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EXECUTIVE SUMMARY

Structure - Contents of the report

The present report provides a synthesis and evaluation of current attitudes and positions for International Transport Research cooperation around a selected number of countries and regions around the world. The material is presented in "geographical" reference, i.e. for each of the regions studied and contains mainly data and information about the current situation, the Transport r*esearch Topics* of interest and *Priorities*, as well as the c*apabilities* assessment (for conducting international transport research cooperation activities), in each of the regions and main countries surveyed.

The regions and countries examined are the following:

A. The USA
B. The *Mediterranean Cooperation region* with reference to the countries of (alphabetically):
   - ✓ Egypt,
   - ✓ Israel.
   - ✓ Jordan,
   - ✓ Lebanon,
   - ✓ Morocco,
   - ✓ Tunisia.
C. The *"European Neighbourhood" region* with reference to the countries of (alphabetically):
   - ✓ Kazakhstan,
   - ✓ Russian Federation,
   - ✓ Turkey,
   - ✓ Ukraine.
D. The *Australasian region* with reference to the countries of (alphabetically):
   - ✓ Australia,
   - ✓ China,
   - ✓ India,
   - ✓ Japan,
   - ✓ Singapore.
E. The *Latin American region and South Africa*, with reference to the countries of (alphabetically) (besides South Africa):
   - ✓ Argentina,
   - ✓ Brazil,
   - ✓ Chile,
   - ✓ Ecuador,

- ✓ Venezuela.

For each of these regions, this report contains the following items of analysis and / or information:

1. Presentation and analysis of facts and relevant issues that relate to Transport Policy and transport research that have been found of interest by the EUTRAIN team or stated as of importance by the experts of the region, in promoting international cooperation in the field of transport.
2. Definition / estimation of, the international cooperation "capability" of the regions as a whole and of the individual countries surveyed. This "capability" as a notion is taken to mean:

i. the ability of a country or region to offer good research teams for cooperative research projects in the field of transport (maybe distinguishing among the various Transport fields), i.e. mainly the existence of active researchers and relevant human capital in the specific area,

ii. Availability of appropriate research infrastructures and other resources to support such research, e.g. hard infrastructures (e.g. simulators, or test trucks, etc.), soft infrastructures (e.g. data bases, libraries, etc.).

iii. Existence of appropriate policies and / or governmental support for such international cooperation especially as regards funding of such cooperative research.

iv. Existence of "champions" (i.e. individuals or research teams or Organisations) who could take the lead in forming proposals and eventually carrying out the work in cooperative research projects.

3. Highlighting the areas and Topics of transport research that seem to draw the interest of the research community and / or the funding Organisations in each case, or those that have a high potential for international cooperation, with the EU.
4. Finally, there are recommendations for increasing and enlarging international cooperation activities with each corresponding area / region which came primarily as a result of the exchanges during the many workshops, visits, and bilateral discussions that the members of the consortium had with appropriate stakeholders and researchers in all the regions surveyed.

Examining the cooperation "capabilities" of the countries surveyed

The "capabilities" for international transport research cooperation of all countries surveyed have been assessed based on the following criteria:

1. Existence in the country of well qualified, internationally competitive, human capital i.e. research teams to work on cooperative research projects in the field of transport.

2. Availability of appropriate research infrastructures ("hard" and "soft").
3. Existence of appropriate institutional environment, policies and / or governmental support for international cooperation.
4. Existence of "champions" (i.e. individuals or research teams or Organisations who could take the lead in forming proposals and carrying out the work in international cooperative research projects).
5. Existence of appropriate funding and/or funding mechanisms for international cooperation.

In the report, there are details and justification as well as individual Tables assessing the "international cooperation capability" of individual countries and / or regions. These Tables are summarised in the Table below which contains the "overall" (i.e. averaged total) marks for each of the above mentioned 5 criteria in terms of each of the 4 main transport modes i.e. road, rail, maritime, air.

Table I: Summary of total Rating figures given for the "international transport research cooperation capability" assessment of the countries surveyed

Countries	Criteria					
	Human capital	Research Infrastructures	Institutional environment	"Champions"	Funding	Overall country/ region wide
USA	9	9	8	9	7.5	**8.5**
Mediterranean cooperation region	5	3	4	6	3.5	**4.2**
Israel	7	6	7	7	7	**6.8**
Russian Federation	8	6.5	6	7.5	6.5	**6.5**
Ukraine	5.5	5	5	6	4	**5**
Kazakhstan	3.1	3.1	4	4.1	3	**3.5**
Turkey	7	5.5	6	6.5	4.5	**5.5**
China	7.8	8	7	8.2	7.8	**7.8**
Japan	7.8	8	7	8.2	7.8	**7.8**
India	7	7	6	7.5	6	**6.8**
Australia	7.8	8	8	8	7.5	**7.8**
Brazil	7	6	7	7.1	6.6	**6.8**
Chile	6	6.4	7	7	5	**6.5**
Latin America countries	5	5.8	6	6.2	5	**5.6**
South Africa	7.8	8	7	7	6.2	**7.1**

Main findings and recommendations per region

A. USA

The USA has a unique technical capability to promote international cooperative research work in the field of transport but still lacks considerable capacity to do so in practice due to weaknesses in (or lack of) the appropriate institutional, funding, and policy (legal) framework. This situation seems currently to change, together with a shifting political emphasis in favour of more international cooperation. It is therefore now an excellent window of opportunity for building on good examples and practices of the past (most notably in cooperating with the EU) in order to go one step further and cooperate in more forthcoming and daring ways thus forming the blueprints for the future international cooperative transport research work at a global scale.

Thus, a first major recommendation would be if in the authorization legislation for the new USA research programmes there is a change over the past policies enabling greater funded participation in the U.S. programmes from researchers from other countries outside the US (a similar move by the EU would be necessary too). Similarly, more "joint programming" and twining actions would be most productive and welcome. Such policy change would be a most welcome advance and a virtual breakthrough, but it is recognised that it would have to be planned well and be based, to a large extent, on a "reciprocal" basis.

Other – less "hard" and easier to implement actions are recommended in the report as follows:

1. Establishing an effective and multi-channel communication process as a key factor that will measurably enhance collaboration between the EU and the United States as well as internationally. Better communication is, for example, essential to funding research infrastructures that are shared, to understand the true technology and know-how value that can be gained through collaboration, how particular collaborations will allow the maximization of the value of particular projects, etc. It is recommended that such an effective communications process between the transport research communities could begin as a joint project between the EU and the U.S. and should include also the new more advanced modes of social communication media (e.g. Twitter, Facebook) that highlight best practices and success stories regarding collaborative R&D between the EU and the United States.

2. The US side could collaborate with corresponding EU Organisations to establish an international transport research and innovations collaboration communication frame(s) with components such as the following1:
    i. The ability to provide on-going best practices and case studies of collaborative projects that are currently in place.
    ii. Upcoming research topics or RFPs (research proposals - private/public) that would not only allow but encourage collaboration.
    iii. A catalogue of interested transport researchers across the EU-US that would receive timely information on collaboration opportunities.
    iv. Specific collaborative research reports that can be downloaded and presented to agency and Congressional staff.
    v. Opportunities for funding research work from EU, or US/ federal and state entities as well as private sector organizations.
    vi. On-line newsletter published in multiple languages.
    vii. Capacity for researchers to "blog" on technical and policy topics.
3. Continue the policy of more funded participation of EU and United States researchers in low – hanging technologies projects and "soft" actions of cooperation such as multi-year technical personnel exchanges, agreements to further the exchange of critical transport data, etc. Also explore more, the use of existing models of international exchange between the U.S. and Europe such as Fulbright and NATO Fellowships as ways to encourage more two-way exchanges.
4. Institutionalise and promote on a permanent basis (through, maybe, the "International Cooperation Promotion and Networking Centres" suggested in this report – see later) common research dissemination activities, workshops and discussion fora. Already the EU-US "Implementation Arrangement" in the Transport area2, must be seen as moving along this line.

[1] A suggestion along these lines, i.e. concerning the importance of information dissemination about best practices and opportunities for research, was made in the International Cooperation Strategic Session organized in the TRA 2012 Conference in Athens (April 23-26, 2012)

[2] *Implementing arrangement*, between the EU/DG RTD and the US DoT/RITA, for "Cooperative activities in the field of Research, Development, Technology and Innovation applied to all modes of transport" signed in 2013 in the framework of the initial Agreement for Scientific and

5. Define and support "International Collaboration leaders" for promoting actions and preparing the ground for international cooperative work between the EU and the US. Such "leaders" would emanate in the U.S. through special research or academic institutions and the same could be done in the EU. These collaboration leaders, will be forming the so called International Cooperation Promotion and Networking Centres (ICPNCs) proposed in this report, each of which will be focussed in a particular global transportation challenge. The main scope and aim of these Centres will be to undertake a number of activities particularly aimed at promoting international cooperation in specific fields and areas of transportation research (e.g. sustainable transport services and mobility, climate change, etc.). These activities will include for example researcher training and exchanging activities, facilitating networking among research centres - in the area of interest – at global level, benchmarking activities, etc.
6. Prepare some basic guidelines and benchmarks for international cooperative work in the field of Transport that would indicatively include:
   - ✓ Regular update of current cooperation opportunities as they relate to specific calls on both sides of the Atlantic;
   - ✓ Evaluation rules and criteria for successful research proposals within the existing calls of each side;
   - ✓ Benchmarks to earmark and follow progress in international cooperation activities.

The main research Themes that seem to be of interest in the US, currently, for international collaborative work, include:

1. Sustainable cities (sustainability – liveability – mobility) incorporating items such as:
   - ✓ Travel behaviour analysis;
   - ✓ Data acquisition;
   - ✓ Optimisation of traveller information.
2. Infrastructure maintenance and testing, incorporating items such as:
   - ✓ Non-destructive evaluation of transportation facilities;

Technological Cooperation between the European Community and the Government of the United States of America, signed December 5, 1997.

- ✓ Models for rolling resistance for road infrastructure asset management systems;
- ✓ Asphalt aging and embrittlement;
- ✓ Long-term bridge performance;

3. Street cars (trams) and personal rapid transit systems.
4. Global freight Transport
5. ITS standardisation.

B. Mediterranean cooperation region

Research and development activities in the *Mediterranean region Countries* are widely concentrated within Universities and some research centres. The recommendations of the report are distinguished in those that concern Israel, and those that concern the rest of the Mediterranean region countries.

As regards the rest of the Mediterranean region countries there is a strong need for "capacity building" in the region in order to enable a more active and fruitful international transport research cooperation capability. This would include:

a. "pressure" on the existing governance regimes to accommodate transport as one of their "priority" subjects (especially with a view to participating in the context of the "Societal Challenges" research of H2020).
b. Actions to increase the capacity of the existing transport research stakeholders to effectively lobby for international cooperative research work and be successful in research proposals.
c. Actions to make transport administrations more aware of the need to expand their agendas from short-term problems to more strategic ones and identify transport in their international cooperation agendas especially within the Euro-Mediterranean partnership framework.
d. Establishment of a "Mediterranean (transport) research agenda", as a critical instrument within the strategy to empower the various stakeholders focusing on and adopting to the region's actual needs.
e. Support the capacity of these countries, all being in political and institutional transition periods, to consolidate their new institutional structures for research procurement and funding,
f. Finally, actions and incentives to support and promote the involvement of the private sector would be very important and effective in promoting successful international cooperative efforts.

For Israel, which too is facing some of the problems mentioned for the other Mediterranean region countries, the levels of research funding and the institutional framework are substantially different and more aligned to those of the EU and the US frameworks. As a result, there is a higher international cooperative work capability a fact that shows in the high number of EU research projects with Israeli participation. Transport research in Israel is also more developed and seems to enjoy a priority higher than that of the other countries of the Mediterranean region.

Overall, however, it can be said that the "international cooperation potential" of the Mediterranean region is rather low and for this reason there is a considerable improvement that needs to be made.

The recommendations that can be made, as derived from our workshops and meetings, are summarised as follows:

A. Based on the experience from the European Technology Platforms (ETPs) success story, one could create similar Technology Platforms (MED-TPs) to strengthen R&D cooperation of the countries in the region with the EU in the frame of Horizon 2020.
B. The research stakeholders in each country (primarily: academia and research centre specialists, as well as research managers, and relevant industrial sectors) should be actively involved in forming policies and strategies for increasing the international research cooperation between Mediterranean Countries and Europe.
C. Give Mediterranean Countries the possibility to improve the research activities in which they have their highest quality and potential. The most immediate form of such cooperative activities should be twinning activities between the leading scientific and educational organizations in these countries with European partners leading to more integrated research collaborative actions.

Other complementary recommendations are:

- Considering specific incentives for the research participation of the Mediterranean Countries in the new H2020 programme (mainly the co-funding requirements).
- Involving the Mediterranean countries Diaspora
- Tackling industrial issues
- Expand ST & I geographical partnership
- Participate in Regional Initiatives
- Increase Maghreb ST & I Cooperation favouring researchers and student's mobility nationally and internationally.

Main Themes and Topics of interest in the various countries of the Mediterranean cooperation region (in alphabetic order) are as follows:

ALGERIA:

1. Transport safety (mainly road) and security
2. Transport management (Mobility in cities, Transport pricing, congestion, promotion of public transport, etc.)
3. Intelligent Transport System ITS

Other themes:

- Air pollution from transport
- Legislation and regulation of transport (Dangerous goods)
- Logistics development
- Transportation planning

EGYPT:

1. ITS solutions applicable to developing countries
2. Institutional organization development
3. Energy efficient truck freight transport
4. Low cost applicable travel demand management
5. Rehabilitation/maintenance of non-paved rural roads with local material

Other themes:

- Non traditional public transport financing mechanisms
- Pavement recycling intermediate technology
- Improved road maintenance techniques
- Barriers to PPP in the road sector.

ISRAEL:

1. Integration of advanced mobility services (DRT, Ride sharing, parking reservation, soft modes etc.)
2. Incentives as a mean for promoting sustainable mobility for people and goods
3. Active safety systems
4. Advanced data collection techniques (Advanced methodologies and techniques for data warehouse, data analytics and decision support systems)

Other themes:

- The role of social media in transportation.

LEBANON:

1. Studies and rules in respect to "constraints on disaster prone" areas (Natural Hazards and water resources vulnerability)

Other themes:

- Geophysical and Geotechnical soil investigations for transport projects
- Monitoring of existing transport structures (e.g. bridges, railways)

MOROCCO:

1. Rationalization of modalities of passage on borders;
2. Modelling for freight and passenger transport.
3. Study of the road safety.

TUNISIA:

1. Road Safety
2. Transport infrastructure construction (mainly road, rail)
3. Road traffic management

Other themes:

- Environment and pollution
- Energy conservation
- Multimodal transport issues.

C. "European neighbourhood" region

The Russian Federation is by far the biggest country of this region but other ones – such as Turkey and Ukraine are also very interesting. Research is mainly executed by public entities, academies, the institute sector and state owned enterprises. Overall, it can be said that the region has considerable "potential" and Transport seems to be one of its interests. This means that the basic preconditions are there and it can initiate high quality research work in cooperation with EU teams in the frame of collaborative EU funded projects.

Recommendations concerning this region include:

- Need for more coordinated calls for transport research between the EU and countries of the region especially with the Russian Federation utilizing the H2020 priorities and funding possibilities;
- Creation of a workgroup *EU - ASIA* with involvement of researchers at equal level to promote research cooperative work on the Eurasian Land – bridge corridors;
- Promote Energy efficiency improvement as well as promotion of "clean" vehicles and modes (including eco driving);
- Socio- economic issues are of interest too, including strategy & economic issues (societal/ human factor as drivers for user behaviour and acceptance, new strategies/ financing methods / access charging / internationalization of the negative impact of

transport e.g. through taxation and pricing to improve efficiency and quality of service);

- Define standards for seamless and efficient services for passenger and freight transport, logistics & smart terminals (border points), integrated (real time) travel and freight information and e-freight (paperless border crossing);
- Research & Innovation on freight transport and logistics services and operations based on real time data, GPS/GLONASS and Galileo & supportive sensors is recommended.

As regards themes and topics of interest:

A. Global Strategic Issues:

1. *The global aspects of climate change*,
2. *Innovative smart and green transport solutions in mega cities*
3. *Safe & secure transport*
4. *New financing and funding models*,
5. *Harmonization & Standardization methods.*

Other themes:

- zero emission energy,
- transport and ageing society,
- integrated transport systems
- education and training in transport,

B. "Operational" topics:

1. *Improving and harmonising the standards for construction and reconstruction of transport infrastructures* (this includes the development of the national standards and the need for new construction technologies as indicated in the Russian Transport Strategy).
2. *Setting up and running a trans-national Weather Warning Systems*. Application of non-meteorological models (geology/landslides, avalanches, flooding) to be implemented in the weather information systems. Emphasis on Rail Weather Information Systems and transferability of the information throughout the rail networks of the region. Also, *resilience of transport systems* (especially for the rail sector).
3. *Rail System improvement* (Rolling Stock, Infrastructure, Signalling) a number of research Topic proposals were identified, and aimed primarily at producing novel engineering and design documentation for the railways (see also main text)
4. *Water Transport* i.e. inland waterways and Maritime: Issues suggested:

- Avoiding bottlenecks at rivers of 4m depth
- Enhancement of level of safety of navigable hydraulic engineering facilities (NHEF)
- Cargo fleet update, average 33 years, improve cargo fleet
- Topics at university: water survey, hydrological regime of rivers, reconstruction of hydraulic conditions,
- Test centre for hydro-facilities, 120m long test basin
- Define tools and mechanism to break through, collaboration with Finland, proving conditions.

5. *Intelligent Transport Systems (ITS)* especially for road and railways.
6. On the Transport Infrastructure side, the following elements are of particular priority: safety, low maintenance costs, capacity optimization, modal information & traffic management systems, and climate resilience;

D. The Australasian region

This region contains some major international "players" in terms of research capacities as well as transport related policies and funding. These "players" are quite different between themselves in terms of size, capabilities, and levels of development so it is necessary to refer to specific countries more than the region as a whole.

China has developed (and still is developing) excellent research facilities in the field of transport. There is a large number of high quality researchers and many national laboratories and research institutes. Many top universities also have excellent working relations with international similar institutions in the EU and the US so International cooperation activities, in the top universities and research institutes of the country, are common and many researchers have experiences in international cooperation.

Japan also has excellent – world class transport research facilities and the government has been investing heavily into science and research in general. Japan has a large number of high quality researchers and research centres. Since international cooperation is always encouraged, many of researchers from top Japanese research institutes have experiences with international cooperation. Japan is a leader in many subjects in the transport field such as high speed train/railway and ITS.

India is the third largest pool of scientific & technical manpower in the world with large English speaking population. India has a very large number of universities, research institutions and annual PhD recipients

with equally large numbers of engineering graduates, and professors. India increasingly focuses on talent development/improving employability.

Australia has world class transport research facilities and high quality researchers. Australian research institutes and researchers are keen in international cooperation, with both developed, emerging and developing countries. International cooperation activities include exchange of researchers/students, joint research and sharing of research facilities/infrastructures.

For all countries in the region the interest for international transport research cooperation is high. From lessons learned from past cooperation, it would be recommended that international collaboration and funding can be initiated by specific EU/ individual Country calls for projects to run in parallel to each other in a harmonized and synchronized way, or joint programming actions. Provisions have to be made for intensive consensus actions on mutually agreed needs, long term preparation and stability in specific areas of global interest and concern. Particular attention should be given to funding joint programming and "common pot" models of cooperation so as to maximise "value for money".

For the individual countries in this region and their themes and topics of priority the reader is directed to see the relevant text in the chapter 5.3. Overall issues that seem to be of wider interest for the whole region are:

- Policy, Rules & Regulations, such as:
  - Transport Policy in energy crisis era
  - International comparison study on the railway policy after privatization
  - Role of culture/tradition/identity in local Transport System (end user comparison study)
  - Policy on transport safety and reliability, smart maintenance
  - Business and policy innovation in the public transport field
  - Transport in an ageing society, human science & behaviour
- Harmonisation of Standards, and more particularly:
  - Standardisation of statistical database between EU and Japan and common Transport Policies for international and harmonized cross border procedures
  - Harmonization of Standards in the ITS Sector on a global basis.
- High Tech Surface Transport and Intelligent Transport systems issues, such as:
  - Next Generation of ITS and Data & Information Management

- Transport and the Climate change ,adaption & resilience to adverse weather
- Efficient utilization techniques for disaster prevention and disaster information
- Energy efficient rail systems and automobiles (incl. renewable energy sources, e-mobility, e-storage)
- Development of low carbon and low environmental load construction materials & technologies through recycling
- Maritime Transport Models to improve Routing load & stability
- Technologies to increase Road infrastructure performance and enhance durability
- Future Railways providing increased capacity, efficiency, quality in a co-modal environment by:
  - improvement of safety and reliability
  - interconnectivity to public transport
  - maintaining and development of railway networks
  - use of high-efficiency energy
  - harmony with the environment

- Improving Asset Management systems for transport infrastructure (Inspection methods ,risk analysis, maintenance for bridges, tunnels, pavement
- Transport Development in European & Asian Megacities and Agglomeration Areas

E. Latin America region and South Africa

Overall, it can be said that the region of Latin America has good "potential" for Transport research cooperation. As major "frontrunners" for such cooperation should be seen the three most "active" – in terms of transport research countries - Brazil, Chile, Argentina (in order of priority).

