TRANSPORT RESEARCH INFRASTRUCTURE ROADMAP





SEVENTH FRAMEWORK PROGRAMME

DETRA

DEVELOPING THE EUROPEAN TRANSPORT RESEARCH ALLIANCE

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EXECUTIVE SUMMARY

The concept of DETRA derives from the Lyon Declaration. In 2008, the Lyon Declaration signatories, ECTRI, FERSI, FEHRL, EURNEX, HUMANIST, ISN and NEARCTIS, committed themselves to working together on the deepening of the European Research Area (ERA) objectives in transport, in order to address Grand Challenges such as climate change, energy, water and food, public health, ageing societies and globalisation. From this commitment grew the objective to create the European Transport Research Alliance (ETRA) that would strengthen the transport domain.

The DETRA project provided a detailed examination of the current status and structure of transport research, bringing together the competences of all partners together with their networks and associated links to provide the most comprehensive assessment of all the aforementioned aspects of ERA development. The project has also set out and begun implementation of the next steps in developing the ETRA.

The second Work Package of the DETRA project called "world-class transport research infrastructures" built on previous work undertaken in the Transport Research Equipment in Europe (TREE[1]), scientific forum on transport forecast validation and policy assessment (TRANSFORUM[2]) and other projects. The study consisted of three tasks:

- European and International Research Infrastructures (RIs)
- Future demands and requirements
- Missing gaps and opportunities

These tasks considered hard (physical) RIs and soft RIs consisting of databases, libraries etc. The team investigated the opportunities that exist to develop the RIs needed for strengthening the ERA of today and addressing the challenges and opportunities faced by transport in the future. Coordination between the transport sector and the European Strategy Forum on Research Infrastructures (ESFRI) are strengthened. The team considered RIs for all surface transport modes (with links where appropriate to aviation and water) and both industry and public sector research requirements.

This report outlines the roadmap for new world-class RIs required for the European transport sector, as well as a roadmap to further develop networking around existing RIs. There is a need for further development of networking around existing facilities/RIs:

- The financial aspects are of course one of the key issue, as well as the limited resources. The creation of an environment where researchers can meet and together develop new methods, new material and new products is considered to be a driver.
- To solve the future challenges a number of new RIs are essential, and it will not be possible for each individual country to invest in all RIs themselves. It is necessary to find a way to cooperate.
- By cooperation between organisations with complementary facilities, the use of resources will be optimised. Instead of inventing the wheel twice, we could invent the wheel in one place and learn how to steer the wheel in another place.

[1] ***The TREE*** *project was financed by the EC as part of the Sustainable Growth programme and was carried out from 2002 to 2004. The main target was to create meaningful and cost-intensive research installations and equipment in Europe and improve the exchange of information and developments about this topic through a network. The TREE project was carried out in close co-operation with the INTRANSNET project (Network for research installations on various transport modalities).*

[2] ***TRANSFORUM*** *was a project under FP6 coordinated by Netherlands. The sub-theme under FP6 was POLICIES-3.2 The development of tools, indicators and operational parameters for assessing sustainable transport and energy systems performance*

The report concludes that there are three different levels of collaboration:

1. Sourcing of partners through database searches (awareness)
2. Sharing knowledge and experience (knowledge sharing)
3. Linking through common RIs (formal cooperation)

By facilitating the networking on levels 1 and 2 (awareness and knowledge sharing), the step to a formal cooperation on level 3 is a logical continuation, and will become in due time a standard procedure.

The roadmap for creating larger networking around RIs includes; the RI database, creating meeting places based on the existing organisations, developing the use of internet, establishing better links to standardisation work and finally creating a step-by-step procedure for establishing formal cooperation.

Four RIs have been identified as possible future common RIs of high priority:

1. Naturalistic Road User Behaviour centre
2. European Multi-modal Traffic (EMT) model
3. Resource centre for European Transport Infrastructure Construction (ETIC) and performance data
4. European Road Infrastructure Testing (ERIT) facility

The preliminary business case for the four RIs shows that they all have their advantages and limitations. The roadmap for establishing new common large-scale RIs highlights two different approaches - one focusing on getting the transport sector into the ESFRI roadmap, the other to directly develop common European research facilities. The constraints that usually are highlighted as reason for lack of cooperation around RIs are mainly the same that are handled in most research and development projects. Hence, it should not be too difficult to set out the rules for how these issues could be dealt with.

This report recommends taking the the next steps to establish both increased networking around existing RI, as well as develop new common RIs. In both cases, the first step, based on the results from DETRA, is to formulate a common view on the needs of RI (the why), the anticipated impacts (the results), the means of cooperation (the how) and finally the prioritised RI (the which). If these short summarised statements could be agreed upon by the transport sector (not only by a single mode), there will be a great potential to actually create the RI in the transport sector that could form the backbone of a strong ERA.

1 INTRODUCTION

The concept of DETRA derives from the Lyon Declaration. In 2008, the Lyon Declaration signatories, ECTRI, FERSI, FEHRL, EURNEX, HUMANIST, ISN and NEARCTIS, committed themselves to working together on the deepening of the European Research Area (ERA) objectives in transport, in order to address Grand Challenges such as climate change, energy, water and food, public health, ageing societies and globalisation. From this commitment grew the objective to create the European Transport Research Alliance (ETRA) that would strengthen the transport domain.

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- European and International Research Infrastructures (RIs)
- Future demands and requirements
- Missing gaps and opportunities

The tasks covered considered hard (physical) RIs and soft RIs (databases, libraries, etc for all surface transport modes with links, where appropriate, to aviation and water), as well as RIs for both industry and public sector research requirements. The opportunities to develop the RIs needed for strengthening the ERA of today and addressing the challenges and opportunities faced by transport in the future were investigated. This included the need to strengthen the coordination between the transport sector and the European Strategy Forum on Research Infrastructures (ESFRI), which was established to support a coherent and strategy-led approach to policy-making on RI in Europe, and to facilitate multinational initiatives leading to a better use and development of RI. The team considered RIs for all surface transport modes (with links where appropriate to aviation and water) and both industry and public sector research requirements.

The first main objective of this report is to identify ways to better utilise existing RIs in the transport sector by improving the network. And secondly, to outline a roadmap for new world-class RIs that are required to strengthen the ERA in the field of transport research.

During the preparation of this report, there has been a tendency to focus more on road than other modes. Discussions have been from the point of view of all modes and their perspective is included, but for the future development of common European RIs, it would be beneficial if the dialogue across the modes could be increased.

