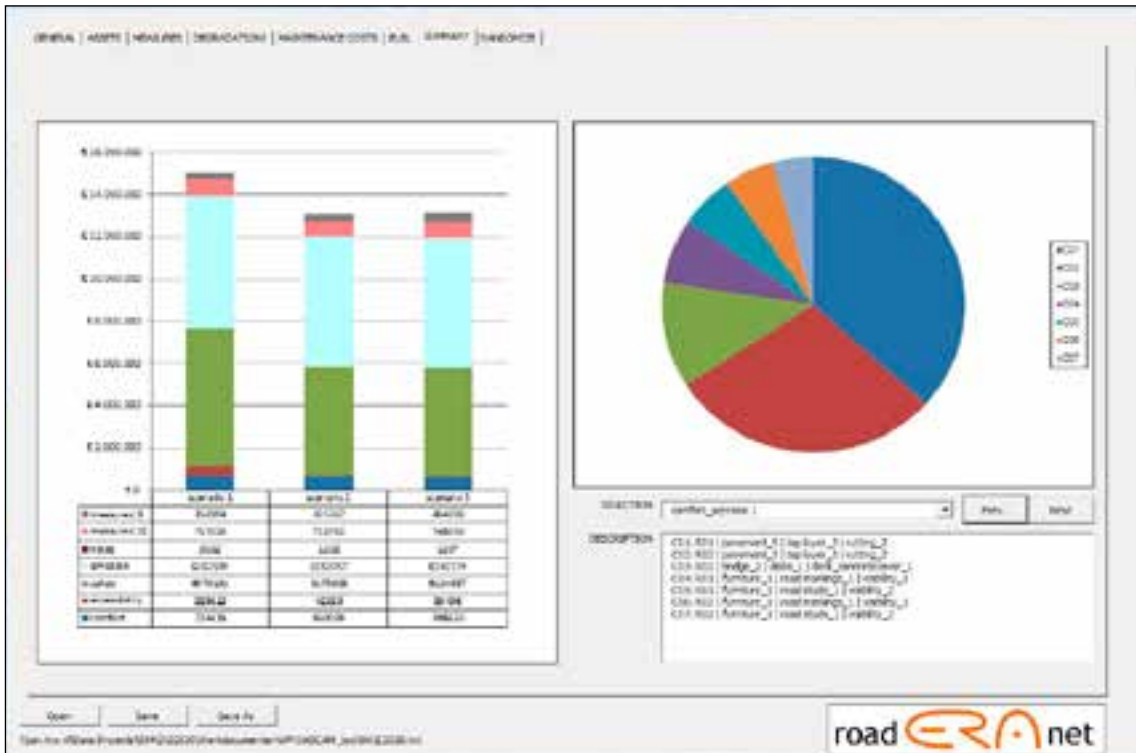
Process Steps	Guiding Questions	Supporting Tools
<p>Road link</p> <p>1. Stakeholder identification</p> <p>2. Stakeholder analysis I</p> <p>3. Intervention optimisation I</p>	<p>Which individuals and/or organisations affect or are affected by the road link?</p> <p>How important are impacts of the road link to stakeholders? How satisfied/dissatisfied are stakeholders with road impacts?</p> <p>Which intervention strategy creates the maximum net positive impact to stakeholders of the road link?</p>	<p>List of road stakeholders</p> <p>Stakeholder survey Impact hierarchy Importance satisfaction rating Importance satisfaction matrix</p> <p>Intervention optimisation tool Stakeholder survey</p>
<p>Intervention project</p> <p>Planning</p> <p>4. Stakeholder analysis II</p> <p>Execution</p> <p>5. Stakeholder engagement</p> <p>Evaluation</p> <p>6. Stakeholder analysis III</p> <p>7. Intervention optimisation II</p>	<p>What are expectations of stakeholders about the specific intervention project on the road link?</p> <p>What are appropriate measures to influence stakeholders' expectations and experiences about the specific intervention project?</p> <p>What are the experiences of stakeholders with the intervention project? How satisfied/dissatisfied are stakeholders with the specific intervention project?</p> <p>Which intervention strategy creates the maximum net positive impact to stakeholders of the road link?</p>	<p>Stakeholder map Stakeholder survey</p> <p>List of engagement strategies</p> <p>Expectancy (dis)confirmation diagram</p> <p>Intervention optimisation tool</p>