Brazil has several research institutes and universities of high international standard with good reputation worldwide. Due to historical reasons, Brazilian researchers have longstanding tradition in cooperating with European countries, particularly with southern European countries such as Italy, Portugal and Spain. The country's recent high economic growth and development is also a positive factor for initiating further international transport research cooperation.

In Chile the government, and increasingly the private sector and academia, are looking into innovation as a major growth engine. During the last decade, the Government of Chile has consulted and collaborated closely with international organisations and

commissioned several studies by consultants with the purpose of identifying the weaknesses and opportunities of the National Innovation System.

Finally, Argentina, although having increased its R&D spending budget over the last few years, still has a limited potential for research funding especially international research funding. The country has however an excellent human resource potential and a traditionally European attitude in its administration and work ethics.

South Africa is considered separately but within this region's material, although not of course part of the Latin American region. The Council of Scientific and Industrial Research (CSIR) of South Africa is the leading scientific and technology research, development and implementation organisation in the country but there are a number of very high standard University research teams and researchers in the main Universities of the country in both Johannesburg / Pretoria area as well as in the Cape Town area. Multidisciplinary research, technological innovation as well as industrial and scientific development in the field of transport does take place and the cooperation potential is quite high. Overall, it can be said that in South Africa particular attention should be given to the existence of high quality Human Capital, and research infrastructures. This means that the EU funding to be provided can be directed to high level teams and there may be room for successful joint programming and "common pot" models of cooperation.

Recommendations for the Latin America region include:

- Simplification of procedures for contracting and managing a research project to reduce turnaround times from proposal conception to project execution and results.
- Having smaller consortia in research projects.
- Better communication and standard channels of information concerning calls and procedures.
- Bilateral cooperation seems to be more welcome than multilateral one. This is based on the realisation that EC funded activities involve a number of countries in the region with different interests and priorities and thus such projects may not be as efficient and interesting as "bilateral" ones.
- Finally, give consideration to the interests (social, commercial, and scientific) of the cooperating countries and not of the EU only. This issue sometimes discourages top researchers from cooperating in international cooperative projects.

From South Africa the main recommendations seem to relate to the need for relaying open, timely, and reliable information concerning the various calls and opportunities for international cooperative work as well as facilitating the networking with partners and teams from EU member countries. A "special purpose tool" like an internet based platform or similar, directly aimed at international teams for their information and better inclusion into EU proclaimed calls and consequently consortia, has been suggested by several South African researchers. The close cooperation and leading position of South Africa within the African Continent and furthermore its position in the so called BRICS should merit special attention and is of value for the EU. Cooperation between South African research Organisations and Brazilian, Indian, and Chinese similar Organisations is increasing and already some interesting success stories exist. The potential future EU – South African cooperation in transport research should build upon these success stories and proceed further in securing – through South Africa – links and connections between the EU and these other countries (i.e. African and BRICS).

As regards the themes of interest for international cooperation in the Latin American region, the following can be noted:

1. *Clean vehicles* (fully electric vehicles, hybrid vehicles or bio-fuel powered vehicles)
2. *Information services for travellers*/users
3. *Traffic control centres and Open data sources in the transport field*
4. *Standardization in transport*
5. *Innovative public transport services*.

Other topics:

- Reducing environmental impacts from transport sector
- Urban logistics
- ICT (future internet) in transport

For South Africa, the main themes of interest for international cooperative research are the following:

1. *Public transport in urban areas* (mainly, provision of efficient and sustainable mass public transport services to serve the needs of the lower income urban residents);
2. *Traffic safety* (road primarily with emphasis on information – education actions especially for the "vulnerable" road users i.e. young, old, educationally underprivileged, and handicapped people).);

3. *Efficient and integrated transport infrastructure networks* (inclusive of rural areas);
4. *Interoperability and harmonisation of transport infrastructures* (also vis-à-vis neighbouring countries). Most notable note: Social aspects of transport infrastructure and service provision and most notably: social acceptability and inclusion in transport provision, labour enhanced transport infrastructure development[3], and human capital development in transport service provision;
5. *Transport modelling* (Development of network based, multi-modal public transport cost models, as well as general passenger and freight related models

Other, more horizontal, recommendations

In addition to the recommendations per region or country, the report contains and three more horizontal recommendations which will be further defined and documented in the overall proposed "framework" for international cooperation to be submitted with the Deliverable 4.1 of the project.

These recommendations concern:

a. the need for creation of a permanent mechanism that will monitor and benchmark international transport research cooperation status and progress;
b. the creation of international transport research promotion centres devoted to supporting and promoting international cooperation activities, and
c. Establishment of ERA-NET types of activities in the international scene.

The first, *Monitoring and benchmarking of activities related to international transport research cooperation*, would aim to assess the progress, effectiveness and impacts of international cooperation activities in transport research, by exploiting both the results of completed as well as on-going projects and also by monitoring and analysing the progress of international transport research related activities during the next years. Benchmarking tools and indices reflecting the progress made and the prospects in the main fronts and areas of international cooperative research actions – e.g. funding mechanisms, evaluation procedures, facilitation mechanisms, etc. - need to be created and quantified. Outputs of such monitoring

[3] There is also a Presidential Commission on infrastructure development with a view to enhancing provision of jobs.

mechanisms could be used as inputs to multi-annual roadmaps for transport research international cooperation, as laid down in respective EC communications.

The second, *Centres for the promotion of international cooperation in transport research*, aims at forming ***International Cooperation Promotion and Networking Centres (ICPNCs)*** each of which will be focussed in a particular global transportation challenge. The main scope and aim of these Centres will be to undertake a number of activities particularly aimed at promoting international cooperation in specific fields and areas of transportation research. These activities will include for example researcher training and exchanging activities, facilitating networking among research centres - in the area of interest – at global level, benchmarking activities, etc. The aim will be to develop and promote the creation of a global network of well trained and motivated "champions" of international cooperation as well as building the necessary "capabilities" in terms of the human capital involved in international cooperation activities are required.

The third recommendation, *ERANET types of activities*, aims to utilise the successful European model of cooperation among transport research administrations for pursuing collaborative research calls and facilitating common funding in joint transport research programmes. At the international level similar structures can be developed and funded aiming at *promoting cooperation among transport research funding administrations* between several countries. Initial ERA-Nets – which in this case would have to be named differently, e.g. ***IRA-NETS*** *(for International Research Area – Nets)* would be created and follow a model of cooperation and operation very similar to that of the European ERA-Nets.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND TERMINOLOGY

EC	European Commission
MPC	Mediterranean Partner Countries
GDP	Gross domestic Product
IPO	International Patent Office
ISO	International Organization for Standardization
WTO	World Trade Organisation

1 INTRODUCTION

1.1 Scope of EUTRAIN project and work plan

In the field of Transport research, international cooperation is pursued as a deliberate policy in order to address common problems and issues in a more resource efficient way. This stems from the fact that the European Union as well as other major national, federal or regional entities of "global" importance[4], are buffeted by common transport related problems and challenges. International Cooperation in Transport research is therefore becoming an increasing priority aiming, primarily, at creating "critical mass" and moving collaboratively to solve critical 21st century transportation challenges. The European Union as part of its current 7 year research programme (FP7) and in support of its policy to create a unified research space among all its member countries - which in the field of Transport is referred to as the **European Transport Research Area (ERA-T) -** is enacting and fostering international transport research collaboration at all levels and with many means.

The main scope of the EUTRAIN project is to review and analyse the issues concerned with promoting more cooperation in the field of transport research between the EU and the rest of the world and to provide a concerted framework to promote such International Cooperation. The scope of the project is quite wide, both as regards the content, as well as regarding its geographic scope (practically all main regions of the world).

As regards content all project work and activities focus on a number of specific issues or "Themes" that have been found by previous work as of primary importance for international cooperation. These issues are:

1. *Themes and Topics of priority interest to the various regions, for international cooperation work (vis-a-vis the EU);*
2. *Programming and governance issues in target regions, including joint programming experiences;*
3. *Research infrastructures and their networking possibilities ;*
4. *Information and data sharing issues;*
5. *Research training and human resource issues – mobility of researchers and networking;*

[4] Such as the U.S., Russia, the Mediterranean countries, Korea, Japan, Australia, South America, India, China, and others.

6. *Institutional cultures and research governance regimes;*
7. *Pre-standardization activities and interoperability (of research results) – Harmonizing approaches and practices for the take up of research results; Intellectual Property regimes and follow-up actions.*

The consortium that carries out the work consists of 5 partners (ECTRI, ERTICO, FEHRL, EURNEX and VOLVO) and several third parties (member Organisations of the above). In association with these partners there is a so called *Network of Associated Entities (NAE)* which consists of 13 Organisations from all regions of the world that act as Associated to the consortium and participate in some of the work. In addition, a wider *Network of "Related" Entities (NRE)* which consists of some 100 Organisations around the world that are simply kept informed of the progress of the work.

The work is organized in five "work packages" (WPs) as follows:

- WP1: Project Management
- WP2: Current status, characteristics and issues in international transport research cooperation
- WP3: Research topics, capabilities, investment and future priorities
- WP4: Synthesis of recommendations – towards a framework for International Cooperation in Transport Research
- WP5: Consensus building and Dissemination actions.

This present Deliverable 3.1, reports mainly the outcome of the work in WP3 above.

1.2 Project objectives and main issues

The main objectives of the EUTRAIN project and the work that is being carried out within it can be summarized as follows:

- To contribute towards the establishment of a framework for international transport research cooperation.
- To investigate (transport) research capabilities, investment, future priorities and potential for cooperation with specific countries / regions.
- To consider, discuss and provide a common understanding of current practices for research governance and management as well as barriers, gaps, and diversions for international transport research cooperation.
- To assess the benefits or added value, as well as the prospective synergies from such closer international cooperation.

- To investigate alternative models and tools for carrying out such cooperation in the most effective and productive way
- To disseminate, in the course of doing the above activities, European know how and practices in transport research administration and management.

The project activities have been planned and are taking place in terms of desk research, workshops, bilateral meetings, questionnaires completion, the final project Conference, internet based (electronic) exchanges of data and information, etc.

1.3 Brief description of WP3 and methodology followed

The main objective of WP3 is to synthesise and evaluate (based on the results of the various project activities) topics and contents for International Cooperation according to the regions or countries concerned, to relate them to ERA-T objectives as they relate to the Europe 2020 objectives and other key documents and also to support the Commission (DG RTD) in setting the relevant topics and priorities for cooperation with specific regions / countries.

The regions of reference are the ones set out as regions of focus for this project, i.e.:

1. of "immediate proximity" and/or interaction with ERA-T[5] such as: US, Russia, Mediterranean cooperation countries (with focus on the southern side of the Mediterranean, i.e.: Morocco. Algeria, Tunisia, Libya, Egypt), and Eastern Europe Neighbourhood cooperation countries (the Balkan countries, Turkey, Moldova, Ukraine and Belarus).
2. of "wider interest and importance": China, India, Korea, South Africa.
3. "Other", e.g. Japan, Australia, Latin America (Brazil / Argentina / Chile), Canada.

These are subdivided in the following regions and this categorisation is followed throughout the whole report:

F. The USA
G. The Mediterranean Cooperation region with main reference to the countries of (alphabetically):
   - ✓ Egypt,

[5] European Research Area in the field of Transport

- ✓ Israel.
- ✓ Jordan,
- ✓ Lebanon,
- ✓ Morocco,
- ✓ Tunisia.

H. The "European Neighbourhood" region with reference to the countries of (alphabetically):
- ✓ Kazakhstan,
- ✓ Russian Federation,
- ✓ Turkey,
- ✓ Ukraine.

I. The Australasian region with reference to the countries of (alphabetically):
- ✓ Australia,
- ✓ China,
- ✓ India,
- ✓ Japan,
- ✓ Singapore.

J. The Latin American region and South Africa, with reference to the countries of (alphabetically) (besides South Africa):
- ✓ Argentina,
- ✓ Brazil,
- ✓ Chile,
- ✓ Ecuador,
- ✓ Venezuela.

As regards the methodology followed in order to fulfil the two main objectives of this Deliverable, namely the prioritisation of Topic and Themes that seem to be of interest in the various regions and countries examined by the project and the assessment of the "research capabilities", the following can be mentioned.

The themes and topics of interest have first been collected by the statements of the various participants in the EUTRAIN workshops and bilateral meetings that were organised around the world. These participants were in their majority research stakeholders and by inference in a position to know the interests of the wider research community as well as the needs of the country / region.

These themes and topics were then grouped, by the EUTRAIN persons that attended these events, in groups of similar topics and were assigned a priority taking into account the:

a. priorities given by the "local" participating experts,

b. geopolitical and scientific importance of the region vis-a-vis the EU, and
c. priorities of the H2020 programme especially its intended response to the so called "social challenges" facing Europe.

For the assessment of the "research capabilities" part of the work we weighted items such as:

- ✓ successful & sustainable collaboration in the past and also for the near future need to imply:
- ✓ Policy objectives & stable framework;
- ✓ Mutually agreed "national" and /or regional interest
- ✓ The degree of higher order of risk and budget sharing to succeed in tackling grand challenges respective cross border issues of the regions.

Furthermore, in applying the above criteria – and to the extent possible – the following issues were considered:
Political willingness / stability of funding,
Common understanding of need/ mutually agreeable needs & requirements
Strategic guidelines with high communality, strengthening European Excellence and competitiveness
Interest of stakeholders at macro & micro economic level
Existence of Data exchange agreements, MOU, etc.
Knowledge, research results & technology sharing Frameworks
Scientific and Research excellences at equal level playing field .

In the following, when presenting the Topics of interest the items in **bold with numbers** are the "selection – prioritisation" items derived through the methodology described in the Introduction by the EUTRAIN team. The rest of the items have been mentioned in the various project meetings and workshops for the respective country region.

2 COOPERATION POTENTIAL WITH THE USA

2.1 Overall outlook and background

Transportation research in the U.S. is a rather complicated, robust, and decentralized series of research programs, each promoted and supported by well entrenched stakeholders which mainly include: the U.S. Congress, the Department of Transportation (U.S. DoT), the National Academy of Sciences, State Departments of Transportation, local and regional governments and their planning agencies, Universities, private firms, Associations, and users of the transportation system.

The main components of the United States Transportation research effort are the following:

1. The **Federal research and technology transfer** programme, carried out directly by the **U.S. DoT** through its various research conducting divisions or Agencies. These are : the Secretary's Policy Office, and the modal Agencies: the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), National Highway Traffic Safety Administration (NHTSA), Federal Motor Carrier Safety Administration (FMCSA), Federal Railroad Administration (FRA), and the Research and Innovative Technology Administration (RITA).
2. **Research conducted by each State department of Transportation**, managed by the individual state DOT members of the American Association of State and Highway and Transportation Officials (ASSHTO) Research Advisory Committee, coordinated with national research programs and funded using either federal funds or funded by the states themselves (mainly from the federal State Planning and Research (SPR) Programs). ASSHTO members also cooperate through the Transportation Pooled Fund programme (similar to an era-net) administered by FHWA.
3. The **Cooperative research programs** managed by the **Transportation Research Board (TRB)**, including the: National Highway Cooperative Research Program (NCHRP), Transit Cooperative Research Program (TCRP), National Cooperative Freight Research Program (NCFRP), National Cooperative Rail Research Program (NCRRP), Airport Cooperative Research Program (ACRP), and Hazardous Materials Cooperative Research Program.

4. The **Policy research** undertaken (and managed) directly by **TRB**.
5. **Special research authorized by Congress**, such as the second-generation, Strategic Highway Research Program (SHRP2)[6].
6. **The University Transportation Centres (UTC) Program** carried out by University Transportation Research Centres formed by consortia of Universities across the country.

Looking at the overall research effort, it can be said that the United States is an undisputed world leader in funding and performing research in general, and research in the field of Transportation in particular. Of the worldwide R&D expenditure (which in 2007 was estimated to total US$ 1.107 trillion[7]), the US accounted for about 33% of this total, while the 27 nations of the European Union (EU-27) accounted for about 24%. In the period 1997 – 2007, R&D expenditure by the US grew at an average constant rate of 3.3% per year[8].

The R&D funding/GDP ratio, in 2009 was nearly 2.9%, rising from around 2.8% in 2008 and 2.7% in 2007[9]. In 2010 it fell to 2.80% and in 2011 to 2.74% showing a downward trend obviously due to the economic austerity measures.

The business sector participates heavily in the conduct of research having performed an estimated $282 billion of R&D in 2009, or 71% of the U.S. total and drawing on business, federal, and other sources of R&D funding. The business sector itself provided an estimated $247 billion of funding for R&D in 2009, or 62% of the U.S. total.

Transport research accounts for a percentage of the total research effort that is around 9-10%. For example it represents approximately 12% of the total research funding provided to the National Science Foundation. Of all public expenditure for R&D, the Transportation sector (Department of Transport) ranks 9th behind the Departments of Defence, Health and Human Services, and Energy, the National Science Foundation, the National Aeronautics and Space Administration, the Department of Agriculture, the Department of Commerce, and the Department of Homeland Security.

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[6] Focusing on four critical issues: safety, infrastructure renewal, travel-time reliability, and capacity needs

[7] We could not find more recent figures but it is estimated that for the argument put forward here, it can be assumed that similar figures, or the same relative level of magnitudes, are applicable at other time periods too.

[8] Over the same period, the EU-27 grew at an average annual constant rate of 3.3% while Japan, the third-largest performer, accounted for about 13% per year.

[9] The ratio has ranged from 1.4% in 1953 to a high of nearly 2.9% in 1964 and has fluctuated in the range of 2.1% to 2.8% in the subsequent years.

2.2 International cooperation capability assessment

2.2.1 Types of actions considered

The most common forms of international cooperation in the field of transport research that are practiced to date by US Agencies are:

a. Technical fellowship exchanges through Department of Transportation approved agreements;
b. Sharing of networking on research structures;
c. Information exchanges through technology assistance programmes and Conferences;
d. Direct scientist to scientist one-way or two-way exchanges through scanning, conferences, or other fact finding missions;
e. Exchange of transportation statistics through hard (physical) or soft (database) means;
f. Use of private sector funds to support or augment transportation projects that cannot be supported through the use of only Federal funds;
g. Memoranda of Cooperation or implementation agreements between the U.S. DoT, itself or its modal research Agencies, and international partners[10].

[10] Such is, for example, the **Implementing arrangement**, between the EU/DG RTD and the US DoT/RITA, for "***Cooperative activities in the field of Research, Development, Technology and Innovation applied to all modes of transport***" signed in 2013 in the framework of the initial Agreement for Scientific and Technological Cooperation between the European Community and the Government of the United States of America, signed December 5, 1997. The activities foreseen to be pursued in the context of the areas of cooperation referred to in this Arrangement include:

1. Exchanging information and documentation. Each Side is to endeavor to provide the other with all information necessary for the cooperation and the implementation of activities listed under Section 2 of this Arrangement.
2. Coordinating studies, programmes, and activities.
3. Conducting joint activities:
    - Collaborative projects and coordination activities, funded by the Sides subject to their respective rules, and identified by mutual consent.
    - Joint analyses, evaluations and other collaborative activities, including joint international workshops or meetings, short-term visits by researchers, sharing of material, data, and information, coordination of sampling or analyses, and joint publications.
4. Participating in working groups in conformity with rules applicable to such participation.
5. Other activities as might be mutually agreed.

All US/DoT operating Administrations can in principle conduct international transportation research collaboration actions. This ability is however, limited by national security, technology transfer, intellectual property, funding, and other restrictions (49 CFR 1.4, 1.23[11]) which so far have contributed to restricting such international cooperation activities to activities like the ones mentioned above. These activities can be mentioned as "soft" actions, as opposed to the more "hard" one such as, e.g. international cooperative research work through co-funding, joint programming, etc. Actually, the more rigorous international cooperative research work against which we will consider in the following the "capability" of the US, can be classified in the following three categories:

A. Organized, centralized and institutionally-driven international collaborative research programmes, through (for example):
    i. Investment in the research programmes of other countries or funding of international researchers;
    ii. Procurement of specific research programmes jointly funded and administered with other countries (joint programming);
B. Organized, centralized and institutionally-driven effort at creating a unified environment for international research and development, involving many countries and research agencies, through a multilateral agreement providing a common legal and research conducting framework (and common funding), through actions such as:
    i. Common guidelines for research procurement (including the setting of research themes, guidelines, funding, etc.).
    ii. Common guidelines for (research proposals) evaluation and assessment
    iii. Benchmarking at all levels.
C. Setting up and implementing a convincing frame for implementing international collaborative research results in each of the cooperating sides, by all stakeholders involved (government, and industry too). Closer cooperation between government, academia, and industry at

[11] The **Code of Federal Regulations** (CFR) annual edition is the codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation. The 50 subject matter titles contain one or more individual volumes, which are updated once each calendar year, on a staggered basis. The annual update cycle is as follows: titles 1-16 are revised as of January 1; titles 17-27 are revised as of April 1; titles 28-41 are revised as of July 1; and titles 42-50 are revised as of October 1. Each title is divided into chapters, which usually bear the name of the issuing agency. Each chapter is further subdivided into parts that cover specific regulatory areas. Large parts may be subdivided into subparts. All parts are organized in sections, and most citations to the CFR refer to material at the section level.

both sides is needed to address the relevant issues and accelerate implementation of novel technologies (that will result from international cooperative research efforts) into practice.