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2 NETWORKING EXISTING RIS

2.1 BACKGROUND

The importance of networking around existing RIs is explained in more details in a separate DETRA report "Research Infrastructure – needs and requirement". The infrastructure itself is the tool for creating the research environment where researchers can meet and exchange knowledge, experience and new ideas. In this environment, the creativity will enable new methods, new material, and new products to not only be a bright idea but be developed into solutions that can be implemented, in line with the full definition of innovation (mind-to-market).

There are a number of drivers for increasing cooperation around existing facilities/RIs. Finance is of course a key driver. The possibility to obtain financial funding for RI is limited, even though it is well-known that both the investment in upgrades and maintenance costs are substantial. In many instances, the RI is expected to be self-financed by funding from research projects. Hence it is attractive for a research institute to have the possibility to access a number of different research facilities/RIs, but only have the financial responsibility for a few of them. And the possibility of increased external use to cover the cost of your own facilities is of course a benefit.

To address future challenges, there is a need for a number of different RIs, and in this case not only the large scale RIs are included but also the smaller facilities and even single equipment. It is impossible to keep up-to-date equipment and qualified personnel in all countries, for all different types of research questions. Hence it is important to build a network that enables researchers from different parts of Europe to cooperate, and to open up and facilitate the use of each other's equipment.

By cooperation between organisations with similar facilities, there is a possibility to further develop equipment and methods, which might result in new standards. The exchange will also create possibility for staff to increase their knowledge.

By cooperation between organisations with complementary facilities, the use of resources will be optimised. Instead of inventing the wheel twice, we could invent the wheel in one place and steer the wheel from another place.

2.2 THREE LEVELS OF COOPERATION AROUND RI

The following three main levels of cooperation have been identified:

2.2.1 Level 1 Finding partners through database search

To be able to collaborate, the first step is to be aware of existing facilities/equipment/RIs in Europe. A database that includes information about facilities and expertise is such a tool for finding the right partners for collaboration. A first outline of an online catalogue has been developed that aims to provide:

a) An up-to-date overview of existing world-class RIs, both in Europe and internationally.
b) A tool for identifying missing RIs to address current and future needs.
c) A tool for identifying cooperation possibilities amongst researchers to exchange knowledge, optimise the use of available facilities and increase their level of capacity, as well as develop common research facilities and test methods and equipment.
d) An effective easy-to-search tool for identifying facilities that have capacity available for extra testing performed in accordance with a specific test method.

The online catalogue is available at http://detra.fehrl.org/facilities and is further described in the DETRA report entitled "European and International Research Infrastructure online catalogue". Despite the limited number of items listed, this catalogue already shows the potential to create networking opportunities both between partners having similar facilities (promoting knowledge and experience exchange), as well as partners with complementary facilities. With further development, this catalogue could become a valuable tool for networking between researchers.

Collaboration on level 1 includes buying a specific test from a laboratory without any other obligation than performing this test and delivering the results. Collaboration on level 1 also includes getting access to results from tests that you do not have the equipment or skills to perform yourself.

2.2.2 Level 2 Sharing knowledge and experience

The next level of collaboration involves a more active cooperation between partners. In this case, partners with similar equipment/facilities decide to cooperate with each other. The aim of this level of collaboration is:

- To further develop existing methods (standardisation) and equipment
- To carry out round-robin tests
- To exchange knowledge and experience
- To exchange staff (to facilitate knowledge and exchange of experience)
- To hold common workshops/seminars/courses for staff and researchers

The obvious benefit of cooperation on level 2 is the development of both methods and equipment without the need for a single partner to perform all the work. It saves both time and financial resources for the partners that decide to work together. As important is the possibility for staff to further develop their knowledge and experience in collaboration with colleagues from other partners. This will create an environment where new ideas will be developed into practical application.

The basis for collaboration on level 2 is trust between the partners that decide to share information, knowledge and experience. This trust implies that the outcome of the cooperation should be used to the mutual benefit of the partners. This trust takes time to build, and can unfortunately be destroyed very quickly. Hence level 2 cooperation requires continuous work to create good relations between partners.

2.2.3 Level 3: Linked through common RIs

Collaboration on level 3 includes establishing common projects around one or more RIs, where the RIs will be seen as a common resource for the project. In this case, formal agreements between the partners will be established with defined responsibilities for each partner.

Some of the aspects that need to be clarified in the agreements are:

- Financial responsibility of each partner
- Responsibility for maintenance of the RI
- Responsibility for development of the RI
- Regulations on the use of the RI outside common projects
- Regulations on the availability of the RI for use outside the partnership
- Regulations on how to share risks and deal with actuarial questions

The aim is to develop the RIs using the best expertise/knowledge from the partners, and then use it in common work. The RI will be located at the facilities of one of the partners. Because of the presence of the RI at its facility, this partner may have an advantage compared to the other partners but, on the other hand, the responsibility for maintaining and operating the RI, including associated human resource costs, will also reside with this partner. The development of a tele-presence could increase the possibility for all partners to get actively involved in testing without having to incur travel costs. Such collaboration could also open the door to visiting research positions, as defined in the agreements.

2.3 ROADMAP FOR NETWORKING

To reach the highest level of networking, namely level 3, we need to ensure that there are tools available for presumptive partners to be aware of each other and get the possibility to meet for knowledge sharing. However, level 3 cooperation will not always be the aim. Depending on the preferences of the partners involved, the research questions and the type of RI, level 1 or level 2 could be more efficient. There are a number of actions that can be taken to facilitate networking, including:

- The RI online catalogue needs to be further developed and the number of items included should be

increased. It is also important that not only RIs related to road transport be added, but also RIs for the other transport modes. Some improvements are still needed to the search functionality and user-friendliness. For the online catalogue to become the tool for increasing awareness of the available RIs throughout Europe and internationally, it needs to be promoted. It needs to become the preferred search engine for RIs within the transport sector.

- A forum for knowledge sharing needs to be further implemented. It is recommended that it be built by already established organisations such as ECTRI, EURNEX and FEHRL. Creating common seminars/workshops focusing on topics related to the use of RIs could be one option. Establishing a common COST project that deals with specific topics could be another possibility. The internet and the communication facilities it enables need further exploration and utilisation. These are tools that could facilitate and enhance knowledge sharing, not only benefiting the younger generation, but also senior researchers.