Guideline for stakeholder oriented optimisation of road intervention strategies (SABARIS)
The guideline describes a 7-step process road agencies should follow when determining the optimal intervention strategy for a road link taking the valuation of road impacts by stakeholders into account.



A generic methodology incorporating Focus Groups and Accompanied Journeys with road users has been defined by the EXPECT project to help NRAs improve their understanding of the needs and expectations of different stakeholders in relation to the various categories of highway assets and establish appropriate service levels. For the further work, EXPECT suggests a work programme as laid out by the model above.





Part of the ASCAM demonstrator. Calculations performed with the demonstrator of the framework has shown that it is possible to build a tool which, in theory, can connect technical measures to end-user services levels (EUSL's).

Assessment ID	Infrastructure Life Cycle Phase				Stakeholder					Spatial	
	Construction	Operation	Maintenance	User	Operator	Owner	Society	Neighbours	Financing Body	Global	Local
N1	●	●●●	●				●	●●●			●●●
N2	●	●●●	●				●	●●●			●●●
N3		●●●						●●●			●●●
N4		●●●						●●●			●●●
A1	●	●●●	●				●●	●●●		●●	●●●
W1	●	●●●	●				●●●	●●		●●●	●●
W2	●	●●●	●				●●●	●●		●●●	●●
W3			●●●				●●	●		●●	●
R1	●●●		●●				●●●	●	●●	●●●	●
R2	●●	●●●	●●	●●●	●●●		●●●		●●	●●●	
G1	●●	●●●	●●				●●●			●●●	

●●●High relevance ●●medium relevance ●low relevance

EVITAs suggests a general framework for implementation of Environmental KPIs. A flexible system that can accommodate different types of technical parameters and indicators, different objectives and different levels of application, is recommended. The first step that should be taken for incorporation of E-KPI in asset management practice is to evaluate their relevance with respect to the infrastructure life-cycle, stakeholders and spatial distribution, depending on the context.

Requirement	Approach	Steps for implementation
Strategic level		
Description of strategic target and requirements	Strategic asset management plan	Define targets and objectives for asset management with regard to the different stakeholders
Transformation of strategic targets into strategic (K)PIs	General and asset-specific management and business plan	Define the indicators, which should be used for the assessment of the asset management processes
Strategic to object level		
Translate strategic targets into (technical) PIs	Minimum requirements for assets, technical guidelines and standards, calculation procedures for (technical) PIs	Define technical indicators, thresholds and levels of PIs with regard to the strategic targets
Object level		
Generation list of (single) asset maintenance treatments (strategies) and calculation of corresponding PIs	Asset-specific management systems using state of the art procedures for the assessment of asset-specific maintenance treatment strategies (e.g. life-cycle-analysis)	Implement PMS, BMS, TMS, etc. (including monitoring, data repository and analysis)
Cross-asset level		
Generation of list of cross-asset treatment strategies and calculation of corresponding PIs	Process for the definition of cross-asset treatment strategies and assessment of strategies based on calculated PIs	Implement procedure for the definition and assessment of cross-asset treatment strategies
Optimisation of cross-asset treatment strategies under given requirements	Optimisation process (tool) for finding the most efficient solution under given requirements	Define optimisation problem and solution
Controlling level		
Control and adjustment	Comparison of pre-defined targets and objectives with actual situation	Define controlling instances and adjustment procedures

An overview of the requirements, the approaches and the necessary steps for the implementation of cross-asset management.

7. CONCLUSIONS AND PERSPECTIVES

Asset management, and especially cross or holistic asset management is no easy task.