2.2.2 Assessment of the (research) operating environment

In assessing the US's International Cooperation capabilities, in the field of Transport research, one has to take into account the overall research operating environment that exists and "obstacles" that have prevented in the past a more deep involvement in international cooperative research work like the one outlined by the three categories of actions A, B, C above.

As a first point, it can be noted that the sheer size and institutional robustness of the U.S. Transportation R&D system which includes Universities, Federal research centres, State-funded R&D programs, and the private sector (both small and large companies) is a positive pre-condition for a more extensive involvement of the US in international collaborative work in the future. In fact the historical background, experience and research ethic, as well as the well-established mechanisms for research governance and funding make the US a unique "pole of interest" for promoting international cooperative work in the transport field.

A second realisation is that in the US there is now a visible change of attitudes in both the research governing administrations as well as the research conducting Organisations in that through international research cooperation many benefits and economies of scale can be achieved in the quest for answers to common global transportation problems. The position that through international cooperation one can achieve better "value for money" for the research dollars spend in transport research (and research in general for that matter) is now heard more and more often in meetings and Conferences from US representatives.

Thirdly, the US research operating environment seem to have realized recently (much more than in the past) the importance and practical utility of cooperation through bilateral or multilateral governmental agreements. Many individual states have engaged in active cooperation for many years, e.g. Minnesota and Nordic countries, California and France etc., but these have provided slow to mature to a wider EU cooperation. Also there is a recent trend for Organization-to-Organization agreements or even laboratory-to-laboratory agreements in all research fields and in Transport too. So individual Organizations take initiatives for advancing international collaborative research activities, and the two most notable examples in the recent past is the FHWA, and the TRB. For example, the FHWA's Advanced

Research Program has made significant progress in developing and standardizing processes and procedures for international collaboration. Similarly, the TRB is also moving forward to put in place frameworks that will enable greater R&D international cooperation.

Each of these cooperative arrangements requires individual Memoranda of Cooperation, Memoranda of Understanding or Agreement, and other implementing documents to be negotiated between the U.S. and international parties. These agreements, once institutionalized, will become "frameworks" for future collaboration of mutual benefit. Furthermore, some US research agencies have specific enabling legislation (e.g., FHWA's International Highway Transportation Outreach Program - 23 U.S.C 506) and the Department of Energy's Studies and Agreements by the Secretary of Energy on a multinational or International basis concerning spent fuel storage facilities and transportation systems (22 USC § 322a).

Against these positive trends there exist also some inhibiting factors which are at work within the US transport research "operating environment" and somewhat limit the "capability" of the country to undertake and support a more extensive number of international cooperation initiatives. We can summarize these factors as follows:

- The multitude of agencies, policy making, and supervising bodies (on both sides of the Atlantic) that are involved in the promotion and funding of transportation research creates difficulties in forming and following a uniform and long term policy towards international cooperative research activities. Different modes (aviation, maritime, road, and railways) have different authorization and appropriation mechanisms that change from one authorization bill to the next. Each operating administration receives different authorization and appropriations guidance from their unique set of Congressional Committees and each such Committee usually sets limits on collaboration based on programmatic priorities and mandates. These restrictions can limit international research collaboration (in the same way they do seem to limit inter-modal research collaboration). This is compounded by the lack of coordination between EU member states, their agencies and the multitude of individual agreements in place which further complicate establishing more cohesive frameworks.
- As a consequence of the previous situation, research programmes (and consequently contracts) issued by the US/DoT and its modes, almost invariably in the past have limited the amount and nature of funding for international collaborative transportation research. A characteristic example of such restrictions (especially if one considers the pure academic nature of the research performed there) is the US/RITA supported grants for the University Transportation Centres (UTCs)

programme. As required by the grants law and the Office of Management and Budget, the UTCs may not co-fund projects with international partners. With explicit approval, UTCs may expend funds on international travel for collaboration and information-sharing purposes, and may conduct shared projects where there is no co-mingling of funds with an international partner. This is a severe obstacle to greater international collaboration. It must be stressed that an equally restrictive policy has been followed up to now (in the FP7 projects) by the EU administration but this is expected to be more relaxed in the new Horizon 2020 EU research framework.

- Supported by FHWA, the American Association of State and Highway and Transportation Officials (ASSHTO) has established some connections with similar European agencies. There is a growing willingness to include European agencies in common programmes in the same way that Canadian agencies already participate. However the complexity of dealing with multiple European agencies and their relations with the different EC Directorate-Generals continues to provide an obstacle. There is a view is that Europeans are always trying to reinvent the mechanisms for cooperation.
- Some observers consider the apparent lack of a centralized authority in the US Department of Transportation to deal with all transport-related research. This inhibits the formulation of a more rigorous and coordinated policy approach to international collaboration in transportation as a broad discipline. This assessment mirrors the frequently held view of the EU that apparent from the US perspective. Within the US Department of Transportation, RITA has the objective to provide overall cross-cutting, intermodal direction, and coordination but the individual priorities of the modal operating administrations remain paramount in the development of RD&T activities.
- Whilst international transport research itself has not been widely acknowledged, technology transfer in the sector has been heavily supported. This includes cooperation with EU member states. In one example, FHWA created the Central European Technology Exchange (CETE). The forerunner was created in 2001 with a cooperative agreement "Highway Transportation Technology Exchange and Establishment of a Technology Transfer Network in Central Europe" with the CDV Transport Research Centre, the Czech Republic. FHWA now operates programs with four Central European countries: the Czech Republic, Hungary, Poland and the Slovak Republic. The CETE provides opportunities for sharing transportation information and technology among the U.S. and their counterparts in Central Europe. The CETE program works to enhance and to improve their access to road technology, including institutional and program building activities, which can facilitate conditions for

sustainable development, foreign direct investment. It serves to create an analogy of the Local Technical Assistance Programme (LTAP) which provides knowledge transfer capabilities within in 51 states of the US.

- There is also no facilitating framework as regards the issues relating to international IP regimes and the implementation of international cooperative research results[12]. The costs of filing a foreign patent application, by the U.S. DoT or one of its modes, are generally seen as cost prohibitive. The existence of a clear and centralized policy regarding patents and intellectual property (IP) is necessary while at present IP policy development and implementation is left to the individual transportation modes (i.e. the modal research Agencies of the US/DoT)[13].

[12] A most notable exception should be noted here as regards the implementation of innovations in road design and construction. Good communication between researchers, consulting engineers, producers, civil contractors and road owners through assemblies such as the Road Pavements Fora, enable innovations to be piloted and implemented in practice within a relatively short period of time.

[13] Patent Attorneys are the critical component of the U.S. patent application and licensing process. An indicator of how much weight a particular agency gives to the development of intellectual property is the number of IP attorneys that are directly employed or are under contract to the organization. The lack of US PTO-approved attorneys in the U.S. Department of Transportation suggests a lack of emphasis on IP. Only Patent Attorneys can practice before the USPTO and that includes filing provisional patent applications. Moreover, the patent attorney has to have sufficient expertise in a particular scientific or technical subject to be of significant use to an agency. For instance, the National Institutes of Health require patent attorneys that have a strong biological or biochemistry background. You cannot become a patent attorney in the United States without a science or engineering undergraduate degrees. While part of the problem has been a lack of investment in attorneys within the different DOT modes with the credentials to support the development of intellectual property. The other factor stems from a DOT culture which emphasizes the "open-source" development of technology without regard to its return on investment (ROI). Whether an "open-source" approach will work with regard to international transport collaboration remains an empirical question. This is particularly true as IP becomes a point of focus within the U.S. Congress and issues related to the protection of IP continue to be a growing point of aggravation between the United States and China. Large agencies like the National Institutes of Health (NIH) have moved towards a system wherein scientists can do most of the work related to licensing, etc. In this situation these non-patent lawyer professionals rely heavily on templates and they also have access to multiple patent attorneys whenever they are engaged in an unusual set of negotiations with national and international private parties. The use of non-lawyers is a product of a long-standing technology transfer process based on Intellectual Property (IP). The DOT in this field does not seem to be involved at all and this is strange, especially given the historical culture of the Organization.

It must be noted here that the different IP regimes between Europe and the United States are not seen as a major issue by those US shareholders that answered the EUTRAIN questionnaire. The issue is whether the U.S. DoT lacks a policy that stresses the protection of IP. For example, when asked in Question 2.4 to rate factors that may

This is an area that particularly renders itself to closer cooperation between the US and the EU governments as well as academia, and industry. Such cooperation should aim to address IP needs and accelerate implementation of novel technologies into practice.

- Finally, the US transport research "operating environment" mirrors that of many EU member state by suffering from lack of clear-cut data and case studies that illustrate the benefits of international collaboration. A more systematic effort towards pronouncing and promoting the benefits of international collaborative R&D would be most effective in changing the situation and creating more impetus for international cooperation.

2.2.3 International cooperation capability assessment

In assessing therefore the "capability" for international cooperation of the US we can now attempt to "grade" it through the help of the following standardized EUTRAIN "Transport Research International Cooperation Capability Assessment" Table based on the basic statements and realizations mentioned above and in more detail in the full USA "country report".

The "capability" is expressed in terms of the following 5 criteria or attributes:

1. Existence in the country of well qualified, internationally competitive, human capital i.e. research teams to work on cooperative research projects in the field of transport.
2. Availability of appropriate research infrastructures ("hard" and "soft").
3. Existence of appropriate institutional environment, policies and / or governmental support for international cooperation.
4. Existence of "champions" (i.e. individuals or research teams or Organisations who could take the lead in forming proposals and carrying out the work in international cooperative research projects).
5. Existence of appropriate funding and/or funding mechanisms for international cooperation.

affect the size or frequency of your organization's or country's involvement or in interest in international research (where 1=minimum and 5=maximum relevance) only one DoT organization rated other legal frameworks (e.g., concerning intellectual property) a five. Four out of the six organizations polled responded with the number rating of 2 or less. The average rating score for Question 2.4 by the responding DoT modes was 2.5 out of a maximum of 5.

Table 1: ***Rating of the international transport research cooperation "capability" of the US***

Modes / Criteria	*Criterion 1 (Human capital)*	*Criterion 2 (Research Infrastructures)*	*Criterion 3 (institutional environment)*	*Criterion 4 ("Champions")*	*Criterion 5 (Funding)*	*Overall country wide**
Road	10	10	9	10	9	**9.6**
Rail	9	8	9	9	7	**8.2**
Air	9	10	9	9	7	**8.4**
Maritime	8	7	7	9	8	**7.4**
Overall (all modes)	9	9	8	9	7.5	**8.5**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of criteria (rounded to nearer digit).*

Overall, it can be said that the US has a unique technical capability to promote international cooperative research work in the field of transport but somewhat lacks the appropriate institutional, funding, and policy background that would promote the more substantive forms of international cooperation (with the EU) in the field of Transport mentioned in this chapter**.** Given that this situation seems currently to change, the new situation could provide a "model" for the world to follow. In this new emerging era, the risk for the EU is that the US could identify other regions of the world as more able for creating partnerships. Nevertheless the opportunity is that building on those good examples, the US could find in the EU a most appropriate partner with whom to cooperate in forming the blueprints for the future international cooperative transport research work at a global scale.

2.3 Main topics of interest

The research, development and technology priorities of the US Department of Transportation as they have been set forth recently by the U.S. DoT Secretary are:

- *Safety* (the U.S. DoT number one priority);
- *State of Good Repair* (optimal condition and performance of US Transportation infrastructures);
- *Economic Competitiveness* (targeted investments to better serve the travelling public and facilitate freight movement, while supporting American jobs and exports);

- *Liveable Communities* (increasing travel choice and providing access to affordable transportation for all); and
- *Environmental Sustainability* (addressing transportation's impacts on air, water and natural ecosystems).

How far these same priorities apply also to international cooperation is not clear.

Another indication of the current US Transport R&D priorities are expressed through authorization legislation and annual appropriations as set forth through the R&D planning authorities of each mode. The following is a partial listing of these priority research activities[14]:

- Data driven decision-making;
- Congestion modelling and reduction;
- Economic analysis;
- Energy sustainability;
- Human factors;
- Infrastructure and materials;
- Improved algorithms;
- Liveability;
- Risk-based analysis to address safety issues;
- Finite modelling and simulation;
- Multimodal intelligent transportation systems;
- Policy analysis methods;
- Positioning, navigation and timing (PNT);
- System resilience and global logistics;
- Transportation implications for an aging population and those with special needs;
- Understanding crash causation, including the role of sleep apnoea.

Finally, through the EUTRAIN survey and bilateral meetings held in the US the following themes we were able to group and prioritise the following potentially interesting themes and priorities[15]:

1. **Sustainable cities** (sustainability – liveability – mobility) incorporating items such as:
   - ✓ Travel behaviour analysis;
   - ✓ Data acquisition;

[14] Statement of Peter H. Appel Administrator, Research and Innovative Technology Administration. U.S. Department of Transportation before the Subcommittee on Technology and Innovation Committee on Science, Space and Technology, U.S. House of Representatives, June 14, 2011.
[15] Source: EUTRAIN EU-US DOT multilateral meeting, January 2012, Washington DC

- ✓ Optimisation of traveller information.

2. **Infrastructure maintenance and testing**, incorporating items such as:
   - ✓ Non-destructive evaluation of transportation facilities;
   - ✓ Models for rolling resistance for road infrastructure asset management systems;
   - ✓ Asphalt aging and embrittlement;
   - ✓ Long-term bridge performance;
3. **Street cars** (trams) and **personal rapid transit** systems.
4. **Global freight Transport**
5. **ITS standardisation**.
6. **Rail sector improvement** with items such as:
   - ✓ High reliability and economics of high speed rail ;
   - ✓ Train control system, next gen. on-board navigations;
   - ✓ Safety risk analysis (infrastructure, rail/vehicle interface);
   - ✓ Advanced materials for train construction;
   - ✓ High REL-information for real time game change to improve capacity, efficiency and quality for customers.

2.4 Discussion and recommendations regarding EU and US cooperation in transport research

As it has been indicated by the discussion in the previous sections, both the EU and the US possess a very high technical capability for high quality research and innovation production in the transport field. However, the process of adopting truly collaborative regimes between the United States and the EU is tedious and is hampered by long-standing institutional impediments stemming from the premise that transportation research funding is viewed primarily as a mechanism for domestic growth and competitiveness.

A significant part of the problem in the past has been a generalized perception in both the US and the EU that there isn't significant value to be gained for either side from international collaboration. This attitude was particularly evident in the US where, probably because the U.S. has enjoyed over the years a relatively robust transportation research program, there was traditionally a certain level of scepticism about what the United States can learn from cooperation with other country researchers relative to the investment in collaborative research. In the past, there was also a strong view that the US could obtain or 'buy' knowledge from other regions without the longer lasting cooperation. Similar ideas, coupled with the inevitable "maintaining a competitive edge" argumentation, may have restricted EU attitudes in the past, too.

In fact, and given the very high level of activity and the potential of the US in performing transport research, the current level of international transportation collaboration (at least in terms of government-to-government and government-to-private sector) activities is exceptionally low. Other U.S. governmental agencies (i.e. in fields other than transportation) seem to have performed far better in this respect having worked out the issues of promoting true and in depth international research cooperation. For example, the *National Institutes of Health (NIH)* Organisation is a leader in developing agreements with international organizations (private and public) to develop innovative drugs on a whole host of fronts[16]. So, in Transportation too, there is no inherent reason while similar arrangements cannot be worked out by the US Department of Transportation and its modes. The lesson to be drawn here is that as the benefits of collaborative international transportation research begin to be documented and fully appreciated by the US and the EU sides, there should be a long-term concomitant increase in the level of policy support and funding for international collaborative transport research.

The existing MoUs and other agreements between the US DoT research Organizations or the TRB and other international organizations (e.g. the MoUs between TRB and ECTRI, or between FHWA and FEHRL), could provide examples of collaboration partnerships such benefits but the critical test will be if these agreements result in long-term scientific and technical collaboration that produces practical research results and innovations.

A major (and crucial) step towards changing the existing situation would be if in up-coming authorization legislation for the new research programmes there is a change over the past policies enabling greater funded participation in the U.S. or EU (transport) research programmes by research organisations or individuals from the other side. Such change would greatly enhance the participation of researchers from one side to the research work of the other, and would put in immediate practice the collaboration between the research communities of the two sides. A notable advance preparing a possible breakthrough toward this direction (but still far from it) is the recent (January 2013) signing of the *implementing arrangement*, between the

[16] One possible facilitation would also come if the U.S. DoT and its individual modes should reach out to other Federal research agencies that may have funding and fewer restrictions on international transportation collaboration. These other programs can be a source of funding for international collaborative transportation projects, e.g. the Environmental Protection Agency has been a source of funds for transportation-related projects.

EU/DG RTD and the US DoT/RITA, for "*Cooperative activities in the field of Research, Development, Technology and Innovation applied to all modes of transport*" signed in 2013. This "Arrangement" was signed in the framework of the initial Agreement for Scientific and Technological Cooperation between the European Community and the Government of the United States of America, signed December 5, 1997.

Among the several factors restricting such development for the moment is of course, the severe resource constraints faced by both the US and the EU (collective or National) administrations. However, these constraints could also be seen as a factor promoting international cooperation by helping to maximize the effect of finite R&D resources.

Relative to the funding issues for international transport research cooperative work is the issue of the participation of the private sector in funding or co-funding such work. If we want international transport research collaboration to flourish, the private sector must be brought in as a partner and a funder, more heavily than up to now. The example of using the private sector to pay the costs of Norwegian experts in the field of retro-fitting ferries with natural gas burning engines is one example in point.

While we wait for the conditions to become ripe for the more in-depth collaborative actions of jointly funded international research work, other – less "hard" and more easy to implement actions could be pursued to promote EU-US cooperation in the field of transport research. Examples of such actions are the following:

1. Establishing an effective and multi-channel communication process could be a key factor that will measurably enhance collaboration between the EU and the United States as well as internationally. Following a top-down approach one could make the framework under which the interested researchers, will explore and exploit the benefits of a more close and institutionalized international cooperation in transport research. Without sustained and clear communications, researchers and decision-makers will not receive real-time, transparent information on how to maximize funding levels, evaluate the degree of value added; nor will researchers and decision-makers have the information necessary to articulate clear goals and objectives. Moreover, to overcome specific policy biases against collaboration requires the effective communication of the intrinsic advantages of collaboration and how collaboration can result to a net addition of jobs. Information of this type is necessary if legislators and policy-makers are to craft authorizing legislation that encourages greater collaboration. For specific barriers to be removed, requires the more effective transfer of information through multiple channels within and

beyond the transportation research communities on both sides of the Atlantic. Better communication is, for example, essential to funding research infrastructures that are shared, to understand the true technology and know-how value that can be gained through collaboration, how particular projects will allow the maximization of the value of particular projects, etc.

2. Along the above lines an effective communications process between the transport research communities could be established which should begin as a joint project between the EU and the U.S. The US side could collaborate with a corresponding EU Organisations to establish an international transport research and innovations collaboration website(s) with components such as the following17:
    a. The ability to provide on-going best practices and case studies of collaborative projects that are currently in place.
    b. Upcoming research topics or RFPs (private/public) that would not only allow but encourage collaboration.
    c. A catalogue of interested transport researchers across the EU-US that would receive timely information on collaboration opportunities.
    d. Specific collaborative research reports that can be downloaded and presented to agency and Congressional staff.
    e. Opportunities for funding research work from EU, or US/ federal and state entities as well as private sector organizations.
    f. On-line newsletter published in multiple languages.
    g. Capacity for researchers to "blog" on technical and policy topics.
3. Another step would be to allow for funded participation of EU and United States researchers in low – hanging technologies projects and "soft" actions of cooperation such as multi-year technical personnel exchanges, agreements to further the exchange of critical transport data, etc., that would incentivize the private sector to compensate for funding restrictions in EU and the US Federal authorization and appropriation legislation for as long as these exist. Successes in such collaboration should lead to larger projects and more extensive collaborative frameworks in the future.
4. The EU and the United States could also explore the use, in the transport research field, of existing models of international exchange between the U.S. and Europe such as Fulbright and NATO Fellowships as ways to encourage technical two-way exchanges. Within this framework, the EU

[17] A suggestion along these lines, i.e. concerning the importance of information dissemination about best practices and opportunities for research, was made in the International Cooperation Strategic Session organized in the TRA 2012 Conference in Athens (April 23-26, 2012)

and the US/DoT must begin a more systematic collaborative effort which could include the organization of common research dissemination activities, Workshops and discussion fora, and gradually a joint outreach to significant U.S. and European foundations to support ways to fund collaborative transportation R&D (e.g. towards the PEW and Gates foundations, etc.). Already the Implementation Arrangement signed in 2013 between the EU/DG RTD and the US/DoT (mentioned earlier) go a long way along this line.

5. Related to the prior "soft" actions promotion, it is of critical importance for EU and U.S. Transportation organizations to develop new publications and advanced modes of communication (e.g. Twitter, Facebook) that highlight best practices and success stories regarding collaborative R&D between the EU and the United States. This could also start as a priority research project of the EU and / or the United States.
6. Collaborative leadership will also emanate in the U.S. through special research institutions and academic institutions. The EU must identify these leaders and outreach to them on a regular basis.