- European standardisation creates nodes and opportunities for the exchange of information. The subject of this report could be further developed there and the link to other activities performed by DETRA partners could be increased.

To reach level 3 cooperation, there are a number of practical, legal and financial issues to be resolved. The issues of complexity will vary depending on the number of partners and the countries involved. To facilitate the process, it is beneficial to set up a standard step-by-step procedure as a guideline for questions and different options of handling them. It should be possible to do this at a European level, knowing the differences between single member states. Templates or an outline for cooperation agreements would aid the process. Current experiences on a level 3 cooperation should be used as a basis or best practice examples. The procedures should be continuously improved by adding new experiences.

3 NEW WORLD-CLASS RI

The need for new world-class RI is discussed in a separate DETRA report entitled "Research Infrastructure - Needs and requirements". The following main conclusions are singled out:

- Open access RIs are the engines of innovation and key drivers of economy for the hosting region.
- The availability of world-class RIs is the backbone of the construction of the ERA.
- There is a need for additional new common world-class RIs within Europe to address future challenges
- The transport sector has mostly worked in a fragmented way, utilising its own national RI instead of focusing resources on building common European RIs. The limited available funding and the need for cooperation between researchers to solve future challenges highlights the importance of cooperation to enable the establishment of one or two strategic world-class RIs in Europe.
- The discussion on RIs should not only focus on the establishment of physical equipment. Equally important are the researchers working with the RI, as well as networking opportunities created around the RI.
- It would appear that there is a need for a more coordinated approach within the transport sector, similar to that found in other scientific areas if funding and support for new RIs are to be achieved.

Four new RIs have been identified of great relevance to solving the future challenges in a coordinated approach and are described below.

3.1 SUGGESTED NEW RI

From a preliminary analysis, the following four RIs were identified as possible RIs that would bring additional value to the transport sector in the work to address future challenges:

1. Naturalistic Road User Behaviour Centre
2. European Multi-modal Traffic (EMT) model
3. Resource centre for European Transport Infrastructure Construction (ETIC) and performance data
4. European Road Infrastructure Test (ERIT) facility

An outline for a business case for each of the above four RIs is presented here. Each outline gives an overview of each new RI, its possibilities, limitations, expected impact and problems that might be encountered.

3.1.1 Naturalistic Road User Behaviour Centre

Objectives, mission and keys to success

The objective of this RI is to link existing areas for naturalistic driving and further develop them as a common resource with the mission to perform research that will give tools to meet the future challenges related to health, safety and security. The overall aim is to reduce the number of accidents on a European scale by understanding the behaviour of people (car drivers, passengers, pedestrians, cyclists, lorry drivers and people using public transport) under different conditions, as well as to reduce vehicle emissions and improve quality of life by training and informing vehicle users about new vehicle technologies and driving techniques.

The key to success is to agree on basic rules for cooperation, allowing researchers from all over Europe to use the RI and contribute to solving future challenges, as well as to focus both on cars and multi-modal systems (including rail (tram), bicycles, motorbikes, pedestrians) proportionally according to their contribution to solving future challenges.

Summary of facility

The new RI should be established by linking existing facilities using agreements that state under which circumstances the different facilities can be made available for use. The ownership of each facility will remain with the original owner, but an umbrella organisation will be created that will develop and manage a common IT resource.

This umbrella organisation (centre) would have the following responsibilities:

- The maintainance of a database on all historic as well as ongoing projects at test sites linked to the umbrella
- Defining a proposal for the strategic development of the different facilities that would benefit all participants in the umbrella
- Knowledge sharing, results sharing and common project development
- Data sharing (all results should be stored in a common database with open access for all researchers linked to the RI)
- Preparing a common research agenda linked to the RI
- The approval or rejection of requests for knowledge/data use outside the consortium and set the requirements for such cooperation
- The enrichment of the knowledge centre with information derived from related scientific projects outside the consortium

Products and services

Cooperation under the umbrella could provide the following services (inter alia):

- Possibility for researchers from countries without naturalistic road user test facilities to perform research without incurring huge costs.
- Carrying out of complementary studies at other test facilities with different outlines.
- Access to data from other research projects. All data obtained at any of the test sites should be open access for researchers linked to the RI unless governed by specific agreements. This will in-

crease the use of data and hopefully lead to more results that can be implemented. To facilitate this, a common standard for data format needs to be developed
- A common analysis platform for naturalistic driving data that will create a greater and therefore a more representative sample, which will strengthen the outcomes of analyses
- A larger database of real-life driving data that can support, in an aggregated format, the answering of specific questions with respect to enforcement, system development, education, traffic control/design, etc.
- Networking with colleagues from other institutes and universities
- The possibility to not only look at cars, but also the interaction between different transport systems (cyclists, pedestrians, motorbikes, light rail, etc)

Additional future value could be created if a common fleet of vehicles could be developed, which could be used in several research projects, thus reducing the costs of individual research projects. When developing this fleet of vehicles, it would be necessary to ensure that these vehicles can be adapted to each country in terms of their characteristics, and that they can accommodate different driving styles. Looking even further into the future, it would be beneficial to add other modes of transport, such as light rail (including monorail and other new envisaged rail systems), ferries and other modes of water transportation. Also of key importance are the whole transport system and the interaction between the different modes.

Market analysis

Before pursuing the concept of a Naturalistic Road User Behaviour Centre, all possible European facilities need to be identified that might be included in such a centre. A number of such facilities already exist and, if they could be linked together, they would already create a significant resource for the research community and assist countries without such resources to perform naturalistic road user studies as well. A detailed analysis of possible partners in the centre should be performed. Based on the objective, it seems reasonable to believe that universities, research institutes and road owners are interested in this kind of facility. Another FP7 project PROLOUGE , finalised in 2011, already explored the need for a common approach. The results indicated that there is interest from researchers, as well as other actors such as insurance companies, industry, road owners, etc. The outcomes of PROLOUGE could form the basis for further developing this business model for a new RI related to naturalistic driving behaviour.

Management system

The responsibility and decisions for each facility should remain with the owner. The management system should be built up as an umbrella organisation, which can only make recommendations. However, the Board of the umbrella organisation should ensure that all different partners can influence the development of the centre. In the agreement signed by all participating parties, duties and responsibilities should be clearly stated.

Financial plan

Should the market analysis show that there is an interest a detailed financial plan should be developed to include assumptions, key financial indicators, break-even analysis, financial details and long-term plans.