The exercise is iterative, or: on-going. The project results of the AM Programme clearly shows that the present asset- and pavement management systems and methods of the European NRAs can have difficulties in coping with this challenge; in terms of technical, economical and often social constraints. The road authority faces constant pressure to keep down expenses, while at the same time increasing public and political demands.

Some of these challenges can be approached by upgrading systems, enhancing communications and embracing and incorporating new topic areas into the equation. But first and foremost, the key to success lies in international cooperation: on legislation, best practices, research, development, innovation, procurement and strategies.

The AM programme has sought to reach a new level in this cooperation: Through strategic alignment of research needs, over identification of common objectives, to selection of cooperative and competitive research providers who performed inventories and research across Europe, to coordination,

guidance, management and ultimately deployment of results through case studies and a symposium for all stakeholders.

An added ingredient in this pot has been the introduction of a portion of soft values to the otherwise very technical world of asset management. This includes investigation of stakeholders - not only the national road owners and road users, but also the different players on the stage, some more influential, some more damaging or assisting than others. But it also included looking at investigative methods with fresh eyes - establishing technical advisory boards, performing accompanied journeys, having dissemination work shops and clustering projects to cross-fertilize topics, methods and findings.

Finally, the programme has added new words and concepts the asset management dictionary: stakeholder requirements and expectations, public opinions, focus groups, E-KPIs, social benefits, as well as suggestive tools to identify and manage these, through IT-systems, road maps, information and dialogue. This is truly a new approach.

The future will show if the results of the AM programme will find their way to implementation. For once, it is perhaps not further research that is needed, but political courage and common trust, understanding and commitment from all stakeholders.



National tourist road in Geiranger Norway
„trolls path“- photo: Jarle Wæhler

List of deliverables

Webpage: <https://sites.google.com/site/assetcall/document-base>

Names of deliverables **Where to find them**

ASCAM

Partners: TNO, IGH, AIT, VTI, BRRC, ZAG

D1	Framework concepts, variables, relationships, assumptions and limitations	<i>Webpage</i>
D2	Inventory Pavement Management practices	<i>Webpage</i>
D3	Inventory Bridge Management Practices	<i>Webpage</i>
D4	Inventory Road Equipment Management practices	<i>Webpage</i>
D5a	Software	<i>Ask project</i>
D5b	ASCAM Demonstrator User Guide	<i>Webpage</i>
D6	Framework presentation (Powerpoint)	<i>Webpage</i>
D7	ASCAM End Report	<i>Webpage</i>

EVITA

Partners: IFSTTAR, PMS-Consult, TRL, ZAG, UoB-FCE, LNEC, DDC

D1.1	Consortium Agreement (written during the phase of negotiation)	<i>For internal use</i>
D1.2	Project quality assurance plan decision making procedure; methods for controlling progress; scientific quality assurance system; role of the Scientific Auditor	<i>For internal use</i>
D1.3	1st semestrial progress report	<i>For internal use</i>
D1.4	2nd semestrial progress report	<i>For internal use</i>
D1.5	3rd semestrial progress report	<i>For internal use</i>
D1.6	Project final activity report project progress; difficulties encountered and decisions made to overcome these obstacles; summarise of the main findings of all Work Packages	<i>For internal use</i>
D2.1	Report on: stakeholders categories and sub-categories; list of expectations; list of necessary KPIs; presentation of existing KPIs	<i>Webpage</i>
D2.2	Report on assessment and evaluation of existing KPIs	<i>Webpage</i>
D3.1	Report on recommended E-KPIs	<i>Webpage</i>
D4.1	Report on Procedure for implementation of KPI	<i>Webpage</i>
D4.2	Practical Guideline for the use of KPI in pavement management practice	<i>Webpage</i>
D5.1	Web site	<i>http://e-kpi.fehrl.org/?m=64</i>
D5.2	Final Workshop Presentations on a CDrom	<i>Ask project after symposium</i>