3 COOPERATION POTENTIAL WITH THE MEDITERRANEAN COOPERATION COUNTRIES

3.1 Overall outlook and background

Transport is an important sector in the Mediterranean partner countries for facilitating mobility, trade and regional integration. Today, the continued economic development of the countries in the Southern and Eastern Mediterranean relies on expanding and improving transport infrastructure both within and between the Mediterranean partner countries and also between the region and the European Union (EU).

The region's proximity to key markets, continued population growth and economic development make modern, efficient and well-planned transport infrastructure crucial for the region's future. Infrastructure and transport are key drivers for both growth and the competitiveness of the Mediterranean partner countries within the global trading system.

Efficient transport infrastructure has a major impact on social and economic development. The mobility of people acts as a catalyst for job creation in various sectors of the real economy by attracting investment to the region. At the same time, efficient and regionally coordinated transport infrastructure will increase the access of goods and people to markets, while also enhancing social cohesion. Additionally, the development of sustainable transport infrastructure contributes significantly to mitigating the effects of climate change.

Research and development activities in Mediterranean Countries are widely concentrated within public research centres and universities (more than 90% vs. 54% in European Union).

Investments in R&D are weak compared to international figures: between 0.2 to 0.7 % GDP (except for Israel: 4.4 % GDP in 2010 and Tunisia: 1% GDP) vs. close to 2% GDP in Europe.

Some countries have done an exercise in national priority setting: Jordan (Strategy plan 2006-2010), Lebanon (STIP) and Morocco (Vision 2025). Other countries have clearly expressed the need for such an exercise. Some initiatives permitted also to identify future areas of common concern between the North and South banks of the Mediterranean.

Some of the main constraints that face scientific research in Mediterranean Countries are:

- lack of a sufficient number of qualified researchers,
- lack of adequate financial support,
- failure by the decision-makers in the public and private sectors to adopt research results,
- non-raising generations in schools on the love and culture of research, school teachers and university professors are overburdened with teaching duties,
- migration of qualified researchers to communities where life and research needs,
- bureaucratic legislation related to scientific research and supplies
- lack of participation in international and regional conferences .

As regards some individual countries in the region, the following are further noted:

Egypt:
Following the formation of the new Egyptian government that followed National elections at the end of 2012, the research and innovation policies in Egypt are under revision. In the near past, Egypt has had an innovation policy implemented via measures to stimulate investment, venture capital, business incubators, industrial modernization, SME development and entrepreneurship. There is no formal coordination body. The delivery of innovation policy should be expected to be carried out via the programmes of the relevant ministries often implemented with assistance from donor organisations. An important point of reference is the *SFD* or *Social Fund for Development*, which finances business centres and incubators as well as the IMP or Industrial Modernisation Programme and GAFI - the General Authority For Investment.

Morocco:
Morocco has a clear policy for innovation drawing on the competencies of several ministries, in particular the ministry with competence for Industry and that with competence for Scientific Research and Technological Development. This policy is a result of initiatives taken by the Ministry for Industry to develop a dialogue on innovation related issues with the Ministry responsible for Higher Education and Scientific Research, as well as with the CNRST – National Council for Research in Science and Technology, OMPIC – the national intellectual property organisation and R&D Maroc - the Moroccan R&D Association. Each organisation has now incorporated innovation in its own strategy implemented via its own institutions.

Jordan:
Jordan does not as yet have a formal innovation policy. Nevertheless, there is a good understanding of the need to adopt a coherent approach to fostering innovation policy that crosses ministerial and institutional lines. The Higher Council for Science and Technology is in charge of the coordination of all science and technology related initiatives in Jordan and it plays an important role in the development of a national network of incubators.

Tunisia:
Following the jasmine Revolution 2 years ago, Tunisia kept most of the former R&D organization with a range of policies emphasising new enterprise development or new business creation. Although there is no formal mechanism for coordinating an innovation policy, the coordination of issues with an RTD emphasis is carried out via the CSRT – the Higher Council for Research and Technology - whereas coordination of industry oriented initiatives takes place via the CSCE-DPI - the Higher Council for Enterprise Creation and for the Development of Innovative Projects. At an operational level, there was direct cooperation between the major organisms of the different ministries.
Though, the current political situation seems to freeze universities involvement in international cooperation and in European partnerships.

Israel:
Transport research in Israel is advanced (perhaps the most advanced in the region) and it is conducted at several Universities and research centres. Government provides the main sources of funding for higher education and university based research. Competitive funding from the Israel Science Foundation follows a bottom up approach (there are no pre-defined themes and grants are given purely on their academic merits as judged by local and international peers). EU's Framework Programmes have become a central source of R&D funding, especially for universities. Actually, funding received by FPs is higher in comparison to funding received by the Israel Science Foundation. Israeli participation in FP7 is run by Iserd, the Israeli Directorate for the European Union Framework Programme for Research and Development. Matimop, the Israeli agency in charge of international cooperation in R&D, runs a network of 29 bilateral agreements with various countries.

The Mediterranean countries region includes a diverse number of countries from Morocco, Algeria to the west to Jordan, Egypt, Lebanon, and Israel in the East. These countries are showing a very diverge picture and have many differences in their policies and strategies in research and higher education in general, and more particularly in transportation research. Also, although research on road transport is of course the most developed modal research

field of Transport, other modes of Transport are also found with the most pronounced being Maritime Transport (ports management), and the less pronounced one rail transport as only few of the countries in the region benefit from railway transport to any substantial degree.

The research cooperation issues are mainly the result of former historical cooperation, between the countries in the region and European countries. However, recently, some European projects (incl. European thematic twiningships) and research association agreements have developed relations also with countries outside the traditional historical circles.

The points set within EUTRAIN Deliverable 2.1 and more particularly the Chapter 8.4.3.1 (Institutional cultures and governance regimes in the Mediterranean Region) stress this overall panorama.

3.2 International cooperation capability assessment

3.2.1 Types of cooperation actions

The most common forms of international cooperation actions practiced today in the region are:

a. Technical fellowship exchanges through bilateral country agreements;
b. Information exchanges through technology assistance programmes and Conferences;
c. Direct scientist to scientist one-way or two-way exchanges.

Perhaps the most striking finding from our bilateral and multilateral contacts within the region is that although education and research cooperation is generally put as a priority within local policies and strategies, transport research is not seen as a relevant priority for most of the considered countries.

The interest in participation in research projects open to participation from the countries in the region (such as for example the FP7 programme) is high in all countries surveyed, but almost everywhere the main problem is seeing as difficulties in obtaining timely information and efficient Networking, in order to form consortia and winning proposals.

As a result, most international research cooperation actions in the countries of the region remain "individual" and "isolated" in nature (i.e. through the capabilities and contacts of individual researchers) rather than institutionalised and widespread actions throughout the research

communities of the countries concerned. International cooperation in the field of Transport seems to be even more "isolated" and "individualised" than the rest of the research fields.

3.2.2 Assessment of the (research) operating environment

A number of issues concerning the research operating environment can be mentioned as a result – mainly – of our Mediterranean region cooperation workshop held in Athens in the summer of 2012. The following issues relate mainly to the Arab countries in the region that cover the northern part of the African continent (the following points do not apply for Israel - a note on Israel follows):

a. The model of research cooperation between the EU and its Mediterranean partners in this region needs, in order to be successful in the future, a rather strong "capacity building" element which – for the field of Transport research – would entail:
    - significant "pressure" on the existing governance regimes to accommodate transport as one of their "priority" subjects within the context of the "Societal Challenges" of H2020, which would be of interest – as far as we can see – to these countries too.
    - Actions to increase the capacity of the existing transport research stakeholders in all these countries to effectively lobby for international cooperative research work.
    - Actions to make transport administrations more aware of the need to expand their agendas from short-term problems to more strategic ones and identify transport in their international cooperation agendas especially within the Euro-Mediterranean partnership framework.
b. In the context of, or in addition to, the above activities it is natural to observe and respect the need for focusing international cooperative initiative to the actual needs and priorities of each research funding recipient country or region. In other words there is a need for establishing a "Mediterranean (transport) research agenda", as a critical instrument within the strategy to empower the various stakeholders and to initiate the convergence with the EU vision. The perception of the current EU transport research agenda, as too far away from the regional priorities and capacities, can only be changed with an incremental approach. This report satisfies this need to some extent and puts forward existing needs and priorities. This should however be seen on a more permanent basis.
c. The capacity of these countries, being in political and institutional transition periods, to consolidate their institutional structures for research procurement and funding, needs to be supported and strengthened. The EU would need to take this into account and accompany its international

cooperation actions toward this region with more institution building elements. This should be seen as a typical "transition" challenge, rather than as a permanent situation. The objective of increasing international cooperation remains, but under the current circumstances, transport research cooperation should help to build up a more solid institutional network rather than integrating Mediterranean partners within particular EU projects. Furthermore, Mediterranean countries need to develop their own institutional and governance models, but exchange and dialog on these issues could be a welcomed support during the transition process.

d. The role of technological stakeholders, and particularly of the private sector ones, is a major concern. Currently, private stakeholders are absent from transport research in most of the countries in the region. These would be critical for achieving the research project participation criteria of the EU research programmes but also for achieving relevant practical socioeconomic impacts from transport research. This is closely related to broader EU-Mediterranean cooperation strategies addressing socio-economic and industrial issues. The involvement of private stakeholders and the consolidation of friendly cooperative frameworks could be facilitated by shaping separate favourable rules concerning such participations most notably concerning the co-financing part.
e. The countries of the region need of course to adopt their own research policies and institutional cultures, which will be adapted to the local needs and institutional transitions. This was very strongly evident in all EUTRAIN project events and is of course something expected. The EU-shaped governance regimes are well known and understood in the countries of the region but are seen as too bureaucratic and complex and also as making the research teams from these countries in a "subordinate" position to European partners in virtually all the projects.
f. The MED countries lag behind other middle income countries in terms of the available transport infrastructure, which hampers trade and economic growth in the region. Efforts should be made to fill this gap. The budget allocation for the next several decades should fund a reasonable program of catching up in this sphere. Domestic resources should be supplemented with external ones.

The innovation performance index of the main Mediterranean region countries is shown in Table 2. This index can be taken to provide an indication as to the capabilities and performance of each country in terms of research, as well as a relative performance indicator between these countries.

Table 2: Mediterranean Countries performance in the field of innovation

Country	Rank 2011 (out of 142)	Rank 2010 (out of 139)	Rank 2009 (out of 133)
Jordan	77	68	59
Lebanon	115	112	n/a
Tunisia	37	31	38
Egypt	103	83	74
Morocco	80	81	96
Algeria	132	107	114

Source: World Economic Forum (2011, 2010, 2009). The Global Competitiveness Report)

As regards Israel, the main problems identified for the other Mediterranean region countries remain, but there the research operating environment is quite different. For one thing, the funding of this country's research effort is much higher than that of the rest of the Mediterranean region countries and in terms of the % to GDP ratio, is one of the highest in the world. Also, the research conducting institutional framework is more advanced and more aligned to that of the EU and the US (more the second). As a result, there are many international cooperative projects with Israeli participation and the country seems to be far more "integrated" in the EU funded research programmes than the rest of the countries in the region.
Transport research in Israel is also quite developed and seems to enjoy a priority higher than the one we found in the other countries. There are also 2 to 3 major transport research centres that enjoy world reputation in the field.

3.2.3 Opportunities/Advantages for European researchers and obstacles

European coordinators should regard the networking with Mediterranean countries as the most important advantage of getting access to qualified Mediterranean cooperation countries' researchers and receiving good competences.

On the other hand, there are still many challenges to overcome. E.g. the Mediterranean cooperation countries' research system and its merits are still more or less unknown amongst European researchers. It might be useful to disseminate information about the Mediterranean cooperation countries' research system especially through European NCPs. In addition, a lack of information about FP7 amongst Mediterranean cooperation countries' researchers represents a further problem. Consequently, Mediterranean cooperation countries' researchers are lacking contacts to EU research

institutions. This problem might be solved by ameliorating the networking structures and enhancing the activities of Mediterranean cooperation countries' NCPs.

Language problems with the French speaking Africans are also mentioned. Moreover, there can arise some visa problems making trips from/to Mediterranean cooperation countries/Europe difficult to conduct.

The bureaucracy represents a critical obstacle to improve cooperation with Mediterranean cooperation countries' partners. It remained unclear, however, which concrete administrative regulation was perceived as burden and why.

As far as the Mediterranean cooperation countries' researchers are concerned, countries for which highest cooperation preferences were expressed are European Mediterranean countries but also high tech countries as France, UK and Germany. Enhancing the Mediterranean cooperation countries' participation, requires more specific calls for Mediterranean countries. This means that better advising structures or counselling services should be established with all countries in the region.

The following SWOT Table summarises the above issues and provides a look at the possibilities that exist in this region.

Table 3: Indicative SWOT on EU – Med countries research cooperation

Strengths	**Weaknesses**
- -Some innovating "pockets" with a strong development (ICT, services,..) - -skilled diaspora in Europe and other countries - some success stories	- Lack of innovation culture - Lack of contacts and cooperation between public & private stakeholders - Strong/rigid political and regulatory frame - Few basic funding - Transport research : lack of industrials, Car parts manufacturers
Threats	**Opportunities**
- Under investment/funding and funds dispersion - Crisis and decrease of foreign direct investments	- Leverage effect of public orders - New innovation policies - South/south partnerships - Transport research: electrical motorization development, (eg. Israel)

3.2.4 European Community initiatives in the region

3.2.4.1 The Mediterranean Innovation and Science & Research Coordination Action (MIRA)

The Mediterranean Innovation and Research Action (MIRA) is a coordination action financed under the International Cooperation Activities of the FP7 Capacities programme.

It aims at developing a scientific and technological partnership between the EU and its Mediterranean partners, by the use of dialogue platforms, identifying topics of common scientific interest, promoting the creation of an observatory of scientific cooperation across the shores of the Mediterranean, and promoting the development of the Euro-Mediterranean Innovation Space and other join initiatives with a research component, such as the Horizon 2020 Programme of de-pollution of the Mediterranean.

MIRA's activities include holding workshops on FP7 opportunities and creating capacities via training activities led by experts.

3.2.4.2 EUMEDRegNet

This is the '*Regional Programme to support the development of the Information Society in the Mediterranean Region*' (EUMEDRegNet). It aims to support and further improve cooperation between Europe and its Mediterranean neighbours on Information Society issues.

The programme builds on the achievements of the two on-going regional projects in the field, EUMEDCONNECT and NATP, and aims to ensure long-term sustainability of the research e-networking infrastructure between the shores of the Mediterranean, in order to maximise synergies between research and education projects.

The EU is providing €3.79 million (2011-2013) to the EUMEDRegNet a funding level that is considered as too low by some of the stakeholders involved.

3.2.4.3 EUMEDCONNECT

EUMEDCONNECT is an electronic network connecting scientists across the shores of the Mediterranean, with their European counterparts. It has enabled the creation of considerable networking in certain fields (not transport among them) allowing e.g. Moroccan nuclear scientists to collaborate with their

European colleagues on particle acceleration, or Tunisian hospitals to treat epilepsy patients with the online help of doctors from France.

3.2.4.4 EMUNI

The Euro-Mediterranean University (EMUNI University) based in Slovenia is one of the six priority areas of the Union for the Mediterranean, established as international network of Universities (179 members from 38 countries). The mission of the University includes approving the quality of higher education through the implementation of postgraduate study and research programmes with a special focus on cultural diversity.

3.2.5 Overall capability assessment

In assessing the "capability" for international cooperation of the Mediterranean region countries we put below, the standardized EUTRAIN "Transport Research International Cooperation Capability Assessment" Table for the region and for Israel separately, based on the basic statements and realizations mentioned above and in more detail in the Mediterranean countries workshop conclusions included in EUTRAIN Deliverable 2.1.

The "capability" is expressed in terms of the following 5 criteria or attributes:

1. Existence in the country of well qualified, internationally competitive, human capital i.e. research teams to work on cooperative research projects in the field of transport.
2. Availability of appropriate research infrastructures ("hard" and "soft").
3. Existence of appropriate institutional environment, policies and / or governmental support for international cooperation.
4. Existence of "champions" (i.e. individuals or research teams or Organisations who could take the lead in forming proposals and carrying out the work in international cooperative research projects).
5. Existence of appropriate funding and/or funding mechanisms for international cooperation.

Table 4: ***Rating of the international transport research cooperation "capability" of the Mediterranean cooperation region***

Modes / Criteria	*Criterion 1 (Human capital)*	*Criterion 2 (Research Infrastructures)*	*Criterion 3 (institutional environment)*	*Criterion 4 ("Champions")*	*Criterion 5 (Funding)*	*Overall region wide**
Road	6	4	4	7	4	**5**
Rail	3	3	4	5	3	**3.3**

Air	5	3	4	5	3	**4**
Maritime	6	3	4	6	4	**4.7**
Overall (all modes)	5	3	4	6	3.5	**4.2**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 5: ***Rating of the international transport research cooperation "capability" of Israel***

Modes / Criteria	***Criterion 1 (Human capital)***	***Criterion 2 (Research Infrastructures)***	***Criterion 3 (institutional environment)***	***Criterion 4 ("Champions")***	***Criterion 5 (Funding)***	***Overall region wide****
Road	8	8	7	8	7	**7.6**
Rail	6	4	7	6	7	**6**
Air	7	6	7	7	7	**6.9**
Maritime	8	7	7	7	7	**7.2**
Overall (all modes)	7	6	7	7	7	**6.8**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Overall, it can therefore be said that the "potential" is low and for this reason there is a considerable improvement to be made.

3.3 Main Topics of Interest

As it was to be expected the research stakeholders that were contacted in the frame of the EUTRAIN project in the various countries in the region have expressed different views as regards transport research Topics of interest. We therefore give below the various suggestions made, in a country by country basis[18].

[18] Main source: the Athens regional EUTRAIN Workshop

The items in **bold with numbers** are the "selection – prioritisation" items derived through the methodology described in the Introduction by the EUTRAIN team. The rest of the items have been mentioned in the various project meetings and workshops for the respective country region:

TUNISIA:

1. **Road Safety**
2. **Transport infrastructure construction (mainly road, rail)**
3. **Road traffic management**

- Environment and pollution
- Energy conservation
- Multimodal transport

ISRAEL:

1. **Integration of advanced mobility services (DRT, Ride sharing, parking reservation, soft modes etc.)**
2. **Incentives as a mean for promoting sustainable mobility for people and goods**
3. **Active safety systems**
4. **Advanced data collection techniques** (Advanced methodologies and techniques for data warehouse, data analytics and decision support systems)
5. The role of social media in transportation.

ALGERIA:

1. **Transport safety (mainly road) and security**
2. **Transport management (Mobility in cities, Transport pricing, congestion, promotion of public transport, etc.)**
3. **Intelligent Transport System ITS**

- Air pollution from transport
- Legislation and regulation of transport (Dangerous goods)
- Logistics development
- Transportation planning

LEBANON:

1. **Studies and rules in respect to "constraints on disaster prone" areas** (Natural Hazards and water resources vulnerability)

- Geophysical and Geotechnical soil investigations for transport projects
- Monitoring of existing transport structures (e.g. bridges, railways, …)

EGYPT:

1. **ITS solutions applicable to developing countries**
2. **Institutional organization development**

3. **Energy efficient truck freight transport**
4. **Low cost applicable travel demand management**
5. **Rehabilitation/maintenance of non-paved rural roads with local material**

- Non traditional public transport financing mechanisms
- Pavement recycling intermediate technology
- Improved road maintenance techniques
- Barriers to PPP in the road sector.

MOROCCO:

1. **Rationalization of modalities of passage on borders**, through the simplification and the harmonization of administrative and custom procedures, the implementation of measures of relevant international agreements, the development of standards for the profession of forwarders, the introduction of the system EED, the restructuring of public companies, a more important priority in the MOS. The objective is more fluidity of the traffic, in particular the RIT traffic;
2. **Modelling for freight and passenger transport**. Setting supply and demand models for interurban networks considering the synergies between competitive modes; In this same area they would like to see the setting of a scientific and objective basis for the forecasting of passengers and freight by an adequate modelling of flows of exchanges EU-UMA, taking a count their contrasted development, with a GDP from 1 to 12 (a massive population from Maghreb living in Europe, goods consisted with majority of finished products in N-S direction and bulk products (raw materials, energetic and others) in S-N direction);
3. **Study of the road safety**.

- the homogenization of regulations of road transport and road marking between States MEDA and EU-MEDA and optimization of the use of the public transportation;
- Study on the improvement of logistics of transport to reduce costs of approach, in favour of a better competitiveness of production companies (total costs are estimated at 20 % of the GDP in Morocco , while they are from 10 to 15 % in the EU and 15 in 17 % in emerging countries);
- Study of the impacts of the opening of the sky of Maghreb to the European and Mediterranean companies;
- Study on the link of legislations and regulations in transport and optimization of the exploitation of the harbour system;
- Study on the improvement and the modernization of agreements governing road transports of people and goods, between EU and South countries, following the example of the "Open Sky" agreement ;

- Study on the increase of the efficiency of each mode of transport involved in costs and multimodal / intermodal routes ;
- Analysis of various international agreements and conventions of transport to update them and make them easier to apply.