Strategy and implementation summary

The main values that this RI would bring could be summarised as follows:

- The possibility for more countries to perform naturalistic driving behavioural studies
- More efficient use of facilities and collected data
- The possibility to study the interaction between different modes
- The sharing of costs for the development of instrumented vehicles and/or instrumentation and
- Knowledge sharing

The first milestone for creating this RI is to investigate the interest among existing facilities for cooperation within a centre. A short description of "what's in it for me" needs to be produced before these discussions. It is also useful to have a "state-of-the-art" in relation to existing facilities; their standing in the research community; the nature of their research; their publications and reputation within the area, the tools they use, as well as their views with respect to future tools and infrastructure.

[5]PROmoting real Life Observations for Gaining Understanding of road user behavior in Europe

3.1.2 European Multi-modal Traffic (EMT) model platform

Objectives, mission and keys to success

The objective of this RI is to create a common model platform with open-access to data for all researchers linked to the RI. This should include data on all transport modes (road, rail, air, waterways and maritime), ranging from freight movement to information about pedestrians. The mission is to use the available data in an efficient way to address the challenge of efficient transport. Due to the rapid increase in transport demand, particularly for freight traffic, the need for efficient transport is increasing each day. Existing problems will grow as traffic demand soars and puts pressure on improving traffic management.

The key to success is to agree on basic rules for cooperation and access allowing researchers from all over Europe to use the RI and contribute towards solving future transport-related challenges. The provision of open access in relation to existing business cases for some existing models is one key issue to resolve in order to succeed. One solution is an umbrella model where the main parts are open to access and some sub-models can be used by researchers at a small fee. Privacy is another issue that needs to be resolved.

Summary of facility

An EMT model platform (with potential gateways to various traffic models) should be founded using the available models from different countries for the different types of modes. The ownership of the existing models should remain with the original owner. An umbrella organisation should be established which has the responsibility to create the linkages and integration between the different models, as well as develop the necessary additional models to complete the EMT model platform. This IT resource should be commonly used by all the partners linked to the RI. In order to ensure the ongoing development/adjustment of the model(s), the partners should agree to use a standard platform and make their existing models compatible with the common model platform. The exchange mechanisms and data formats should be studied with respect to existing European standards (such as DATEX II), which should assist in resolving this issue. All partners linked to the RI should have open access to the EMT model platform.

Products and services

A common EMT model will provide access to models and data for all researchers linked to the RI. This will enhance the possibility to ultimately achieve an integrated multi-model transport model platform for Europe. It will also increase contact between different researchers and groups, leading to improved networking and knowledge exchange.

The model platform should be such that additional models can be connected/interfaced to it in the future, including additional transport modes, specific issues for certain regions in Europe, links between different modes, etc. The integration of models that look at traffic systems/management under abnormal conditions such as extreme weather and emergency situations should also be considered. The EMT model platform should not compete with existing commercial services but be of a complementary nature.

Market analysis

A number of the existing models already have a business case and need to be integrated in a more detailed and advanced way to create an EMT model. However, for the owners of these commercial products to be interested in linking their models to the European model, there needs to be a clear added value for them. If it can be proven that a commercial model linked to the EMT will have better accuracy, be able to study more scenarios and/or have a more complete set of data, then it might be in the interest of the owners of the commercial products to make their model compatible with those of the EMT. It is doubtful that the commercial products would be available for free, but reduced fees or the possibility to release light versions could be possible options.

It is essential to also bear in mind that parts of the models could be country- or even area-specific, and this could be in conflict with having a common European model. There might be an interest for some companies to create their own complete model and sell access to it. These companies would then not be interested in the concept of an open access model. For researchers and organisations/companies that do not have their own complete model, a common European model would be an additional, new and valuable tool. Nowadays the existing commercial services are not focused on offering a pan-European service. Therefore, this RI offers a European added-value which none of the current companies can offer. So even though there is market from a researcher's point of view, there are questions that need to be resolved in relation to existing models.

Management system
Details of the management system need to be developed at the next stage.

Financial plan
At this stage, no detailed financial plan has been developed since it will be influenced by the possibility of finding a cooperation model with existing commercial products. This plan should include assumptions, key financial indicators, break-even analysis, financial details and long-term plans.

Strategy and implementation summary
The main values that this RI would bring could be summarised as the following:

- More efficient use of models and data
- Possibility to study interaction between different modes
- Share cost for development
- Knowledge sharing

The first milestone is to investigate the interest among potential partners and users of the EMT. The question of existing commercial products also needs to be resolved.

3.1.3 Resource Centre for European Transport Infrastructure Construction and performance data (ETIC)

Objectives, mission and keys to success
The common challenge for infrastructure maintenance and asset management is to preserve existing infrastructure value and meet stakeholder requirements (safety, environment, etc.) with a limited budget. For newly built infrastructure projects, satisfying socio-economic needs and cost implications and sustainability play a decisive role in transportation planning and infrastructure construction projects. These are common to all surface transport modes. Materials and construction methods for transportation infrastructure and the extensive knowledge of current practices and historic performance are both necessary for the development of new and innovative designs. This will be supported by the networking of existing infrastructure databases in each member state across all modes, which will also provide a deeper insight into asset management strategies and maintenance planning and ensure better cost efficiency. The recognised stakeholder expectations will then be better integrated in transportation. Furthermore, cross-fertilisation among the modes and contribution to best practices will be enhanced. Therefore, in order to achieve world-class infrastructure that stimulates socio-economic development and strengthens competitiveness in transportation, a common (joint) resource centre/database on infrastructure construction and maintenance across all modes of transport is required. This should include:

- Construction drawings, material information and design criteria
- Inspection protocols
- Maintenance reports
- Performance monitoring data
- Environmental audits
- Deterioration models

The key to success is to agree on the basic rules for cooperation that allow researchers from all over Europe to use the RI and hence contribute to solving future challenges.

Summary of facility
This proposed RI should be seen as a treasure of consolidated knowledge. It will aim to provide input for the planning, design and construction of new transport infrastructure, as well as for the maintenance and management of existing transport infrastructure. Through the cross-referencing of deterioration and degradation mechanisms deduced from inspection protocols and monitoring data and information about construction methods used, materials, etc., it will be possible to extend common life-cycles of transport infrastructure assets and their components.