EXPECT

Partners: TRL, AIT, BRRC, TNO, VTI

D1	Inception Report	<i>For internal use</i>
D1.2	State of the Art Report in asset management including case studies	<i>For internal use</i>
D1.3	Monthly progress report	<i>For internal use</i>
D2.4.1	Report on consultation meetings	<i>Webpage</i>
D3	Report describing tools to evaluate and prioritise different stakeholder requirements	<i>Webpage</i>
D4	Report describing the methodologies to align stakeholder expectations with engineering standards	<i>Webpage</i>
D4.2	6 monthly progress report	<i>For internal use</i>
D5	Final version of the webpage including documents produced for wider diffusion available at the end of the project	<i>http://eragnet-expect.brrc.be/</i>
D5.2	Final report	<i>Webpage</i>

HEROAD**Partners: VTI, TRL, BRRC, FERHL, ZAG, AIT**

D1.1	Report on pavement performance: Recommendations on optimised assessment of pavement condition, in particular making best use of new data collection methods (including traffic-speed techniques)	<i>Webpage</i>
D1.2	How the quality of pavement condition data is controlled in the EU, and recommendations for QA procedures	<i>Webpage</i>
D2.1	Report on structures performance: Recommendations on optimised structural assessment and their implementations in an efficient bridge (asset) management	<i>Webpage</i>
D3.1	Report on road furniture performance	<i>Webpage</i>
D4.1	Report on environmental components: Strategies for the effective integration of environmental parameters into asset management systems	<i>Webpage</i>
D5	Report on overall asset performance	<i>Webpage</i>
D6	Final summary report	<i>Webpage</i>

PROCROSS**Partners: AIT, TCD, SEP, ZAG**

D1	Good practice in Cross Asset Management Optimisation	<i>Webpage</i>
D2	Effective monitoring of road infrastructure assets	<i>Webpage</i>
D3	Tentative Document - The Procedures for Cross Asset Management Optimisation	<i>Webpage</i>
D4	Final report "The Procedures for Cross Asset Management Optimisation"	<i>Webpage</i>

SABARIS**Partners: UT, ETHZ, IFSTTAR, KUL, ATO**

D1	Project Website	www.utwente.nl/ctw/prime/researchprojects/finished/projectSABARIS/
D2	List of road stakeholders	<i>In final report</i>
D3	List of road benefits	<i>In final report</i>
D4	List of engagement strategies	<i>In final report</i>
D5	Benefit hierarchy	<i>In final report</i>
D6	Values of benefit types	<i>In final report</i>
D7	WP1 report	<i>For internal use</i>
D8	Project progress report	<i>For internal use</i>
D9	Optimisation model	<i>In final report</i>
D10	Optimisation tool	<i>In final report</i>
D11	WP2 report	<i>For internal use</i>
D12	Case study findings	<i>In final report</i>
D13	Results of the sensitivity analysis	<i>In final report</i>
D14	Guideline for use and implementation of such an optimisation tool in road agencies	<i>In final report</i>
D15	WP3 report	<i>For internal use</i>
D16	Final project report	<i>Webpage</i>

SBAKPI**Partners: TRL, DTU**

D1	Project Team Agreement (written during the phase of negotiation)	<i>Internal use</i>
D2	1st Steering Group Meeting	<i>Internal</i>
D3	2nd Steering Group Meeting	<i>Internal</i>
D4	1st Consultation Meeting	<i>Internal</i>
D5	2nd Consultation Meeting	<i>Internal</i>
D6	Draft Benchmarking Framework	<i>For internal use</i>
D7	Trial of Benchmarking Framework with up to 5 NRA	<i>For internal use</i>
D8	Revised Benchmarking Framework	<i>For internal use</i>
D9	Project Report and Dissemination of Benchmarking Tool	<i>Webpage</i>



Social benefit report

ERANET ROAD II SRO4
 Effective asset management meeting future challenges 2010 – 2013