3.4 Discussion and recommendations regarding EU and Mediterranean countries cooperation in transport research

A suggestion to improve the situation would be if, based on the experience from the European Technology Platforms (ETPs) success story, one could create similar Technology Platforms (MED-TPs) to strengthen R&D cooperation with Europe on Horizon 2020. ICT and the societal challenges where transportation research plays a key role would be the areas to start with. The collaboration between ETPs and similar structures in Mediterranean countries will help at analysing potential areas of cooperation between Europe and the Mediterranean Countries around the thematic areas of Horizon 2020 and at producing Strategic Research Agendas as tools to set up sustainable technical and scientific cooperation. It will also help identify research and innovation bottlenecks and facilitate issues such as: know-how transfer and knowledge circulation, researchers' mobility, etc.

The research stakeholders in each country (primarily: academia and research centre specialists, as well as research managers, and relevant industrial sectors) should be actively involved in forming policies and strategies for increasing the research cooperation between Mediterranean Countries and Europe. They should be called upon to address the research-innovation chain, encompassing academia as well as the private sector, and to prescribe various collaborative activities for individual researchers and developers. *These "capacity building" actions should be the first "Topics" for the cooperative research projects in the framework of the new H2020 programme.*

Also, these stakeholders, in the frame of these new "capacity building" projects, should work with the EU to develop applied research and technological capacity with a focus on the commercialization of RTD results for use by the private sector, especially SMEs. They should also be asked to consider specific recommendations as to how to improve integration of Mediterranean countries into the European Research Area.

The current FP7 frame and the future Horizon 2020 FP should give Mediterranean Countries the possibility to improve the research activities in which they have their highest quality and potential. The most immediate form of such cooperative activities should be twinning activities between the leading scientific and educational organizations in these countries with European partners leading to more integrated research collaborative actions.

A twinning and joint research plan is agreed by the twinned partners and implemented. Projects between European and Mediterranean countries should thus include as a first step a common set of activities, e.g. twinning activities between research institutions, large-scale networking & brokerage activities, exchange of researchers and young specialists, organisations of joint events such as summer school or an international conference for research the Mediterranean Countries, etc. Some specific capacity building actions such as training and coaching activities, and improving the integration of local teams into the European research networks would also enhance participation by Mediterranean countries researchers and research teams in H2020.

It is expected that the new EU Framework Programme "Horizon 2020" will provide a number of cooperation opportunities, in particular in Transportation Research for associated Mediterranean countries.

Some complementary recommendations are:

- ✓ Considering specific incentives for the research participation of the Mediterranean Countries in the new H2020 programme (mainly the co-funding requirements).
- ✓ Involving the Mediterranean countries Diaspora
- ✓ Tackling industrial issues
- ✓ Expand ST & I geographical partnership
- ✓ Participate in Regional Initiatives
- ✓ Increase Maghreb ST & I Cooperation
- ✓ Favouring researchers and student's mobility nationally and internationally
- ✓ Institutionalize the Cooperation with the EU: Creation of a structure uniquely dedicated to strengthening the Mediterranean Countries-EU partnership

4 COOPERATION POTENTIAL WITH THE EUROPEAN NEIGHBOURHOOD COOPERATION COUNTRIES

4.1 Overall outlook and background

This region contains countries like the Russian Federation and the CIS countries, Ukraine, Turkey and the other Black sea region countries. It is a huge area "neighbouring" the EU member countries and having traditional economic and social ties with them.

Russian Federation

The Russian Federation has spent 1.11% of the 2010 GDP on R&D (Eurostat, 2012). In parallel with the GDP growth of the country during the recent years, funding for R&D has also grown substantially. Research funding structures are strongly dominated by public funds. Research is mainly executed by public entities, academies, the institute sector and state owned enterprises. The Russian Academy of Sciences (RAS) is a major player and receives major grants from the state. The strength of Russian research lies traditionally in basic research, while applied research and technology development are lagging behind. Strategies for developing the science and technology sector are laid down in programme documents and implemented along these lines.

Major guidance is provided by the Strategy for the Development of Science and Innovation in the Russian Federation up to the year 2015, prepared by the Ministry of Education and Science in 2006 and the 2007 Comprehensive Programme for the Scientific-Technological Development and Technological Modernisation of the Economy of the Russian Federation up to the year 2015. A more recent document is the strategy for innovation policy Innovative Russia 2020, which was prepared by the Ministry of Economic Development and approved at the end of 2011. The main partner and the focus of Russia's S&T internationalisation policy is clearly the EU, its Member States and the Associated Countries to the FP7.

There is a Transport strategy for the Russian Federation that has been worked out by the relevant government departments with time horizon 2030. Realization of such strategy will provide satisfaction of requirements of the innovative socially focused development of the Russian economy and the

society in high-quality competitive transport services. The main expected results of the Russian 2030 Transport strategy will require rigorous transport research to be done and cooperation with the EU and other international "players" and research stakeholders is seen by the Russian side as of paramount importance.

The cargo turnover of railway and road transport in Russia for the period of 1995-2011 has grown by 1.75 and 1.5 respectively with some decrease in 2009. The cargo turnover of inland waterway transport for the same period of time has decreased by one third with an insignificant growth in 2005-2007. The spread in cargo turnover between inland waterway and road transport has increased from 65 billion t-km in 1995 to 168 billion t-km in 2011. The fraction of inland waterway transport in the total cargo turnover in 2011 has amounted to 3% versus 4.3% in 2002.

In the **social** front, results of the Transport strategy realization are expected to be:

- availability and quality of transport services for all social groups according to the social standards guaranteeing traffic ability over the whole territory of the country;
- increase of social mobility till 15,6 thousand km per man year, being 2,6 times higher than 2007;
- guarantee of permanent year-round connection of all rural-type settlement having perspectives of development on roads with hard deposition with highways network of public service;
- reduction of population share not provided with access to transport services of common facilities to 2 % by 2030 year (by 2010 to 10 %);
- price affordability assurance of transport services for all social groups, due to effective flexible state tariff policy;
- decrease of accident rates, risks and safety threats of all transport means. Reduction in fatal accidents on a yearly basis by 63%;
- reduction of harmful effects of transport on the environment. The volume of transport induced CO2 emissions is expected to be reduced by 22 % for road and 51 % for rail transport.

In the general **economy** the results are expected to:

- fall in level of transportation costs of production, in 2030, by 30 %;
- increase of service speed of sales promotion (merchandising) by automobile transport in the inter-regional and international traffic up to 1100 km / day, and by rail (container transportation) - up to 800 - 1700 km / day;

- rising of delivery performance of goods transport to allow to reduce warehouses stocks for guaranteed goods production up to 3 - 6 days;
- export increase of transport services by 2030 up to 5,7 times. Transit transportations through the territory of Russia to increase from 28 million tons to 85 million tons;
- assurance of planned rate of increase of Gross Domestic Product by means of the freight transport service for organizations and population in full volume of necessary high-quality transport services;
- assurance of intensive development stimulation of related industry sectors in national economy in accordance to coordination with strategies and programs of development of related sectors - suppliers of resources for development and transport functioning.

Other transport results of the Transport strategy realization are expected to be:

- significant (by 2 - 4 times) increase of transport systems productivity. The time share of movement of goods by the way will increase up to 16 - 20 hours per day (automobile transport in international and intercity traffic);
- increase of yield on capital investments of transport and increase of profitability;
- reduction by 30 % of power consumption level of transport;
- creation of the public and federal-aid highways basic network, connecting all administrative centres of Russian Federation subjects on hard-surface road network, transformation of road network structure from radial into the network;
- assurance of trucking facilities passage with the load per axle of 11,5 tons on the federal-aid highways which are a part of the international transport corridors on all their extent;
- assurance increase of national carriers competitiveness. Share of Russian transport operators of the international automobile transportation of goods is increased from 41 % in 2007 to 50 % in 2030, and under the Russian flag with 6 to 16 %. Share of vessels under the Russian flag in the total deadweight of the sea transport fleet controlled by Russia, will be increased from 36,4 % in 2010 up to 40 in 2030;
- implementation of goods transport innovative technologies according with world best achievements, assurance of technological interaction optimization of different types of transport and all participants of transport process. By 2030 delivery periods of freights in the multimodal (mixed) message will be reduced by 25 % on to comparison with 2006;
- competitive environment development, state-private partnership, purposeful formation of conditions for investment will provide the intensive growth of investment appeal of the branch.

The Russian Federation transport sector at the boundary of 2030 is expected to become a **core sector** of the Russian Federation economy, growing in rates and advancing the growth rates of the national economy. The sector is expected to come to competitive positions by level of specific transport expenses, safety, environmental friendliness and quality of transport services.

Ukraine

Ukraine is one of the largest neighbours of the EU, with a population of more than 46 million. In terms of research activity Ukraine was the seventh most active international partner country participating in the FP7 programme. It is an important transit country with a number of International Transport Corridors on its territory. These are Pan-European transport corridors, Rail Co-Operation Corridors (ORC) and European Transport Corridors - Caucasus - Asia (TRACECA) and Europe – Asia. So, Ukraine seems to hold a strategic position vis-à-vis the EU in facilitating its connections to the East.

The problem of interoperability of the railway sector with the rest of the EU countries, as well as the development of intelligent transport systems are among the most important issues in Ukraine and consequently it is a top priority for the research field too.

Other main policy directions and research themes related to transport investments are:

Increase in transport network capacity;

- Introduction of high speed railway passenger services, primarily day trains;
- Development of the road network, primarily in relation to express ways and relief roads;
- Development of the sea ports' and maritime transport capacities;
- Improvement and development of the public transport network;
- Creation of a network of logistic centres and dry ports;
- Improvement of the network of transport information and communication technologies;

Some of the issues related to international cooperation activities for research, are as follows:

- Difficulties in information and data sharing (language barriers, high cost of participation in international events)
- Problems with the interoperability and transferability of research results (difference in research methods, non-harmonized normative and methodological basis)
- Lack of properly funded (international) research programmes (lack of national funding to cover costs of participation)

- Conditions of disparity in human resources (shortage of research assistants due to lack of funds)

Kazakhstan

The economic and geographic features of Kazakhstan (a large area, the lack of access to the sea, the uneven distribution of population centres and natural resources) make the economy of this country one of the world's most "cargo intensive" one, causing a high reliance on the transport system. Being at the crossroads of Europe and Asia, Kazakhstan has significant transit potential, because other Asian states have no alternative land transport links with Russia and Europe. The relatively flat landscape and the presence of natural stone material allow unrestricted development of rail and road transport.

Within the near future the Kazakhstan government expects to be integrated in the world transport system "according to international standards". This will be necessary due to their interest in transhipment. There is a *national transport strategy* that involves all types of transport. Trade between Asia and Europe will require an upgrade of the existing transport including modernization of transport technologies.
The current *National Transport Strategy* of the Republic of Kazakhstan, covered the period 2006 until 2015, providing $ 26 billion investment in transport infrastructure. The purpose of the Transport Strategy is the progressive development of the transport and communications complex in accordance with the economic strategy of the country.

As a result of the Transport Strategy the transport system will be brought on a higher level and the transport network will be optimized. Financing of the infrastructure on the principle of full cost recovery will allow resources for its further sustainable development and the maintenance at a high technical level.

The Kazakhstani transport sector is keen to be organically integrated in the global transport system of Europe and thus the country is very much looking towards the EU for research cooperation and guidance towards this end. Transport infrastructure will thus have to meet international standards and the regulatory framework and monitoring system in the field of ecology and environmental impacts will have to be brought to international standards.

All of this will significantly increase the share of transit, which will be container shipping based. Transit is expected to provide substantial revenues to the state budget and transportation companies.

The national transport strategy covers the rail, road, city passenger, air and water transport. The strategy aims to facilitate growth of trade between East and West in convenient, reliable and affordable transit routes. It provides for the modernization of existing and new - "rectifying" routes and infrastructure facilities, with the update of all types of vehicles.

The modal share of the total land routes accounts for roads and railways about 88.4 and 14.0 thousand km respectively. The length of the waterway is 3.9 thousand km, the airways - 61 thousand km. The density of the network by 1000 square km area is of about 5.1 km of railways, 32.4 km of roads paved, 1.5 km of inland waterways.

At the present the transport sector is characterized by the poor state of fixed assets, obsolete infrastructure and technology.

The share of transport costs in the final production cost is relatively high and is up to 8% and 11% for railways and road transport respectively (compared to 4-4.5% in countries with developed market economies). As a result, the economy of Kazakhstan transport burden is two times higher than in developed countries. In terms of cargo intensity Kazakhstan's economy is about five times less efficient, because for each unit of GDP in dollar terms of not less than 9 ton-km of transport work in the EU cargo intensity - less than 1 t-km/dollar of GDP.

In the territory of Kazakhstan there are today formed, on the basis of the existing transport infrastructures planned, the following four international transport corridors:

- *Northern Corridor of the Trans-Asian Railway (TARM)*: Western Europe - China, the Korean Peninsula and Japan, through Russia and Kazakhstan.
- *Southern Corridor TARM*: South-Eastern Europe - China and South-East Asia through Turkey, Iran, Central Asia and Kazakhstan.
- *TRACECA:* Eastern Europe - Central Asia via the Black Sea, the Caucasus and the Caspian Sea.
- *North-South:* Northern Europe - Persian Gulf countries via Russia and Iran, with the participation of Kazakhstan.

Turkey

Turkey is investing considerably in both its transport and research infrastructure as part of its development plans. According to the results of R&D Activities Survey 2010 conducted by TurkStat in public sector, foundation universities and business enterprise sector and calculations based on higher education

sector registers for state universities, R&D Expenditures (GERD) in Turkey increased by 14.6% compared to the previous year and reached to 9.268 Billion TL (4,070 Billion Euro) in 2010. The share of GERD in GDP was 0.84%,

Turkey has been a full participant in the EU framework programmes since FP6, contributes to Era-Net, Era-Net+ and JPI activities and intends to invest considerably in both domestic and international research activities.

As a country that is still undergoing a period of massive development, Turkey shares many research priorities of central and eastern countries as well as those of neighbourhood policy and Mediterranean partner countries. All of these countries are crucial (Western) Europe's transport connections with the Eurasian landmass and strong and reliable transport systems and research priorities could better reflect this.

The Scientific and technological Research Council of Turkey, TÜBİTAK is responsible for promoting, developing, organizing, conducting and coordinating research and development in line with national targets and priorities. TÜBİTAK acts as an advisory agency to the Turkish Government on science and research issues, and is the secretariat of the Supreme Council for Science and Technology (SCST), the highest S&T policy making body in Turkey.

There are numerous research institutes and universities participating in transport research. Analysing the sectors financing R&D expenditure, 45.1% financed by business enterprise sector, 30.8% by government sector, 19.6% by higher education sector, 3.7% by other national sources and 0.8% by foreign funds in 2010.

4.2 International cooperation capability assessment

In assessing the "capability" for international cooperation of the above mentioned *"European Neighbourhood Cooperation"* region and countries we note that there is a lot of interest and good background of research work done in the various countries. Due to their different historical backgrounds the situation differs widely among the countries in this region and the reader is referred to the individual country reports EUTRAIN publication.

The Tables below present the standardized EUTRAIN "Transport Research International Cooperation Capability Assessment" for the Russian Federation, Ukraine, Kazakhstan and Turkey, based on the basic statements and

realizations mentioned above and discussed during the bilateral meetings and the regional workshop in Moscow and. Again the "capability" is expressed in terms of the following 5 criteria or attributes:

1. Existence in the country of well qualified, internationally competitive, human capital i.e. research teams to work on cooperative research projects in the field of transport.
2. Availability of appropriate research infrastructures ("hard" and "soft").
3. Existence of appropriate institutional environment, policies and / or governmental support for international cooperation.
4. Existence of "champions" (i.e. individuals or research teams or Organisations who could take the lead in forming proposals and carrying out the work in international cooperative research projects).
5. Existence of appropriate funding and/or funding mechanisms for international cooperation.

Table 6: ***Rating of the international transport research cooperation "capability" of the Russian Federation***

Modes / Criteria	*Criterion 1 (Human capital)*	*Criterion 2 (Research Infrastructures)*	*Criterion 3 (institutional environment)*	*Criterion 4 ("Champions")*	*Criterion 5 (Funding)*	*Overall region wide**
Road	7	6	5	7	6	**6**
Rail	9	8	8	9	8	**8**
Air	8	7	6	8	8	**7**
Maritime	7	5	4	6	4	**5**
Overall (all modes)	8	6.5	6	7.5	6.5	**6.5**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 7: ***Rating of the international transport research cooperation "capability" of Ukraine***

Modes / Criteria	*Criterion 1 (Human capital)*	*Criterion 2 (Research Infrastructures)*	*Criterion 3 (institutional environment)*	*Criterion 4 ("Champions")*	*Criterion 5 (Funding)*	*Overall region wide**
Road	5	5	4	5	4	**4.5**
Rail	6	5	4	6	4	**5**

Air	6	6	6	7	4	**6**
Maritime	7	5	5	7	4	**5.5**
Overall (all modes)	5.5	5	5	6	4	**5**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 8: ***Rating of the international transport research cooperation "capability" of Kazakhstan***

Modes / Criteria	***Criterion 1 (Human capital)***	***Criterion 2 (Research Infrastructures)***	***Criterion 3 (institutional environment)***	***Criterion 4 ("Champions")***	***Criterion 5 (Funding)***	***Overall region wide****
Road	4	4	4	5	3	**4**
Rail	4	4	4	6	4	**5**
Air	3	3	4	4	3	**5.5**
Maritime	2	2	4	3	2	**2.6**
Overall (all modes)	3.1	3.1	4	4.1	3	**3.5**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 9: ***Rating of the international transport research cooperation "capability" of Turkey***

Modes / Criteria	***Criterion 1 (Human capital)***	***Criterion 2 (Research Infrastructures)***	***Criterion 3 (institutional environment)***	***Criterion 4 ("Champions")***	***Criterion 5 (Funding)***	***Overall region wide****
Road	7	7	6	7	5	**6.2**
Rail	7	6	6	7	5	**5.5**
Air	7	5	6	6	4	**5.5**
Maritime	7	5	6	6	4	**5.5**
Overall (all modes)	7	5.5	6	6.5	4.5	**5.8**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

** Average of ratings.*

Overall, it can be said that the region has considerable "potential" and Transport seems to be one of its core interests. Particular attention should be given to the high marks for Human Capital and "champions". This means that the basic material is there and it can initiate high quality research work in cooperation with EU teams in the frame of EU funded common projects.

4.3 Main Topics of Interest

The priorities and objectives for the strategic transport plans of the countries as mentioned in section 4.1 above also give some indication as to where the interests lie for transport related research. However, in the regional workshop in Moscow the participants mentioned a number of areas and Topics of interest which are simply mentioned here without having means of checking them against formal government policies for transport research.

They represent mainly the interests of the workshop participants from the *Russian Federation* but all Moscow workshop participants agreed on their importance. So they can be considered as representing the "region".

The overall areas in which the interest of the various region representatives seemed to lie were:
Electronic services (ITS), document flow for freight transport and logistics, avoiding the bottlenecks in the transport system (congestion reduction), efficient and well-coordinated solutions in a fast - safe – and green transport system.

The topics of interest, below, in **bold with numbers** are the "selection – prioritisation" items derived through the methodology described in the Introduction by the EUTRAIN team. The rest of the items have been mentioned in the various project meetings and workshops for the respective country region.

A. Global Strategic Issues:

1. **the global aspects of climate change,**
2. **innovative smart and green transport solutions in mega cities**
3. **safe & secure transport**

4. **New financing and funding models,**
5. **Harmonization & Standardization methods.**

- zero emission energy,
- transport and ageing society,
- integrated transport systems
- education and training in transport,

B. More definitive topics

1. **Improving and harmonising the standards for construction and reconstruction of transport infrastructures** (this includes the development of the national standards and the need for new construction technologies as indicated in the Russian Transport Strategy).
2. **Setting up and running a trans-national Weather Warning Systems.** Application of non-meteorological models (geology/landslides, avalanches, flooding) to be implemented in the weather information systems. Emphasis on Rail Weather Information Systems and transferability of the information throughout the rail networks of the region. Also, resilience of transport systems (especially for the rail sector).
3. As regards the **Rail System improvement** (Rolling Stock, Infrastructure, Signalling) a number of research Topic proposals were identified, and aimed primarily at producing novel engineering and design documentation for:
    - Technological process on incoming control of units and junctions
    - Technological process on capital repairs and roundhouse servicing of rolling stock
    - Design documentation on updating of freight and passenger cars
    - Design documentation on new freight cars
    - Design documentation on capital construction projects and reconstruction
    - Examination of normative – technical documentation
    - Acceptance and certification tests
    - Preparation of complete document package for starting of operation
    - Scientific support for implementation of new designs and technical processes in manufacture.
4. **Water Transport** i.e. inland waterways and Maritime: a lot of interested was expressed for increasing the use of inland waterways (IWW) in Russia especially in view of the limited capacity of highways, motor

roads and railway roads. This is an issue for many central EU member states too. Issues suggested:

- Avoiding bottlenecks at rivers 4m depth
- Enhancement of level of safety of navigable hydraulic engineering facilities (NHEF)
- Cargo fleet update, average 33 years, improve cargo fleet
- Topics at university: water survey, hydrological regime of rivers, reconstruction of hydraulic conditions,
- Test centre for hydro-facilities, 120m long test basin
- Define tools and mechanism to break through, collaboration with Finland, proving conditions.