Most of the data necessary for building this database are already available and collected within different systems and diverse indicators or measurement methods, but they are of varying quality. Even within one country or one institution/company operating in a single mode, various databases in this context are not uncommon. The variety of systems and content specifications represents a specific problem which needs to be solved soon in order to proceed towards a joint cross-modal database for transport infrastructure construction and maintenance. Further harmonisation efforts are required and may focus around Building Information Modelling (BIM).

Issues that need to be dealt with in order to specify the content and database layout are:

1. The status-quo of existing transport infrastructure databases
2. Specifications and database layout
3. Legal, liability and disclosure issues
4. User access framework

Products and services

Typical products and services provided by this RI are related to the research and development in engineering. Scientific questions of design, construction, materials, maintenance strategies and asset management will be addressed. These questions are typically posed by researchers and scientists at universities or research institutes. However, other parties (authorities, operators, construction industry, etc.) will also benefit. The common objectives for the database are the provision of:

1. Open access to all researchers
2. An all-inclusive pan-European database
3. A multimodal database on the construction and maintenance of transport infrastructures, including data from all relevant transport modes

The products and services this specific RI may provide are already available on a much smaller scale on national databases and for single modes of transport. The true benefit of having this on a European and multimodal scale is the richness and complexity of the data. Hence, the associated research topics will not be completely new, but an extensive and comprehensive database will be provided. Deduced models will not only be used for predicting purposes, but also to study the different European regions or climates as influencing factors (e.g. de-icing and freeze-thaw in northern regions, high temperature in southern regions, corrosion for maritime structures).

Topics for research in connection with this RI could include:

- Life-cycle cost analysis
- Life-cycle analysis
- The improvement of current design codes
- Development of long-life materials and designs
- Deterioration and degradation curves
- Traffic loading (history)
- Innovation in construction industry
- Maintenance of assets

Market analysis

A market analysis would reveal that there are a noticeable number of systems available off-the-shelf. This fact implies two main problems:

a) The variety of systems makes harmonisation efforts extremely complicated to integrate existing data in a common transport infrastructure database.
b) The existing market and business cases for databases in construction and management of transport infrastructure is a hurdle for an overarching, comprehensive database with open-access.

Due to this, it is of utmost importance for the successful implementation of a transport construction and maintenance database to thoroughly prepare the business cases.

A Strength, Weakness, Opportunities, and Threats (SWOT) analysis could provide a lot of the required insights into how this database will prevail on a European level. The legal and liability issues in connection with the non-disclosure of data issues may play a decisive role, especially for road operators and authorities. However, it is essential that these issues be resolved as they play a very important role in delivering and updating the database.

Management system

Specific management focus is required for this RI. As a soft and distributed RI, the challenges are not the single technical components and the physical functionality, but the IT competence, database layout and strategies for the management/updating of data. A sophisticated quality control system is required to guarantee comparable datasets and indicators. A scientist

conducting a database query should be confident that all data are based on the same quality criteria using similar or comparable standards. For this purpose, it is necessary to establish a common single management board and legal form.

Financial plan
The financial planning is not complex or extensive in terms of technical (hardware) development. However, the associated tasks prior to implementation for strategic planning are assumed to be quite extensive. A number of barriers to implementation have to be dealt with to not suddenly face shortcomings or hurdles. At this stage, no detailed financial plan has been developed due to the above-mentioned reasons. This plan should include assumptions, key financial indicators, break-even analysis, financial details and long-term plans.

Strategy and implementation summary
Strategic planning is especially essential for the successful implementation of this ETIC Resource Centre. A number of critical considerations have to be met before entering the implementation stage. Several crucial questions have to be dealt with, including:

- How to setup a joint European multimodal database for the construction and maintenance of transport infrastructure
- How to combine existing databases and generate a new open access database (eg BIM)
- How to deal with quality criteria
- How to deal with legal, liability and non-disclosure issues
- How to generate business cases in accordance with the already existing market

All of these questions should be dealt with prior to the implementation of this RI in order to avoid any shortcomings in its development and implementation. Therefore, the roadmap towards the implementation of an ETIC Resource Centre is structured below according to a preparatory phase and an actual implementation phase:

Preparatory phase
This phase will attempt to solve all issues in connection with the implementation and operation of the proposed distributed RI. This requires a thorough analysis of the current status and best practice examples for transport infrastructure-oriented construction and performance databases. It also needs to deal with quality criteria, as well as liability and legal issues. Another issue to be solved during this phase is the national member state commitment towards this RI.

Implementation phase
The following three aspects need to be addressed:

a. identification of the most appropriate management structure
b. location of the RI
c. development of the RI

It is expected that the development of this RI will take five years (2015 to 2020), after which the RI will become fully operational (from 2020 onwards).

3.1.4 European Road InfrastructureTesting (ERIT) facility

Objectives, mission and keys to success
The objective of an ERIT facility combines full-scale testing under realistic loading and environmental conditions and monitoring of all relevant pavement, loading and environmental parameters. Innovative road elements and concepts already developed or to be developed in the near future should be able to address future challenges. The mission is to support and accelerate the implementation of these innovative road elements by full-scale testing. The new ERIT facility will implement the latest technology to investigate and assess road conditions and determine the functional and/or structural performance of innovative road pavements. The focal point will be the testing of functional and structural elements, pavement structures and materials, and evaluation of innovative construction techniques, while also allowing for the testing and evaluation of ICT-related innovations.

The mid-term goal is the rapid deployment of innovative materials and innovative pavement structures and enhancement of existing and development of new construction methods without risk or disadvantages to road owners and users. The main feature of this new type of road testing facility is the realistic testing of innovations in the field of road infrastructure covering all aspects from a technical, economic and environmental point of view.

The key to success is the realistic assessment of technical and economic requirements and the assessment of different stakeholder positions. The collaboration between a number of highly-qualified national research

institutes and technical centres from Europe and around the world guarantees the best possible outcomes from the investigative and development activities which will culminate in the concept formulation for the ERIT facility. The needs of different stakeholders will also be integrated into the conceptual study during the market analysis stage of the project. By demonstrating and disseminating the urgent needs and presenting technical solutions for the testing and assessment of pavements, this study can support the next step, namely implementation.

Summary of facility

The ERIT facility will provide a facility for conducting accelerated full-scale testing under realistic loading and environmental conditions and monitoring of all relevant pavement, loading and environmental parameters. It will offer a testing facility divided into single sections whose road design can be built up and divided separately from the others in order to offer the testing of different materials conducted by different customers. For road construction, there will be road construction devices at the facility or the support of construction companies and the support of experts. The testing facility will be fully instrumented with testing devices (sensors, auscultation equipment or other types of devices) and the necessary hardware equipment for real-time data transmission and storage. Researchers will not have to stay at the testing facility the whole time the tests are conducted, but will have real-time access to all data. The loading will be simulated by trucks that are driven automatically and can be varied. This allows for an accelerated assessment of the characteristics of new construction material and methods.