5. **Intelligent Transport Systems (ITS)** especially for road and railways are of particular interest to the Russian side. Ideas for research for implementation of ITS in a system that integrates the whole technological process for freight and passenger rail transport, could provide innovation along the following lines:
   - Multipurpose application
   - Satisfy industries and maintaining tracks
   - New train control system: without eurobalises, replaced by virtual balises
   - Possible areas of mutual interest and further cooperation
   - Focus on GNSS application to Railway, new advanced ATP/ ATC systems as a light version with less infrastructure cost
   - Cooperation in the field of logistics, using GNSS combined with ITS approaches
   - Resources and fuel management.
   - ➢ Compatibility – transferability of the Russian rail control and management system PTSC System with the European ETCS is another area of great interest[19].
   - ➢ Other relevant areas mentioned during the workshop in Moscow and in the bilateral meetings:

1. [19] Already the ITS Russia Organization has started cooperation with ITS Europe and other Organizations to implement an Action Plan, which contains:
   - eCall / ERA GLONASS – Creation of dedicated Working Group
   - Standardization
   - GNSS based ITS applications
   - Interoperability in terms of Road User Charging
   - Traffic and Traveller Information in the context of Transport Corridors and Large Events
   - eCall ERA GLONASS Working Group.

- *eCall/HeERO and ERA/GLONASS*: The success of the eCall/ERA GLONASS WG should be continued in alongside the HeERO and HeERO2 pilots, as there is a clear need for cooperation to ensure the harmonisation of standards and interoperability of the systems right up to the point of deployment.
- *Harmonisation of EU and Russian ITS standards*: Currently there is no formal agreement between the Russian standards body and CEN in the context of transport.
- *Traffic and traveller information*: This topic is relevant in the context of both transport corridors and cities. The Helsinki to St Petersburg transport corridor is key, especially as the European ITS Congress will be held in Helsinki in 2014, as well as and the M4 highway from Moscow to Sochi.
- *Smart insurance and telematics products*: This can be linked to eCall/ERA GLONASS as such systems would function using the same or a similar in-vehicle system. The aim would be to investigate the feasibility of developing such systems and how they could reduce the cost of vehicle ownership and improve safety and security of vehicles.
- *ITS for large events*: How to benefit from ITS solutions to address mobility and transport demand in the context of the Sochi Winter Olympic Games and the FIFA World Cup which will be hosted by Russia 2014 and 2018 respectively.

Russian Federation

For future EU Russia Cooperation the following recommendations may foster the interest, criticality and the success rate of mutually agreed projects tackling common problems, e.g. Grand Challenges. This is especially important to find practical solutions to cover areas of common concern such as: the global aspects of climate change, zero emission energy, ageing society, innovative smart and green transport solutions in mega cities and safe & secure and integrated transport. New financing models, education and training, Harmonization & Standardization methods will be also thematic priorities in a framework agenda towards future research cooperation.
Based on these holistic aspects some of these thematic and cross cutting issues for collaboration at mutual interest and at equal level playing field are identified as follows:

- Next generation Train Control System
- E call HeERO & ERA/ GLONASS and Harmonisation of ITS Standards

- EURASIAN Landbridge to optimize travel time, Speed of Container transport, capacity, efficiency and cost of infrastructure and maintenance
- Need for harmonisation of Standards & enabling e-freight/ digital freight documentation and speedy customers
- Intermodal corridors and Hub Structure, seamless and efficient services for pax and freight
- Transport and the climate change, resilience to adverse weather conditions (incl. Complex system of landscape- environment monitoring)

Ukraine

For the case of Ukraine improved road transport with durable and effective road materials & technologies, pavement engineering and intelligent traffic management strategies and meteorological monitoring/ forecast for Transport corridors are the most important topics for collaboration.

4.4 Discussion and recommendations regarding EU and European Neighbourhood countries cooperation in transport research

There is a global view shared by all transport research stakeholders in the region under discussion that international transport research collaboration is a "must". There is also widespread agreement that this collaboration should be addressing the Grand societal Challenges and providing "intelligent" solutions (i.e. based on ITS). Perhaps the two most often mentioned "key" elements for the future were:

- ITS as the key enabling technology to answer the grand challenges of the future, and
- Cost effective transport infrastructures in all modes that are weather resilient.

Concerning the future of transport research cooperation considerable areas of concern and barriers to overcome do remain. From the experience of the past these mainly concern:

- The long lasting process form proposal submission to project Kick-off;
- The necessary preparatory actions and networking necessary to define issues of mutual interest;

- Performance at equal level playing field being limited between call and proposal deliverable (consequence thematic issues early in advance);
- The limited funding of the region's participants in EU funded projects while missing the co-financing budget by the corresponding Governments.

On the recommendations side, and besides the various Themes and Topics suggested in the previous section, most research stakeholders that participated in the EUTRAIN events organised in the region, aligned behind the EUTRAIN findings and initial international cooperation framework as explained to them. They stressed the value of creating strong and efficient "networks" of cooperation in order to facilitate and enhance the cooperation in the areas of mutual interest and tackling the research challenges of H2020. Fostering this EU-region collaboration needs well-defined win-win, mutually agreed and equal level playing field, environment.

Based on the above rather holistic recommendations for research Topics of interest, some prioritization of these Themes and Topics of interest is made here. The emphasis is on cross cutting issues and on themes that can provide "equal level" playing field for collaboration. These "priority issues include:

- ✓ Urban Mobility and accessibility issues;
- ✓ International standards for operation and construction of transport infrastructures;
- ✓ ITS issues and applications to improve traffic management, operational performance and productivity as well as better interconnectivity in advanced & demanding logistic solutions and travel chains (pax and freight to make rail transport operations more reliable & punctual);
- ✓ Weather forecasting and relevant transport user information;
- ✓ Surface transport corridors between Europe – Asia ;
- ✓ Inland waterways issues (hydrological conditions of Russian rivers / new ships for inland waterways and incentives for fleet renewal / energy efficiency issues);
- ✓ Railway transport (especially resource management, GNSS applications, harmonization between ITARUS-ATC and ERTMS).
- ✓ Infrastructures for electric cars and Eco-mobility issues.

Further recommendations include:

- ➢ Need for more coordinated calls for transport research between the EU and countries of the region especially with the Russian Federation utilizing the H2020 priorities and funding possibilities;
- ➢ Create a workgroup EU - ASIA with involvement of researchers at equal level to promote research cooperative work on the Eurasian Land – bridge corridors;

- Promote Energy efficiency improvement as well as promotion of "clean" vehicles and modes (including eco driving);
- Socio- economic issues are of interest too, including strategy & economic issues (societal/ human factor as drivers for user behaviour and acceptance, new strategies/ financing methods / access charging / internationalization of the negative impact of transport e.g. through taxation and pricing to improve efficiency and quality of service);
- Define standards for seamless and efficient services for passenger and freight transport, logistics & smart terminals (border points), integrated (real time) travel and freight information and e-freight (paperless border crossing);
- On the Transport Infrastructure side, the following elements are of particular priority: safety, low maintenance costs, capacity optimization, modal information & traffic management systems, and climate resilience;

Finally, research & Innovation on freight transport and logistics services and operations based on real time data, GPS/GLONASS and Galileo & supportive sensors is recommended.

5 COOPERATION POTENTIAL WITH THE AUSTRALASIAN REGION

5.1 Overall outlook and background

China

China has excellent research facilities in all sectors of transport. There is also a large number of high quality researchers. There are many national laboratories and national research institutes. Many top universities also have excellent research facilities. International cooperation in top universities and research institutes are common and many researchers have experiences in international cooperation. Some examples of research institutes and universities that have been active in international cooperation projects are presented below.

Research Institute of Highway (RIOH), Ministry of Transport

RIOH is one of the largest research institutes founded by the Ministry of Transport. RIOH has participated in a number of FP6 and FP7 projects on road transport. RIOH has more than 1,000 employees and a number of key state laboratories, such as vehicle crash test laboratory, bridge engineering laboratory etc. It has one of the largest road transport test fields, covering 2.4 km^2. It also hosts the National Intelligent Transport System Centre (ITSC). It has been working in a number of international cooperation projects funded by FP6 and FP7 covering transport policy, ITS and standardization.

Figure 1: RIOH's Road Transport Test Field

Tongji University

Tongji University is one of leading universities in China, specialist in vehicle technologies and civil engineering. It hosts many key state laboratories and joint research centres with large companies, e.g. VW. The National Clean Vehicle research centre for development of electric vehicle technologies, funded by the Ministry of Science and Technology, has been one of the world leaders in clean vehicle technologies, particularly in power systems. In the campus there are many different types of winter tunnels for civil engineering, bridge design and vehicle design. It also hosts a 1.5 km Meglev test track.

Beijing Transportation Research Centre (BTRC)

BTRC is funded by the Beijing municipal government and provides policy support to policy makers and information to end users. It has a large floating vehicle fleet consisting with over 20,000 vehicles. The database is able to provide Traffic Performance Index (TPI) for the whole road network of Beijing. It also has historic traffic data covering all Beijing road networks for a number of years. Such data has been used to identify congestion areas, support government policy (e.g. vehicle number plate based access control) and develop transport models. It is a member of TISA (Traffic Information Service Association, a non-profit international organization based in Brussels). It has been in consortia of a number of FP6 and FP7 projects focusing on ITS, traveller information (such as Viajeo) and sustainable urban mobility (such as Viajeo PLUS). It also carried out projects funded by other international organizations such as GIZ (German International Cooperation Organization), World Bank etc.

Japan

The experts in the EUTRAIN events organised in Japan agreed that a substantial international cooperation is based on intense and trustful communication and research at an equal level playing field with mutual interest covering the societal challenges.

The major areas of mutual interest and concern identified are tackling the grand challenges where transport is affected or can considerably contribute. They also convene that the global aspects of climate change, zero emission energy, ageing society, innovative smart and green transport solutions in mega cities, safe, secure and integrated transport, new financing models and education and training will be thematic priorities in a framework agenda towards future research cooperation.

While these areas go for improvement of

- safety even at large earthquakes
- convenience to the human aspects
- resilience to adverse weather, heavy rain& snow
- cost/ benefit/ risk analysis and

- more value for the money and attractiveness for the customer by high reliability and availability of the Transport system

The overall framework is set by the value target of business & policy innovation in the public & individual transport field.

Still, based on experience in other sectors like aviation, besides high level scientific case studies on global aspects only selected but concrete topics may have a start-up chance for international collaboration following mutual interest and concern.

Some basic facts and realizations for EU/Japan collaboration are the following:

- Addressing global policy objectives (political willingness/ stability)
  - Climate change & ECO Transport
  - Demographic factor and aging population
  - Transport development in Megacities
  - Shortage of engineers & gender aspects
  - Renewable energy
- Common understanding
  Due to lack of experience only few Japanese scientists & engineers are aware how to integrate in EC projects.
  The broad scientific excellences covering all modes of the transport sector agreed that substantial international cooperation is to be built on continuous, intense and trustful communication and research at an equal level playing field with mutual interest covering societal challenges.
    - International collaboration is of vital importance, transport policy exchange and better understanding should be the academic backbone
    - Vice Versa Exchange of information on ongoing projects, the general policies, White paper activities and international strategies for ASIAN Transport

  There is a mutually agreed need for a sustainable cooperative network, common knowledge database on researchers, problems, mythologies and projects and activation of research competition to build up trustful cooperation.
- Function of organizational structure/governance, the countries scientific and research capabilities, infrastructures and investments are straight forward organized, covering wide transport research fields:
  - Research Institutes of MLIT (e.g. PWRI, NMRI, NILIM, ENRI,..)
  - Universities
  - Institutes for policy studies (ITPS,GRIPS)
  - Private sector Research (JARI,RTRI, NEXCORI, Highway TRC)

So far the institutional international research cooperation agreements mainly handle information exchange incl. workshops/seminars with little R&I Cooperation is focusing on ASIA (like Korea, China, Thailand), USA/UJNR, RUSSIA and EUROPE (like Sweden, France, Germany) and recently collaboration on High Speed Aircraft Research/Civil Hypersonics including EU funding.

Japan has excellent research facilities and the government has been investing heavily into science and research. Japan has a large number of high quality researchers and research centres. Since international cooperation is always encouraged, many of researchers from top Japanese research institutes have experiences with international cooperation. Japan is a leader in many subjects in the transport field such as high speed train/railway and ITS. For example, Japan is a pioneer in Cooperative Systems, and reached a high technical achievement.

For example, the *Public Work Research Institute (PWRI)* of Japan is a major world level research facility, It includes the:

- Tsukaba Central Research Institute covering research in construction technology, materials and resources research, geology and geotechnical engineering, water environment, hydraulic engineering, erosion and sediment control, road technology;
- Civil Engineering Research Institute for Cold Region covering research in Cold-Region Road Engineering, Cold-Region Construction Engineering, Cold-Region Construction Engineering, Cold-Region Hydraulic and Aquatic Environment and Cold-Region Hydraulic and Aquatic Environment etc.
- International Centre for Water Hazard and Risk Management (ICHARM)
- Centre for Advanced Engineering Structural Assessment and Research which carries out research in bridge and structural engineering

PWRI has been involved in a number of international cooperation research activities, including bridge asset management, safety inspection methods of exiting bridges, application of ITS to improve traffic safety in tunnels, application of risk analysis to evaluate tunnel safety, inspection and maintenance of existing road tunnels, criteria about road surface conditions and use of recycled materials for road construction and maintenance, winder road maintenance, safety under winter conditions etc.

India

India is the third largest pool of scientific & technical manpower in the world with large English speaking population. India has over 600 universities (17,600

colleges), 1,500 research institutions and 1600 PhDs annually. India has over 500,000 engineering graduates, 5 million graduates and 0.33 million professors. India increasingly focuses on talent development/improving employability.

The research governance system in India follows a top-down approach. During 2011, 1% of the country's GDP has been invested in R&D. The president of India has declared 'The Decade of Innovation' (2010-2020) and the Science Advisory Council issued a vision document to make India a global leader in science in the coming decade. There are four main actors who initiate the policy setting for R&D agenda and priorities of S&T sectors and coordinate efforts in finalising the process. These are: a) Planning Commission (through the Member, In-charge of Science and Technology); b) Office of the Principal Scientific Advisor to the Government of India and Scientific Advisory Council to the Prime Minister; c) Ministry of Science and Technology and Ministry of Human Resource and Development represented through various agencies such as the University Grants Commission and science organisations; and d) the representatives of the private business enterprises. Science policy advice to the government is channelled through the Prime Minister's office, which has constituted several bodies for advice on knowledge and higher education, science and innovation, climate change and national innovation. From the perspective of research funding, a dominant proportion of GERD, around 68%, is met by the government sources and 30% from the business enterprise sector. The most remarkable growth in R&D intensity has been from the business enterprise sector which has witnessed a substantial increase from 18% in 2003 to nearly 30% of GERD in 2010.

As an example of the transport research sector of the country we mention below the Centre for Infrastructure, Sustainable Transportation & Urban Planning (CiSTUP) of the Indian Institute of Science (IISc).

The CiSTUP was established in 2009 during the centenary celebrations of the Indian Institute of Science and has plans and a road map to be one of the finest centres of advanced research and training in the field of transportation engineering in India and abroad. The mandate and vision of CiSTUP is to produce knowledge that addresses the unique urban issues specifically on sustainable urban transportation along with other related topics of infrastructure and urban planning. Further, the centre conducts training programmes, capacity building and also develops expertise and provides complete technological and planning solutions for urban renewal and development programmes related to urban transportation and infrastructure engineering. The main areas of Specialization and Interest are Infrastructure, Sustainable URBAN Transportation and Urban Planning. Among these areas, Sustainable urban transport is the primary focus for the activities of the centre.

Australia

Overall, Australia has good research facilities and high quality researchers. Australian research institutes and researchers are keen in international cooperation, with both developed countries (e.g. Europe, Japan, U.S.A), emerging market (e.g. China, Brazil, India), and developing countries (e.g. Bangladesh). International cooperation activities range from exchange of researchers/students, joint research, sharing research facilities (e.g. Accelerated Pavement Testing)

Figure 2: Australia Accelerated Loading Facilities: Collaboration with China and USA

The collaboration in Accelerated Loading Facilities (ALF) is carried out by Australia Road Research Board (ARRB), which is very active in international cooperation in many subjects.

Perhaps the most well-known transport research centre in Australia is the *Australia Road Research Board (ARRB)*. Over the past 50 years of its life, ARRB

has provided advice, technical expertise and solutions to transport and road authorities across the world. ARRB's member agencies include federal, state and local government bodies. ARRB is a not-for-profit entity. ARRB and its members recognize the critical role they play in supporting one another to improve productivity, safety, sustainability and amenity outcomes for the public. Key strategies include:

- conducting multi-disciplinary programs of research on national priorities for Austroads
- consulting services for members and the industry
- creating a hub for road industry knowledge and experience which provides certainty and reliability in information
- expanding knowledge sharing and transfer activities to meet industry needs
- developing and commercializing innovative technology and systems.

Over many decades, the ARRB has maintained strong international research collaboration links and has joint research with RIOH (China), PWRI (Japan), FHWA (U.S.A.), TRL (UK) etc.

5.2 International cooperation capability assessment

The "capability" for international transport research cooperation of this region is assessed in terms of the criteria used, i.e.:

1. Existence in the country of well qualified, internationally competitive, human capital i.e. research teams to work on cooperative research projects in the field of transport.
2. Availability of appropriate research infrastructures ("hard" and "soft").
3. Existence of appropriate institutional environment, policies and / or governmental support for international cooperation.
4. Existence of "champions" (i.e. individuals or research teams or Organisations who could take the lead in forming proposals and carrying out the work in international cooperative research projects).
5. Existence of appropriate funding and/or funding mechanisms for international cooperation.

In terms of the above mentioned criteria, the transport research cooperation "capability" of the region is high and almost at the same level as that of the US.

Due to their highly differentiated historical development and backgrounds the countries of this region will require separate policies and approaches in establishing this cooperation so again the assignment of average figures in

Table 5.1 below may not express correctly the situation in individual countries. For these situations the reader is referred to the individual country reports of the relevant EUTRAIN publication.

The tables below show the standardized EUTRAIN "*Transport Research International Cooperation Capability Assessment*" for China, Japan, India and Australia, based on the basic statements and realizations mentioned above and discussed during the bilateral meetings and the regional workshop in Beijing.

Table 10: ***Rating of the international transport research cooperation "capability" of China***

Modes / Criteria	***Criterion 1 (Human capital)***	***Criterion 2 (Research Infrastructures)***	***Criterion 3 (institutional environment)***	***Criterion 4 ("Champions")***	***Criterion 5 (Funding)***	***Overall region wide****
Road	8	8	7	9	8	**8**
Rail	8	9	7	9	8	**8**
Air	7	7	7	7	7	**7**
Maritime	7	7	7	7	7	**7**
Overall (all modes)	7.8	8	7	8.2	7.8	**7.8**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 11: ***Rating of the international transport research cooperation "capability" of Japan***

Modes / Criteria	***Criterion 1 (Human capital)***	***Criterion 2 (Research Infrastructures)***	***Criterion 3 (institutional environment)***	***Criterion 4 ("Champions")***	***Criterion 5 (Funding)***	***Overall region wide****
Road	8	8	7	9	8	**8**
Rail	8	9	7	8	8	**8**
Air	8	8	7	8	7	**7.8**
Maritime	7	7	7	7	7	**7**
Overall (all modes)	7.8	8	7	8.2	7.8	**7.8**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 12: ***Rating of the international transport research cooperation "capability" of India***

Modes / Criteria	*Criterion 1 (Human capital)*	*Criterion 2 (Research Infrastructures)*	*Criterion 3 (institutional environment)*	*Criterion 4 ("Champions")*	*Criterion 5 (Funding)*	*Overall region wide**
Road	7	7	6	8	6	**7**
Rail	7	7	6	8	6	**7**
Air	7	7	6	7	6	**6.5**
Maritime	7	7	6	7	6	**6.5**
Overall (all modes)	7	7	6	7.5	6	**6.8**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 13: ***Rating of the international transport research cooperation "capability" of Australia***

Modes / Criteria	*Criterion 1 (Human capital)*	*Criterion 2 (Research Infrastructures)*	*Criterion 3 (institutional environment)*	*Criterion 4 ("Champions")*	*Criterion 5 (Funding)*	*Overall region wide**
Road	8	8	8	9	8	**8**
Rail	8	9	8	8	8	**8**
Air	8	8	8	8	7	**8**
Maritime	7	7	8	7	7	**7**
Overall (all modes)	7.8	8	8	8	7.5	**7.8**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Overall, it can be said that the region has great "potential" for Transport research cooperation with the EU at equal par. Particular attention should be given to the high marks for Human Capital, funding, and "champions". This means that the EU funding to be provided can be directed to joint programming and "common pot" models of cooperation so as to maximise "value for money".

5.3 Main topics of interest and priorities

Due to the wide diversity of the opinions expressed, according to the particular country of origin of the stakeholders asked, the suggested topics of interest are given separately by country below.

China

The **main fields** of interest for transport research that were collected as such through the project's events and meetings, the following can be noted (not in order of priority):

- Transport emergency response and evaluation system (severe weather conditions such as heavy snow and rain, or special events such as festivals);
- Public transport data analysis system, i.e. how to process at a major interchange to deal with huge number of passengers or some special conditions;
- Congestion charging policy, particularly experiences and lessons learnt from London and Singapore;
- Sharing experiences in use of Traffic Performance Index with other countries;
- Development of common methodologies and standards to influence legislations and regulation in different countries;
- Road safety and railway safety;
- Application of electric vehicles including buses. Good practices from applications of electric buses in Shanghai may be ready to share with the world including operation, bus driver training etc.;
- Energy saving in transport;
- Use of ITS for multimodal mobility and freight transport.

Other suggested topics of a wider scope and approach were the following:

A. Joint research to review current practices, share experiences and propose strategies in response to large scale emergency which causes significant increase in traffic demand or severe disruption to transport systems; Such emergency situations may be due to severe weather or special events. Due to the large size of Chinese cities, Chinese researchers are interested in cooperation with big European cities that have comprehensive traffic management systems and advanced infrastructure. Ideally, such projects may be involved with European cities that have good reputations in provision of mobility services and have substantial experiences in dealing with emergency situations. Such projects may be involved with policy makers from government

bodies (city authorities), transport operators, and academic researchers.

B. Knowledge sharing and transferring on policy and legislations on sustainable urban mobility such as reduction of car usage and air pollution, encouraging usage of public transport, promoting sustainable transport modes such as cycling, city and road planning to facility sustainable urban mobility. Chinese researchers and government bodies (particularly city authorities) are interested in learning good practices in sustainable urban mobility in Europe, particularly with European cities that are successful in facilitating sustainable urban mobility. Since China is experiencing a fast economic growth, it may be only interested in cooperation with European cities that also enjoy economic development. Such projects may be involved with policy makers from government bodies (city authorities), transport planners, and academic researchers.
C. Technical demonstration and implementation on using ITS to facilitate long haul (cross continental) multimodal logistics. EU is one of the biggest trade partners with China. There is a huge demand in logistics between EU and China. In recently years, some goods were transported between EU and China using cross continental railway lines (this is also involved with a number of other countries such as the Russian Federation). It has been proven as a successful story. Research addressing on reducing empty loads, monitoring goods and improving overall efficiency is needed. Such projects may be involved with logistics companies, ICT providers for logistics, academic researchers and high level government bodies that deal with cross board issues.

Japan

The **main fields** of interest for research in this country were expressed as follows:

- **International comparison of integrated transport policy and global challenges, tackling common problems**
- **Transport and the climate change, resilience to adverse weather conditions**
- **Transport in aging societies, human science and societal aspects**
- **Next generation of ITS and Data & Information Management (Harmonisation of Standards, PT, HighSpeed & Road)**

While other topics of interest are:

- Reduction on noise and vibration from high speed trains when speed is above 360 km/h;
- Inspection methods to existing bridges and other transport infrastructure;

- Transport safety in extreme conditions, e.g. earthquake;
- Smart transport infrastructure maintenance (bridges/tunnels/road), especially during winter time, in order to minimize impacts on traffic;
- Use of recycled materials for roads;
- Winter road safety;
- Application of ITS to traffic safety in tunnels;
- Standardisation in ITS (e.g. cooperative system and Field of Test, i.e. FOT).

Other wider scope suggested topics for potential projects to cooperate with EU by researchers and stakeholders in Japan:

A. Joint research on application of risk analysis to evaluate tunnel safety including use ITS to improve traffic safety and management and application of risk analysis to evaluate tunnel safety. Europe has many experiences which can be shared with Japan. Such research may be knowledge sharing and transferring projects including site visits, seminars and reporting on best practices. Researchers, infrastructure, motorist clubs and other key stakeholders should be involved for such cooperation.
B. Joint research on smart transport infrastructure maintenance for bridges, tunnels and road, especially during winter time, aiming at minimising impacts on traffic and saving cost. Such projects can involve different stakeholders in road transport sector such as traffic and infrastructure operators, transport planner (modelling), road materials specialists etc. Japan is particularly interested in cooperation with Northern European countries, e.g. Scandinavian countries and countries in Alps regions, where are also severe winter conditions.

Singapore

The main fields of interest for research were expressed as being the following:

- Electric vehicle related technologies, including:
  - battery technologies
  - global environmental impacts of electric vehicles (particularly life cycle of battery)
  - engine, power systems and other vehicular technologies
  - smart grid and vehicle charging
  - Telematics systems (e.g. navigation systems) for electric vehicles
- ITS data sharing and standardisation;
- Port management;
- Logistics management (long haul logistics rather than urban logistics).

Other wider scope suggested topics include:

A. Joint research on global environmental impacts, i.e. pollutions and use of natural resources. Such research should be a global cooperation and include key regions and countries in the e-mobility sector, such as Europe, Latin America (particularly Brazil) and China. Partners should include experts from transport and environmental science.
B. Joint research on electric vehicle related technologies development. Such research may involve with key stakeholders such as leader battery manufacturers, vehicle manufacturers, service providers and researchers. Such joint research may have Intellectual Property issues which should be carefully concerned.

India

The main specific fields of interest for Indian researchers were noted to be the following:

- **Smart mobility for people (urban and interurban);**
- **Freight transport;**
- **Increasing the share of public transport in urban areas;**
- **Innovative financing in the transport sector;**
- **Reducing urban traffic congestion**.

In addition, for India, a main interest and preoccupation seems to exist for the development of a comprehensive methodology that is capable of estimating the residual life of the flexible pavement using the actual deterioration criteria obtained from field measurements and laboratory evaluation of field samples with respect to climate and loading conditions prevailed in the field. With this well-established criterion that distinguishes between the mixtures' crack propagation phenomenon, it is envisioned that the methodology would provide a suitable platform to developing a useful comprehensive fatigue evaluation criterion for the different asphalt mixtures/ flexible pavements. The procedure would act as a tool to estimate / forecast the residual life of the flexible pavement during its design period. Methodology and recommendations from the proposed international collaborative research will help the Indian Federal agencies in the various countries to implementing the test criteria in a quick and in-advance assessment of the routine pavement monitoring and maintenance; the major merit being huge cost savings due to catastrophic failure from fatigue cracking. Predicting the fatigue life or remaining life of existing roads will lead to greater opportunities to use contracts related to performance-based parameters (mechanical properties of the pavement layers). In effect, those recommendations will assist in a rational decision making for the requirement of overlay treatments and making pavement maintenance policies, both from technical and economic perspectives.

Australia

The areas suggested for co-operation in the transport sector research include:

1. **Network of operations / ITS**;
    - Probe vehicle data
    - Real-time traffic information
    - Road operation using integrated data
    - Cooperative systems
    - Asset Management;
2. **Bituminous surfacing**;
3. **Freight Transport**;
    - Transport productivity issues.

Other suggested topics for potential projects to cooperate with EU by researchers and stakeholders in Australia included joint research in technologies of road network operation and real-time traffic data collection. To be able to facilitate efficient and effective road network operation, collection of real-time traffic data and use of the collected data for road operation are essential. In Australia and Europe, much research has been carried out into real time data collection and road network. Probe vehicle data has been playing an important role in real-time traffic data collection and has been used in road network operation[20].

5.4 Discussion and recommendations regarding EU and Australasian countries cooperation in transport research

For all countries in the region the interest for international transport research cooperation is high.

From lessons learned from past cooperation, it would seem that international collaboration and funding can be initiated by EU/Country calls for projects to run in parallel to each other in a harmonized and synchronized way. Provisions have to be made for intensive consensus action on mutually agreed needs, long term preparation and stability in areas of global interest and concern such as:

- Policy, Rules & Regulations

[20] However, there are still some technical issues to be solved such as improving quality of probe vehicle data, integrate probe vehicle data from various data sources (e.g. data from vehicle navigation units and smart phones). Such research should involve with traffic operators, researchers, data/service providers and ITS associations.

- Transport Policy in energy crisis era
- International comparison study on the railway policy after privatization
- Role of culture/tradition/identity in local Transport System (end user comparison study)
- Policy on transport safety and reliability, smart maintenance
- Business and policy innovation in the public transport field
- Transport in an ageing society, human science & behaviour

- Harmonisation of Standards
  - Standardisation of statistical database between EU and Japan and common Transport Policies for international and harmonized cross border procedures
  - Harmonization of Standards in the ITS Sector on a global basis.
- High Tech Surface Transport and Intelligent Transport systems issues, such as:
  - Next Generation of ITS and Data & Information Management
  - Transport and the Climate change ,adaption & resilience to adverse weather
  - Efficient utilization techniques for disaster prevention and disaster information
  - Energy efficient rail systems and automobiles (incl. renewable energy sources, e-mobility, e-storage)
  - Development of low carbon and low environmental load construction materials & technologies through recycling
  - Maritime Transport Models to improve Routing load & stability
  - Technologies to increase Road infrastructure performance and enhance durability
  - Future Railways providing increased capacity, efficiency, quality in a co-modal environment by
    - improvement of safety and reliability
    - interconnectivity to public transport
    - maintaining and development of railway networks
    - use of high-efficiency energy
    - harmony with the environment
  - Improving Asset Management system for transport infrastructure (Inspection methods ,risk analysis, maintenance for bridges, tunnels, pavement
  - Transport Development in European & Asian Megacities and Agglomeration Areas

6 COOPERATION POTENTIAL WITH LATIN AMERICA AND SOUTH AFRICA

6.1 Overall outlook and background

Due to different development and social characteristics, different Latin American countries have different backgrounds and research capabilities as well as cooperation interests with the EU. Below we refer to the most representative countries in the Region.

Brazil

Brazil has many excellent research institutes and universities that enjoy high reputation worldwide. Due to historical reasons, Brazilian researchers have longstanding tradition in cooperating with European countries, particularly with southern European countries such as Italy, Portugal and Spain. Information on some organisations that are active in international cooperation is provided below.

Institute for Technological Research (IPT)

IPT, a public research institute linked to the São Paulo State Department of Development, has been contributing actively to the country's development for over a century. IPT is one of Brazil's largest research institutes, with state-of-the-art laboratories and a highly qualified team of researchers and technicians working basically in four major areas:

– Innovation,
– R&D,
– Technological services and metrological support, and
– Information and education in technology.

Heedful of the needs of the public and private sectors, IPT provides solutions and technological services aimed at increasing the competitiveness of companies and promoting quality of life. Its twelve technological centres act multidisciplinary in a broad range of fields, encompassing segments such as energy, transportation, oil and gas, environment, civil construction, cities, and safety.

IPT contributes to the Brazilian productive sector and public policies putting together teams which are well prepared to develop research in different technological areas, particularly in ICT, such as: NGN (IPv6, Wireless, Mobile); ITS – Intelligent Transportation Systems; Telecommunication – data and voice convergence; EMI – Electro-Magnetic Interference; DSRC – Dedicated Short

Range Communication; Corporate networks interconnection, security and management; RFID – Radio Frequency identification; Information Technology embedded applications in vehicles.

In addition to its current research, development and innovation projects, the institute is expanding its areas of action to include biotechnology, new materials and bio-energy.

University of Sao Paulo (USP)

The University of São Paulo is a public university in the Brazilian state of São Paulo. It is the largest Brazilian university and the country's most prestigious educational institution. According to reports by the Ministry of Science and Technology, more than 25% of the articles published by Brazilian researchers in high quality conferences and journals are produced at the University of São Paulo. USP is one of the largest institutions of higher education in Latin America, with approximately 90,000 enrolled students. It has eleven campuses, four of them in São Paulo. USP is involved in teaching, research and university extension in all areas of knowledge. The University has great reputation in both teaching and R&D.

Argentina

R&D intensity in Argentina reached 0.62% in 2010. The private sector financed about 25% of GERD in 2009. Although important budgetary increases were observed in the recent period, the R&D intensity is far from reaching the 1% GDP goal which was originally due to be met by 2010. The goal of increasing BERD to 50% has not been met so far. In fact, there is a declining trend in BERD/GERD dropping to slightly below 30% in recent years. The recently published National Plan of Science, Technology and Innovation 2012-2015 effectively postpones the achievement of this objective (50% of BERD) to 2015. The science and technology sector in the country experienced important changes in recent years through modifications in the regulatory system and in the institutional set up. These shifts started in 1996, with the creation of the National Agency of Promotion of Science and Technology (ANPCYT). This new decentralised institution was conceived to separate the promotion of science and technology by introducing competitive funding from the execution of research as such, traditionally concentrated at the R&D centres of the National Council for Scientific and Technical Research (CONICET) and other thematically specialised research performers. In 2007 the upgrading of the Secretary of Science and Technology into the current Ministry of Science, Technology, and Productive Innovation (MINCYT) represented a major institutional evolution. The federal organisation of Argentina imposes challenges in policy coordination since the powers of the state in science and technology are located at federal and provincial levels.

In practice, the main responsibility in terms of R&D policy definitions lies with MINCYT. Similarly, the federal government is the main promoter of R&D. As a whole, R&D expenditures are dominated by public funding (75% of total GERD) taking place mostly at CONICET centres, thematically specialised research organisations and public universities. In line with the goal of R&D expenditure reaching 1% of the country's GDP, there have been important increases in budget allocation and a continuous rise in research personnel in the recent period.

Chile

The Government of Chile, and increasingly the private sector and academia, are looking into innovation as the growth engine. Between 2001 and 2009, the Government has consulted and collaborated closely with international organisations such as the Inter-American Development Bank (IADB), the World Bank and the OECD, and commissioned several studies by consultants with the purpose of identifying the weaknesses and opportunities of the National Innovation System (NIS). Chile also benchmarked several 'like-minded' countries that had successfully added value to traditional natural resource industries, and were able to reach high levels of national development. Since 2005 the Chilean research policy has been one of the central focuses of the Government. The National Innovation Council for Competitiveness (CNIC) included strengthening research capabilities as one of the main pillars to improve Chilean competitiveness. The CNIC, which is an advisory body to the President, has an executive counterpart in the Ministerial Committee on Innovation.

At the implementation level, the funding mechanism is twofold: the National Commission for Scientific and Technological Research (CONICYT) finances basic research and human capital development, and the Chilean Economic Development Agency (CORFO) provides funds for applied research, technology transfer, business innovation and entrepreneurial activities. CONICYT functions under the Ministry of Education, and CORFO under the Ministry of Economy. The governance system in Chile is centralised and dominated by the Metropolitan Region of Santiago, which accounts for 40% of the population and an even greater share of all economic activities. Likewise, the R&D policies and funding agencies are concentrated in the capital. However, in response to the dominance of Santiago and the peculiarities of Chilean geography, decentralisation and regional development have been high priorities for the Government. Between 2007 and 2011, the Regional Development Agencies (ARDP) worked together with the Regional Governments (GORE) and assumed and took on the responsibility of articulating, coordinating, and also funding their own activities.

In 2011, the majority of the ARDPs were transformed into "Corporations for productive development" (CRDPs), which are private non-for-profit organisations. These new private organisations are responsible for the diffusion of development and innovation activities, and are financed in part by the regional governments (i.e. only up to 5%), but also from international cooperation agencies, or other entities. Particularly regional universities have been at the centre of channelling funds and implementing regional policies. Since 2005, the Government has been active in formulating policies and establishing a new institutional framework, including the National Innovation Council for Competitiveness, to enhance national science, technology, and innovation capabilities. In 2007 Chile produced its very first ever National Innovation Strategy (Vol. 1), with specific strategic targets for developing its human capital and science base, supporting and encouraging R&D activities in the private sector and improving institutions. The second volume of the strategy was published in 2008.

Ecuador

Ecuador has experienced a fast growth in economy in the last decades. Many infrastructure projects were carried out. Lack of skilled professionals has become an issue to the country. Moreover, sustainable development may not be as widely understood and accepted in the policy level. Training to policy makers is also foreseen as an urgent need. Ecuador is very interested in cooperation with the EU on education and training in sustainable transport such as:

- Training of academic staff to PhD level at EU universities
- Academic leadership courses
- Joint Masters in transport courses with EU universities

Continuing professional education in transport for local government officials

South Africa

Most of cooperation between EU and South Africa is carried out through the Council of Scientific and Industrial Research (CSIR). The Council of Scientific and Industrial Research (CSIR) is one of the leading scientific and technology research, development and implementation organisations in Africa. It undertakes directed and multidisciplinary research, technological innovation as well as industrial and scientific development to improve the quality of life of the country's people. It is committed to supporting innovation in South Africa to improve national competitiveness in the global economy. Science and technology services and solutions are provided in support of various stakeholders and opportunities are identified where new technologies can be further developed and exploited in the private and public sectors for commercial and social benefit.

The CSIR's core research and development base consists of key competency areas, these areas draw together research fields and scientific disciplines assembled to align with the needs of specific government departments, primary, secondary and tertiary industry sectors and society in key areas of socioeconomic impact. In an effort to contribute to placing our continent on a path of sustainable growth and development, CSIR supports and actively participates in the New Partnership for Africa's Development (NEPAD)), and supports capacity building programmes on the African continent.

Some examples of research infrastructure supporting the science, engineering and technology activities in the transport research area include:

- The CSIR Coastal and Port Hydraulics Laboratory for the physical modelling of ports and coastal structures, breakwater armouring, and moored and manoeuvring ships;
- The CSIR Heavy Vehicle Simulator for accelerated pavement testing of road and airport pavements;
- The University of Pretoria's Geotechnical Centrifuge Laboratory, a 150G-ton instrument that is used to carry out model studies of geotechnical problems;
- The CSIR Wind Tunnel, with a test and evaluation capability up to 4,5 times the speed of sound;
- The Gerotek Test Facility, an all-encompassing test facility at which vehicle design and performance can be monitored in a typical South African environment.

CSIR Hydraulics Laboratory

CSIR Heavy Vehicle Simulators

University of Pretoria's Geotechnical Centrifuge

CSIR Wind Tunnel

Figure 3: CSIR research infrastructure

6.2 International cooperation capacity assessment

Due to the wide geographic coverage of this "Region", it may not be possible to give a detailed and sound assessment on research capacity in each of the countries and regions covered. Therefore, the assessment of research capacity is done separately for some countries of Latin America and separately for South Africa.

The tables below show the standardized EUTRAIN "*Transport Research International Cooperation Capability Assessment*" for Brazil, Chile and the other countries of the region of Latin America. It is based on the basic statements and realizations mentioned during the regional workshop in Sao Paolo in March 2013.

Table 14: Rating of the international transport research cooperation "capability" of Brazil

Modes / Criteria	Criterion 1 (Human capital)	Criterion 2 (Research Infrastructures)	Criterion 3 (institutional environment)	Criterion 4 ("Champions")	Criterion 5 (Funding)	Overall region wide*
Road	7	6	7	8	8	**7**
Rail	7	6	7	8	7	**7**
Air	7	6	7	6	7	**6.5**
Maritime	7	6	7	7	5	**6**
Overall (all modes)	7	6	7	7.1	6.6	**6.8**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 15: Rating of the international transport research cooperation "capability" of Chile

Modes / Criteria	Criterion 1 (Human capital)	Criterion 2 (Research Infrastructures)	Criterion 3 (institutional environment)	Criterion 4 ("Champions")	Criterion 5 (Funding)	Overall region wide*
Road	8	8	7	8	6	**7.5**
Rail	7	6	7	8	5	**6.5**
Air	6	6	7	6	4	**6**
Maritime	6	6	7	7	5	**6**
Overall (all modes)	6	6.4	7	7	5	**6.5**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Table 16: Rating of the international transport research cooperation "capability" of other Latin America countries

Modes / Criteria	***Criterion 1 (Human capital)***	***Criterion 2 (Research Infrastructures)***	***Criterion 3 (institutional environment)***	***Criterion 4 ("Champions")***	***Criterion 5 (Funding)***	***Overall region wide****
Road	7	6	6	7	6	**7**
Rail	5	6	6	6	5	**6.8**
Air	4	5	6	6	4	**5.5**
Maritime	5	6	6	6	5	**6**
Overall (all modes)	5	5.8	6	6.2	5	**5.6**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

***** *Average of ratings.*

Overall, it can be said that the region of Latin America has very good "potential" for Transport research cooperation. From our individual discussions and country assessments we can estimate that two countries in the region (Brazil, and Chile) may be distinguished from the rest both as regards their human capital for high level research as well as their funding potential and infrastructures.

Table 17 below shows the EUTRAIN "*Transport Research International Cooperation Capability Assessment*", for South Africa. It is based on the country visit (February 2012) and the various data, statements and realizations made during the various workshops.

Table 17: Rating of the international transport research cooperation "capability" of South Africa

Modes / Criteria	*Criterion 1 (Human capital)*	*Criterion 2 (Research Infrastructures)*	*Criterion 3 (institutional environment)*	*Criterion 4 ("Champions")*	*Criterion 5 (Funding)*	*Overall region wide**
Road	9	9	7	8	7	**8**
Rail	8	8	7	7	6	**7**
Air	7	8	7	7	6	**7**
Maritime	7	7	7	7	6	**7**
Overall (all modes)	7.8	8	7	7	6.2	**7.1**

Note: Scoring is made on a scale of 1 – 10 (1: No capability at all, 10: Maximum capability)

*** Average of ratings.*

Overall, it can be said that South Africa has very high "potential" for Transport research cooperation with the EU. Particular attention should be given to the high marks for Human Capital, and research infrastructures which are on the high standard of research personnel found in South African Universities and the CSIR. This means that the EU funding to be provided can be directed to high level tams and there may be room for successful joint programming and "common pot" models of cooperation.