In a second step, conditions for ITS-related research will be offered.

An area in the western part of Poland is envisaged as a location. The benefits of this location are that the size of the area available is sufficient, it has good accessibility, low land price, moderate climate, qualified personnel and available construction companies that can be acquired. Supplementary infrastructure elements (electricity, telecommunication, energy, water) are also located nearby.

For the conceptual planning, the following aspects both for the hard and the soft infrastructure have to be investigated, defined and specified:

- Basic aspects concerning the test road itself (geometrical layout of the test road, size of the area required, dimensions of the pavement structure, design and equipment (energy, water, telecommunications, waste disposal, etc.)
- Measuring and stress-inducing systems
- Required auxiliary constructions and supplementary infrastructure: main buildings for operation and control of the tests and data acquisition systems and secondary buildings/areas (storage areas, workshops, safety devices and personnel rooms) close to the road test facility
- Access (suppliers, personnel, fire brigade, rescue vehicles)
- Stress-inducing systems (driving system, intensity of axle loads, manner of load application and time-acceleration simulation of tyre overruns)
- General necessary information
- Sensors, auscultation equipment and other types of devices that would be required in order to provide such information
- Necessary hardware, in particular related to data transmission and storage
- Design of a logical framework for collecting, processing, storing and reporting the information, in particular the definition of the dedicated software

An initial start-up business plan that will serve as a feasibility study has to be prepared. This start-up business plan has to consider the following main elements: evaluation of existing business plans from other testing facilities; mission statement; keys to success; market analysis; and cost estimations including break-even analyses.

Products and services

The testing facility will offer the testing of new road materials and construction methods under accelerated loading conditions to drastically shorten the time from laboratory testing to market implementation. It will be fully equipped with sensors and auscultation devices to guarantee the investigation of all aspects necessary for assessing the quality of new materials, construction methods and ITS devices. This data will be available online and in real-time for researchers all over Europe to allow for real-time investigation. Different framework conditions can be chosen and varied. Different types of auxiliary construction can be distinguished to guarantee optimal boundary conditions for the economic and cost-effective execution of testing programmes. Customers will be offered a core team of specialists and technicians situated at the location to assist with all the relevant technical questions of construction and data transfer as well as address management and business-related questions.

Market analysis

The main requirements for the accelerated ERIT facility, its soft infrastructure, management structure and business model have to be defined on the basis of a review of the existing full-scale pavement testing facilities and an enquiry among possible partners and stakeholders. The objective is to define the main characteristics of the testing facility, i.e. the design of the test road facility, and its organisation and funding. The market analysis will have to:

- Review testing possibilities/limitations of existing accelerated test tracks or roads
- Identify testing needs not covered by existing test facilities
- Define potential partners and types of tests that would interest them
- Define the main technical characteristics of the new testing facility: size, loading possibilities, requirements in terms of instrumentation and data acquisition, and other equipment needed on the site
- Review modes of organisation, management, financing of existing accelerated test tracks, in order to define possible organisations for the new test road facility

This aim will be reached by collecting information from existing accelerated testing facilities concerning:

- The characteristics of the facility, loading possibilities, advantages and limitations of the existing equipment will be examined
- The types of tests performed and their duration
- The instrumentation and pavement monitoring equipment used; identification of the most recent and efficient technologies used in Europe and other countries in this domain is of particular interest
- The main partners, mode of financing of the experiments, cost of operation

Management system

A fit-for-purpose management system will be developed in the next stage. The basic idea is to have a core team working at the testing facility with the opportunity for researchers to work on special projects at the location. A team of IT specialists will also provide a logical and physical system for collecting, transmitting, processing and storing the information collected by sensors and auscultation devices to give the researchers the opportunity to log in in real time from their remote location.

Financial plan

A business model is an indispensable element for linking the scientific part of the study with the economic needs of implementation. After the identification of needs and requirements and review of business plans of existing facilities, a feasibility study for the test road facility will be carried out that considers the results of the market analysis and knowledge of existing facilities. The facility should aim to solve the challenges of the future. Therefore, special consideration will be given to the gaps in resources previously identified. The feasibility study will result in a concept business plan for the facility.

Strategy and implementation summary

The mid-term goal of an ERIT facility is the rapid deployment of innovative materials and pavement structures, as well as the enhancement of existing and development of new construction methods without risks or disadvantages to road owners and road users. The main feature of this new type of road testing facility is the realistic testing of innovations in the field of road infrastructure, covering all aspects from a technical, economic and environmental point of view. These well-tested materials, pavement structures and/or construction methods will enable the road to withstand future challenges (e.g. the increase of heavy goods vehicle

traffic, different framework conditions due to the impact of climate change) and the road infrastructure to perform adequately. Despite the decreasing budgets of national road authorities, a road testing facility at a European level will bundle the financial resources and the national know-how. By joining up with international forces, the development of innovative elements will accelerate their implementation into practice.

3.2 ROADMAP FOR NEW RI

Two different roadmaps are outlined below. The first one recommended is where a common effort is made to integrate the need for RIs in relation to transport in the ESFRI roadmap. Success here would considerably facilitate the next step to implement new common RIs within the transport sector. However, the ESFRI route is not a quick way to achieve the common RIs, and therefore an alternative approach directly involving the Member States is also proposed.

Recommended approach: Follow the ESFRI route

ESFRI has been established to support a coherent and strategy-led approach to policy-making on RI in Europe and facilitate multinational initiatives leading to a better use and development of RI (ESFRI Procedural Guidelines, March 2009). ESFRI produces and continuously updates a European Roadmap on RI.

Until now, transport-related RI does not appear in the ESFRI Roadmap. A concerted effort should be made to ensure that large RIs associated with the transport sector form part of the ESFRI landscape.

In order to achieve this, the following steps would be required:

I. *National research centres and universities, in association with national transport authorities should initiate national dialogue on the need for major national transport-related RI to address transport needs and initiate the drafting of strong motivations for these. Institutional actors such as CEDR, FEHRL, ECTRI for coordination at European level could also be used to initiate the process. National representatives on ESFRI should also be involved. The end goal is to ensure that transport-related RI features on national roadmaps. Alternatively, or in addition to the above, scientific communities and/or European associations could be used to develop sector-specific RI roadmaps in which the needs for large transport-related RI are clearly defined. If this approach is adopted, the national representatives should still be involved.*

II. *The drafting of ESFRI proposals for transport-related RI, derived from national and/or sectorial roadmaps, and subsequent endorsement of these proposals by an ESFRI delegation and/or by a Council of an EIROForum[6] member organisation before submitting to the ESFRI Executive Board.*

III. Upon approval by the ESFRI Executive Board that the proposal can be subjected to the ESFRI review process, a Thematic Working Group (WG) would then be constituted and tasked to take the process further. It is essential that the champions for the proposal(s) submitted to ESFRI form part of this WG, which would be responsible for scanning the long-term scientific landscape in the field and assessing the scientific case as well as the technological and financial feasibility.

IV. If the outcomes of the WG are positive and endorsed by ESFRI, the RI would be listed on the ESFRI Roadmap, which will certainly assist with the implementation. This, however, is not the end of the road, but rather the beginning of the implementation phase, which could be quite cumbersome (detailed design, including e-infrastructures; location of the RI, whether it is a single site or a distributed entity; establishment costs and financial sustainability; governance and administration; etc).

More 'informal' implementation

Other options for the implementation of new RIs should also be considered One such option is to work through national structures and bodies such as ERA NET TRANSPORT or CEDR for the implementation of new RIs. Pooled funding could be raised for the development of concept documents and master plans for the implementation of ERA RI in the field of transportation, as well as the financing of the implementation itself. The advantage of this approach is that the ERA NET member countries that agreed to sponsor the concept documents and master plans could essentially be the same countries that support the implementation of the proposed RI.

To succeed in sourcing financing for new large-scale RIs within the transport sector, it is essential that the transport sector first agree on the needs and prioritise the required RIs accordingly. A coordinated action including all transport modes are a key to success. Based on the results from the DETRA project, it should be possible to finalise such a statement and use this to approach ESFRI as well as other bodies.

[6] ***EIROforum*** *is a partnership between eight of Europe's largest inter-governmental scientific research organisations responsible for infrastructures and laboratories to combine the resources, facilities and expertise of its member organisations to support European science in reaching its full potential (http://www.eiroforum.org/)*

4 HANDLING THE CONSTRAINTS FOR COLLABORATION

4.1 INTELLECTUAL PROPERTY RIGHTS (IPR)

A significant amount of work has been done at European level to deal with the issues of IPR. For instance, the European Committee de la Recherche Scientifique & Technique (CREST) prepared two reports on the subject. The Expert Group Report on IPR and Research (CREST, 2004) highlights the constraints and formulates recommendations for IPR in research. A second report from 2006 is more useful in this context as it provides guidance and tools on how to deal with IP issues in cross-border collaboration, which is essential for the joint development of world class RIs.

In 2008, the Commission of the European Communities published "Recommendation on the management of intellectual property in knowledge transfer activities and Code of practice for universities and other public research organisations".

Finally, CREST in 2009 published yet another report entitled "Exploring synergies through coordinating policy measures between the EU Member States, Associated Countries and the European Commission, in which the following statement is made:

"Significant discrepancies between national regulatory frameworks, policies and practices, as well as varying standards in the management of intellectual property hamper international cooperation. What is therefore needed are comparable rules and practices that allow equitable access to intellectual property generated through international cooperation and ensure mutual benefit for all research partners. First steps in this direction have been taken in April 2008 through the 'Commission recommendation on the management of intellectual property in knowledge transfer activities' and the 'Code of practice for universities and other public research organisations' (CREST, 2009) as well as through the corresponding Council resolution taken on the Competitiveness Council of 29-30 May 2008. The Commission's Strategic European Framework for International S&T Cooperation refers to IPR issues by proposing that Member States and the Commission *"promote globally, including through bilateral EC and Member State international S&T cooperation agreements, the principles set out in the Recommendation and associated Code of Practice on the management of IP. They should further develop these to guarantee fair and mutually beneficial conditions for all parties, whilst taking account of LDC needs."*

4.2 LEGAL ISSUES INCLUDING CONTRACTS

The legal issues are usually addressed in contract documentation and are fairly standard for all types of projects. Typically, they deal with issues such as:

- responsibilities of the various parties
- Intellectual property
- confidentiality and publicity
- liabilities
- insurances
- payment modalities
- governing law and dispute resolutions
- breach and termination

In addition to regular contract issues, specific questions might need to be handled in relation to the shared responsibility of RIs regarding their development, maintenance and financing.

4.3 COMPETIVENESS

The Competitiveness Council established in 2002 deals with this matter. It deals, for instance, with public procurement, free movement of goods, intellectual and industry property rights, competition and company law. It also encourages an environment favourable to the cooperation between organisations and fosters better exploitation of the potential of the policies of innovation, research and technological development. Community activities are geared towards strengthening the scientific and technology bases as well as international competitiveness by combining research resources. The latter corresponds to the 2020 vision of the ERA where in the Official Journal of the European Union dated 31.1.2009 (final attachment) it is stated that: *"The ERA creates significant added value by fostering healthy Eu-*

rope wide scientific competition whilst ensuring the appropriate level of cooperation and coordination".

DETRA is fully aligned with the concept of the ERA in paving the way for world-class RI and/or a network of distributed infrastructures to address some pertinent transport issues. With the Competitiveness Council and the establishment of the ERA, greater synergy within the EU is promoted, whilst constraints hindering effective cooperation between EU member states and European Research, Development and Innovation (RDI) organisations are being dealt with.

4.4 CONCLUSIONS

The above-mentioned constraints that are often referred to as obstacles impeding cooperation around RIs are handled on a more regular basis in other projects with more than one partner. The terms and conditions of any contract between two or more entities will, in one way or another, deal with issues such as competitiveness and IPR. The same also applies to contractual relationships around RIs, where obstacles can be overcome as for any other contract. The key to success is to set out clear rules for cooperation from the beginning. These rules should consider prior work that has been undertaken in terms of IPR, as well as other legal aspects, as mentioned above.

5 EXPECTED OUTCOME

The expected outcome of creating common new RI in the transportation research area and networking around existing ones depends on the focal point. Expectations will differ according to whether we look at the RI from the researcher/scientist's point of view or consider the institute or company's position. Even Member State representatives will have differing opinions on the new RI compared to, for example, the EC perspective. In the ESFRI document *"Strategy Report on Research Infrastructures - Roadmap 2010"* (European Union, 2011), the ESFRI Chair Vierkorn-Rudolph phrased the major expectations in common European RIs as: *"Especially in difficult economic circumstances, research and innovation are the key drivers for Europe's welfare. Excellent Research Infrastructures enable the cross disciplinary, frontier research and innovation that is needed to address the Grand Challenges – including the tightening supply of energy, greenhouse gas emissions, and an ageing population. Research Infrastructures contribute to the implementation of the Europe 2020 strategy and its Innovation Union Flagship Initiative and enable the building up of the European Research Area. They also support the Joint Programming Initiatives by providing researchers with excellent research platforms dealing with pressing societal challenges, and ESFRI uses the same approach of cross-border cooperation in a variable geometry. Research Infrastructures also play a crucial role in the training of young scientists and engineers: they attract thousands of scientists and students from universities, research institutions and industry, from Europe and from outside Europe. They guarantee the generation of new ideas and developments which turn into innovations and therefore support the creation of jobs."*

According to this, common RIs play a decisive role in:

- Economic development
- Innovation
- Addressing Grand Challenges
- Providing scientific platforms
- Training of young scientist and engineers

In the following paragraph, the authors listed the results and outcomes of common RI under the following different viewpoints of researchers, research institutes, national Member State representatives and the EC:

I. Outcome and expectations from the researcher's point of view:

- Availability of research facilities to perform specific and required research tasks
- Access to research results and data
- Strengthening the research community
- New possibilities for research methodologies
- Training of young scientists
- Access to other researcher's data (if problems in relation to IPR and open access are solved)
- Platform to exchange knowledge with researchers and scientists throughout Europe and beyond
- Access to other researcher/staff knowledge and experience. In this case, the knowledge of the technical staff should also be highlighted. Knowledge about the equipment itself and how to get it to perform as expected is highly valuable
- Possibilities to attend workshops, seminars and courses for researchers and staff
- Possibilities to work as a guest researcher/technical staff or foreign scientist, in order to increase knowledge and experience
- Points of contact for discussion on both research topics and technical issues related to the research equipment

II. Outcome and expectations from the research institute's point of view:

- Shared financial risk for investments in large-scale facilities
- Efficient use of resources
- Access to information and latest results
- Avoid duplication of research
- Possibilities for cooperation
- Joint project development
- Higher utilisation of RIs and optimised production capacity of equipment by opening up the RIs for external use and cooperation with others
- Lower costs due to a reduced number of self-owned equipment and having more equipment available that is commonly used. Reduced financial risk
- Possibilities for better cooperation and the creation of new joint projects
- Achievement of critical mass

III. Outcome and expectations from the national Member State representative's point of view:

- Access to facilities that would not be possible to build within one country alone
- Efficient use of resources
- Shared knowledge access
- Innovation
- Strengthening the research community
- Economic development
- Multiplication of research investments
- Enhancement of the prestige of a specific scientific area
- Enabling young researcher programmes to be aligned with world-class infrastructures
- Greater economic benefits and return of investments.
- International recognition
- Achieving critical mass for scientific excellence
- Ability to pool funds

IV. Outcome and expectations from EC point of view:

- Efficient use of resources
- Knowledge sharing and implementation of results not only in project partner countries but across a broader community
- Innovation
- Economic development
- Supporting world-class research in Europe
- Strengthening competitiveness of Europe in transportation
- Dealing with grand societal challenges in transport
- Fostering regional cooperation
- Mobilisation of critical mass in national, European and international public and private-owned resources
- Avoiding duplication of research
- Enhancing prestige in specific areas of science, engineering and technology
- Greater socio-economic impact by accelerating the development and implementation of new materials/construction methods/processes into practice
- International recognition
- Achieving critical mass of the promotion of scientific excellence
- Pooling of funds
- Stimulation of international (global) cooperation

6 CONCLUSIONS AND RECOMMENDATIONS

This report highlights the importance of networking around RIs and the RI itself for strengthening the ERA in the transport sector. Both existing RIs and new RIs are essential tools for addressing the great challenges. There is a need to further develop and strengthen networks around existing facilities and RIs:

- **Finance** is of course a key issue that needs to be resolved, as well as issues relating to limited resources. On the other hand, the possibility to create an environment where researchers can meet and jointly develop new methods, new material and new products should be seen as a driver
- To solve the future challenges, **a number of new RIs are essential** and it will not be possible for each single country to invest in all of these themselves. It is necessary to find a way to cooperate
- **By cooperation between organisations with complementary facilities**, the use of resources can be optimised. Instead of inventing the wheel twice, we could invent the wheel at one place and steer the wheel at another place

By facilitating the networking on levels 1 and 2, the shift towards more formal cooperation on level 3 would not be a major step, but over time become a standard procedure.

The need for new common RIs can be summarised as follows:

1. There is a need for additional RIs to be able to solve the common future challenges. They will also be key drivers for innovation, knowledge exchange, research development and the economy
2. Financing of the world-class RI is a key issue, and to be able to realise the necessary RIs it is important that the transport sector applies a new common strategy that focuses on a coordinated approach with cooperation between countries/researcher, open access RI and a common roadmap, contrary to the status quo which is fragmented and focuses predominantly on the local needs of each country.
3. The need to facilitate strategic international cooperation for complex critical global RIs, ensuring global access and interoperability with added value for the money spent

Four RIs have been identified as possible future common RIs with high priority:

1. Naturalistic Road User Behaviour Centre
2. European Multi-modal Traffic (EMT) model
3. Resource Centre for European Transport Infrastructure Construction (ETIC) and performance data
4. European Road Infrastructure Testing (ERIT) facility

A number of constraints are usually highlighted as reasons for not cooperating around RIs, but these are mainly the same issues dealt with in most research and development projects. Hence, it should not be too difficult to set out the rules for how these issues should be handled. The recommendation is that the next steps be taken to establish both increased networking around existing RI as well as to develop new common RIs. In both cases, the first step, based on the results from DETRA, is to formulate a common view on the needs of RI (the why), the anticipated impacts (the results), the means of cooperation (the how) and finally the prioritised RI (the which). If these short summarised statements could be agreed upon by the transport sector (not only by a single mode), there will be a great potential to actually create the RI in the transport sector that could form the backbone of a strong ERA.

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