6.3 Main topics of interest

Brazil

Brazil is one of the most active countries in international cooperation with the EU. It also participated in a number of FP7 projects addressing a wide range of topics in transport. Topics Brazilian researchers are interested in are shown below:

1. **Clean vehicles** (fully electric vehicles, hybrid vehicles or bio-fuel powered vehicles)
2. **Information services for travellers**/users
3. **Traffic control centres and Open data sources in the transport field**
4. Standardization in transport
5. **Innovative public transport services**.
6. Reducing environmental impacts from transport sector
7. Urban logistics
8. ICT (future internet) in transport

In relation to the above suggested topics the following clarifications were noted by researchers and stakeholders in Brazil:

A. Joint research in technologies of clean vehicles and application of clean vehicles. Clean vehicle is one of the most popular research topics in Brazil. Brazil is interested in cooperation with the EU on technologies of clean vehicles including battery technologies, vehicle design, charging system design and charging point design. Brazil is also willing to work together with the EU on usage of clean vehicles, e.g. transport policy to promote fully electric buses and hybrid taxis. Brazil is also interested in bio-fuel powered vehicles. Research projects on technical development to address battery technologies and vehicle design may be involved with major car manufacturers and key technology providers. Projects on policy related to clean vehicles may be involved with major car manufacturers, policy makers, researchers as well as energy providers.
B. Curitiba is the first city in the world to implement Bus Rapid Transit (BRT) system. There are many experiences to share with rest of the world. In recent years, some European cities consider to implement BRT systems. Therefore, knowledge transferring from Brazil to Europe can be beneficial to European cities. Moreover, Brazilian BRT systems need to be updated with ITS technologies for better management and better traveller information services. Brazilian researchers are interested in applications of advanced ITS technologies for bus management and operation as well as traveller information provision.
C. Brazil has already cooperated with the EU on future internet programme. Brazilian researchers are interested in further exploring potential opportunities in using future internet in transport and mobility services. Using future internet technologies to improve efficiency of urban logistics and close boarder logistics (RFID-based seamless monitoring and management). Such research may be involved with logistics companies, service providers, ICT providers and academic researchers.

Ecuador

The areas for co-operation for transport sector research of interest to Ecuadoran research stakeholders include:

- Transport policy and climate change
- Road causality reduction
- Design of resilient transport infrastructure
- Efficient public transport
- Sustainable urban mobility for medium size cities

Argentina

The areas for co-operation for transport sector research may include:

- Freight and logistics
- Multimodality
- Integrated and intelligent networks
- Advanced Materials and Structures Engineering for Safer and Greener Means of Transport
- Promotion of common standards

Venezuela

The areas for co-operation for transport sector research may include:

- Education campaigns for drivers
- Gender issues (e.g. transportation at night for women)
- Centralized transport research system, based on local need (e.g. traffic lights at cities)
- There is a need for better coordination between all national stakeholder
- Traffic management and ITS
- Data collection
- Public transport
- Road safety and security

Chile

The areas for co-operation for transport sector research may include:

- Urban transport (Demand modelling, Public transport and BRT systems, Traffic flow theory)
- ITS
- Smart Cities
- Integrated traffic management systems in large cities, including safety and environment/climate related aspects
- New data collection methods
- Use of new data for decision making and transportation planning
- OD matrices estimation methods
- Socio Economic Evaluation (Valuing transport externalities)
- Freight transport and logistics (Intelligent transport systems, Urban Logistics)
- Air transport (Logistics, planning and management)

South Africa

The main fields of interest for research, stated during the discussions as being of interest to the South African research community, are the following (in bold the main ones):

1. **Public transport in urban areas** (mainly, provision of efficient and sustainable mass public transport services to serve the needs of the lower income urban residents);
2. **Traffic safety** (road primarily with emphasis on information – education actions especially for the "vulnerable" road users i.e. young, old, educationally underprivileged, and handicapped people).);
3. **Efficient and integrated transport infrastructure networks** (inclusive of rural areas);
4. **Interoperability and harmonisation of transport infrastructures** (also vis-à-vis neighbouring countries). Most notable note: Social aspects of transport infrastructure and service provision and most notably: social acceptability and inclusion in transport provision, labour enhanced transport infrastructure development[21], and human capital development in transport service provision;
5. **Transport modelling** (Development of network based, multi-modal public transport cost models, as well as general passenger and freight related models);
6. Port operations (improving efficiency and capacity);
7. Greening of Transport (all aspects of transport related environmental impacts);
8. Electric vehicles and less energy intensive technologies;
9. Moving freight from road to rail, and provision of competitive high-speed rail for movement of freight and passengers;
10. Asset management in the field of transport;
11. Transport economics (implementation of the user pays principle, and so on);
12. Transport and economic development;
13. Labour enhanced construction of transport infrastructure;
14. Pavement engineering, including provision of sustainable access roads in rural areas and longer-life pavements on high volume roads.

6.4 Discussion and recommendations regarding cooperation with EU in transport research

There is no doubt that all researchers believe that international cooperation has huge benefits to the science, technology, organisations and individuals.

[21] There is also a Presidential Commission on infrastructure development with a view to enhancing provision of jobs.

There are many successful experiences and practices. Many organisations and researchers are interested in cooperation with the EU countries.

It has been identified by researchers from all regions that key current problems of EC funded cooperation activities are:

- Procedures of applications, signing a contract and managing a project are too complicated. Researchers often feel that they spent more time on administration works than on scientific work itself.
- Often, an EC-funded project has a large consortium. Such a large consortium may prove inefficient and communication among the consortium members is not easy. Researchers prefer to have a small consortium with few partners who share similar interests.
- Bilateral cooperation is more welcome. Some of EC funded activities involve with a number of regions (e.g. all BRICS countries). Since different countries have different interests, such projects are not efficient and results are often rather discouraging.
- EC funded activities have much too long turnaround times. Time from proposal preparation, to evaluation and contract signature can take 2 years. It is not useful particularly for developing regions, e.g. the BRICS countries. It is often the case that when a project is funded, priorities and interests have changed significantly.

Urban mobility is one of the top priorities identified by many experts and stakeholders. There is strong need for cooperation on urban mobility between EU and Latin American countries and more specifically on raising awareness of benefits of ITS for urban mobility and urban logistics. This may be done through exchange of professionals and policy makers to gain first hand experiences. Raising awareness can also be done through small-middle sized demonstration projects to demonstrate advanced urban mobility solutions and allows cities to experience such solutions. Assessment of social benefits is essential and dissemination of the assessment results would accelerate take-up of new technologies.

Mobility plans have become mandatory in some Latin American countries for certain sized cities. Many European cities have substantial experiences in using Sustainable Urban Mobility Plan (SUMP) as a tool for integrated and participatory sustainable urban mobility strategy and policy. Exchanging of experiences and transferring of knowledge can be top priorities for cooperation between EU and Latin American countries.

The first BRT system in the world was implemented in Curitiba, Brazil, in 1970s. Since then, BRT systems were implemented in a number of cities across Latin America. It has been recognised that ITS can significantly improve service quality of BRT and passengers' experiences with BRT. While BRT operators and cities in Latin American countries are keen to show their systems, they are also

interested in potential use of ITS to improve BRT operation and passengers' comfort level.

Facilitating multimodal travel has been seen as an important measure to promote sustainable travel and reduce congestion. Enabling infrastructure, services and information services are needed in order to facilitate multimodal travel. Joint research on transport planning, guidelines on interchange designs and services required, as well information services can be beneficial to Latin American cities and their economic growth.

Due to geographic reasons, Latin America often experiences competitions between European and American standards, resulting in fragmentation of implemented interfaces and protocols. Harmonising standardisation, particularly in data management of ITS, charging points of electrical vehicle, has been seen as a strong interest to cooperate between EU and Latin America. It has been recognised that implementation of harmonised standards will promote deployment of new technologies.

7 OVERALL CONCLUSIONS AND RECOMMENDATIONS

7.1 Overview of the work and method followed

The present report aims to provide a synthesis and evaluation of current attitudes and positions for International Transport Research cooperation around a selected number of countries and regions around the world in terms of *Research Topics* of interest and *Priorities*, as well as *Capabilities* for conducting international transport research cooperation activities, with the EU.

The results and recommendations can be used for defining collaboration opportunities, the relevant topics and priorities for cooperation with the regions / countries. The regions and countries examined in this report were the following:

A. The USA
B. The Mediterranean Cooperation region with reference to the countries of (alphabetically):
   - ✓ Egypt,
   - ✓ Israel.
   - ✓ Jordan,
   - ✓ Lebanon,
   - ✓ Morocco,
   - ✓ Tunisia.
C. The "European Neighbourhood" region with reference to the countries of (alphabetically):
   - ✓ Kazakhstan,
   - ✓ Russian Federation,
   - ✓ Turkey,
   - ✓ Ukraine.
D. The Australasian region with reference to the countries of (alphabetically):
   - ✓ Australia,
   - ✓ China,
   - ✓ India,
   - ✓ Japan,
   - ✓ Singapore.
E. The Latin American region and South Africa, with reference to the countries of (alphabetically) (besides South Africa):

- ✓ Argentina,
- ✓ Brazil,
- ✓ Chile,
- ✓ Ecuador,
- ✓ Venezuela.

For each of these regions, this report contains the following items of analysis and / or information, which also indicate the method we followed in its conception and lay out of the work:

1. Presentation and analysis of facts and relevant issues that relate to Transport Policy and transport research that have been found of interest by the EUTRAIN team or stated as of importance by the experts of the region, in promoting international cooperation in the field of transport.
2. Definition / estimation of, the international cooperation "capability" of the regions as a whole and of the individual countries surveyed. This "capability" as a notion is taken to mean:
   - ✓ the ability of a country or region to offer good research teams for cooperative research projects in the field of transport (maybe distinguishing among the various Transport fields), i.e. mainly the existence of active researchers and relevant human capital in the specific area,
   - ✓ Availability of appropriate research infrastructures and other resources to support such research, e.g. hard infrastructures (e.g. simulators, or test trucks, etc), soft infrastructures (e.g. data bases, libraries, etc).
   - ✓ Existence of appropriate policies and / or governmental support for such international cooperation especially as regards funding of such cooperative research.
   - ✓ Existence of "champions" (i.e. individuals or research teams or Organisations) who could take the lead in forming proposals and eventually carrying out the work in cooperative research projects.
3. Highlighting the areas and Topics of transport research that seem to draw the interest of the research community and / or the funding Organisations in each case, or those that have a high potential for international cooperation, with the EU.
4. Finally, there are recommendations for increasing and enlarging international cooperation activities with each corresponding area which came primarily as a result of the exchanges during the many workshops, visits, and bilateral discussions that the members of the consortium had with appropriate stakeholders and researchers in all the regions surveyed.

Our summary of main findings and recommendations per region are shown below.

7.2 Rating of international transport research cooperation "capabilities" of the countries surveyed

The "capabilities" for international transport research cooperation of all countries surveyed have been assessed based on the following criteria:

1. Existence in the country of well qualified, internationally competitive, human capital i.e. research teams to work on cooperative research projects in the field of transport.
2. Availability of appropriate research infrastructures ("hard" and "soft").
3. Existence of appropriate institutional environment, policies and / or governmental support for international cooperation.
4. Existence of "champions" (i.e. individuals or research teams or Organisations who could take the lead in forming proposals and carrying out the work in international cooperative research projects).
5. Existence of appropriate funding and/or funding mechanisms for international cooperation.

The table 18, below, presents the standardized EUTRAIN "*Transport Research International Cooperation Capability Assessment*" for all countries, based on the bilateral meetings and the regional workshops that have been organized within the activities of the project.

Table 18: Summary of total Rating figures given for the "international transport research cooperation capability" assessment of the countries surveyed

Countries	Criteria					
	Human capital	***Research Infrastructures***	***Institutional environment***	***"Champions"***	***Funding***	***Overall country/ region wide***
USA	9	9	8	9	7.5	**8.5**
Mediterranean cooperation region	5	3	4	6	3.5	**4.2**
Israel	7	6	7	7	7	**6.8**
Russian Federation	8	6.5	6	7.5	6.5	**6.5**
Ukraine	5.5	5	5	6	4	**5**
Kazakhstan	3.1	3.1	4	4.1	3	**3.5**
Turkey	7	5.5	6	6.5	4.5	**5.5**
China	7.8	8	7	8.2	7.8	**7.8**
Japan	7.8	8	7	8.2	7.8	**7.8**
India	7	7	6	7.5	6	**6.8**
Australia	7.8	8	8	8	7.5	**7.8**
Brazil	7	6	7	7.1	6.6	**6.8**
Chile	6	6.4	7	7	5	**6.5**
Latin America countries	5	5.8	6	6.2	5	**5.6**
South Africa	7.8	8	7	7	6.2	**7.1**

7.3 Main findings and recommendations per region

7.3.1 Cooperation potential with the USA

The USA is a world leader in funding and performing research in general, and research in the field of Transportation in particular, and the business sector participates heavily in the conduct of such research.

International cooperation in the field of transport research as practiced to date by US Agencies takes mainly the following forms:

- Technical fellowship exchanges,
- Sharing of networking on research structures,
- Information exchanges through technology assistance programmes, scanning tours, and Conferences,

- Direct scientist-to-scientist one-way or two-way exchanges,
- Exchange of transportation statistics and data
- Use of foreign private sector funds to support or augment transportation research projects and
- Signing of Memoranda of Cooperation or implementation agreements between the U.S. DoT or its research Agencies and international partners.

Despite the fact that all US/DoT operating Administrations can undertake international transportation research collaboration actions, several restrictions, such as national security, technology transfer, intellectual property and mainly funding restrictions, do restrict international cooperation activities.

The US has a unique technical capability to promote international cooperative research work in the field of transport but still lacks the appropriate institutional, funding, and policy background that would promote the more substantive forms of such international cooperation such as "common pot" funding of international research through joint programming, or even coordinated programming and twining actions. This situation seems currently to change, and it is therefore now the opportunity of building on good examples and practices of the past (most notably in cooperating with the EU) in order to go one step further and cooperate in more forthcoming and daring ways thus forming the blueprints for the future international cooperative transport research work at a global scale.

The main research Themes that seem to be of high interest in the region for international collaborative work include:

1. *Sustainable cities* (sustainability – liveability – mobility) incorporating items such as:
   - ✓ Travel behaviour analysis;
   - ✓ Data acquisition;
   - ✓ Optimisation of traveller information.
2. *Infrastructure maintenance and testing*, incorporating items such as:
   - ✓ Non-destructive evaluation of transportation facilities;
   - ✓ Models for rolling resistance for road infrastructure asset management systems;
   - ✓ Asphalt aging and embrittlement;
   - ✓ Long-term bridge performance;
3. *Street cars* (trams) and *personal rapid transit* systems.
4. *Global freight Transport*
5. *ITS standardisation.*

A major recommendation - and a crucial step towards changing the existing situation - would be if in up-coming authorization legislation for the new USA research programmes there is a change over the past policies enabling greater funded participation in the U.S. (a similar move by the EU would be necessary too). Such a move would be a most welcome advance and a virtual breakthrough. However, it is recognised that such moves have to be planned well and be "reciprocal" so as to produce results toward the direction of "joint programming" through common funding mechanisms.
The recent (January 2013) signing of the *implementing arrangement*, between the EU/DG RTD and the US DoT/RITA, for "*Cooperative activities in the field of Research, Development, Technology and Innovation applied to all modes of transport*" that falls within the framework of the EU-US Agreement for Scientific and Technological Cooperation, signed December 5, 1997 is a positive small step towards – hopefully - this direction.

While we wait for the conditions to become ripe for the more in-depth collaborative actions of jointly funded international research work, other – less "hard" and easier to implement actions are recommended as follows:

a. Establishing an effective and multi-channel communication process as a key factor that will measurably enhance collaboration between the EU and the United States as well as internationally. Following a top-down approach one could make the framework under which the interested researchers, will explore and exploit the benefits of a more close and institutionalized international cooperation in transport research. Better communication is, for example, essential to funding research infrastructures that are shared, to understand the true technology and know-how value that can be gained through collaboration, how particular collaborations will allow the maximization of the value of particular projects, etc. It is recommended that such an effective communications process between the transport research communities could begin as a joint project between the EU and the U.S. and should include also the new more advanced modes of social communication media (e.g. Twitter, Facebook) that highlight best practices and success stories regarding collaborative R&D between the EU and the United States.
b. The US side could collaborate with corresponding EU Organisations to establish an international transport research and innovations collaboration communication frame(s) with components such as the following[22]:

[22] A suggestion along these lines, i.e. concerning the importance of information dissemination about best practices and opportunities for research, was made in the International Cooperation Strategic Session organized in the TRA 2012 Conference in Athens (April 23-26, 2012)

i. The ability to provide on-going best practices and case studies of collaborative projects that are currently in place.
ii. Upcoming research topics or RFPs (research proposals - private/public) that would not only allow but encourage collaboration.
iii. A catalogue of interested transport researchers across the EU-US that would receive timely information on collaboration opportunities.
iv. Specific collaborative research reports that can be downloaded and presented to agency and Congressional staff.
v. Opportunities for funding research work from EU, or US/ federal and state entities as well as private sector organizations.
vi. On-line newsletter published in multiple languages.
vii. Capacity for researchers to "blog" on technical and policy topics.

c. Allow for funded participation of EU and United States researchers in low – hanging technologies projects and "soft" actions of cooperation such as multi-year technical personnel exchanges, agreements to further the exchange of critical transport data, etc., that would incentivize the private sector to compensate for funding restrictions in EU and the US Federal authorization and appropriation legislation for as long as these exist. Successes in such collaboration should lead to larger projects and more extensive collaborative frameworks in the future.
d. The EU and the United States could also explore the use, in the transport research field, of existing models of international exchange between the U.S. and Europe such as Fulbright and NATO Fellowships as ways to encourage technical two-way exchanges.
e. The EU and the US/DoT could begin a more systematic collaborative effort which could include the organization of common research dissemination activities, Workshops and discussion fora, and gradually a joint outreach to significant U.S. and European foundations to support ways to fund collaborative transportation R&D (e.g. towards the PEW and Gates foundations, etc.). Already the above mentioned *Implementation Arrangement* signed in 2013 between the EU/DG RTD and the US/DoT must be seen as moving along this line.
f. Define and support "Collaborative leaders" for promoting actions and preparing the ground for international cooperative work between the EU and the US. Such "leaders" would emanate in the U.S. through special research or academic institutions and the same could be done in the EU.
g. Prepare some basic guidelines and benchmarks for international cooperative work in the field of Transport that would indicatively include:
    - ✓ Regular update of current cooperation opportunities as they relate to specific calls on both sides of the Atlantic;

- ✓ Evaluation rules and criteria for successful research proposals within the existing calls of each side;
- ✓ Benchmarks to earmark and follow progress in international cooperation activities.

7.3.2 Cooperation potential with the Mediterranean cooperation region

Research and development activities in Mediterranean Countries are widely concentrated within public research centres and universities. The The Mediterranean region Countries face several constraints in conducting scientific research, and transport research in particular. With the exception of Israel which differentiates in terms of research funding as well as organisation and the number of human resources devoted to research, the main constraints for the region seem to be:

- ✓ the lack of a sufficient number of qualified researchers,
- ✓ inadequate funding and administrative support,
- ✓ unwillingness by the decision-makers in the public and private sectors to adopt research results,
- ✓ migration of qualified researchers,
- ✓ bureaucratic legislation and administration,
- ✓ reduced participation in international and regional events such as Conferences, workshops, and projects.

There is a strong "capacity building" element that is necessary, including:

a. "pressure" on the existing governance regimes to accommodate transport as one of their "priority" subjects (especially with a view to participating in the context of the "Societal Challenges" research of H2020),
b. actions to increase the capacity of the existing transport research stakeholders to effectively lobby for international cooperative research work and be successful in research proposals,
c. Actions to make transport administrations more aware of the need to expand their agendas from short-term problems to more strategic ones and identify transport in their international cooperation agendas especially within the Euro-Mediterranean partnership framework.
d. Establish a "Mediterranean (transport) research agenda", as a critical instrument within the strategy to empower the various stakeholders focusing on and adopting to the region's actual needs.

e. Support the capacity of these countries, all being in political and institutional transition periods, to consolidate their new institutional structures for research procurement and funding,
f. Finally, actions and incentives to support and promote the involvement of the private sector would be very important and effective in promoting successful international cooperative efforts.

For Israel, although it is facing some of the problems mentioned for the other Mediterranean region countries, the levels of research funding are higher and the research conducting institutional framework seems more advanced and more aligned to that of the EU and the US frameworks. As a result, there is a much higher international cooperative work and projects with Israeli participation and the country seems to be more "integrated" in the EU funded research programmes than the rest of the countries in the region. Transport research in Israel is also more developed and seems to enjoy a priority higher than that of the other countries.

Overall, it can be said that the "potential" is low and for this reason there is a considerable improvement to be made.

Main Themes and Topics of interest in the various countries of the Mediterranean cooperation region (in alphabetic order):

ALGERIA:

1. *Transport safety (mainly road) and security*
2. *Transport management (Mobility in cities, Transport pricing, congestion, promotion of public transport, etc.)*
3. *Intelligent Transport System ITS*

   Other themes:
   - Air pollution from transport
   - Legislation and regulation of transport (Dangerous goods)
   - Logistics development
   - Transportation planning

EGYPT:

4. *ITS solutions applicable to developing countries*
5. *Institutional organization development*
6. *Energy efficient truck freight transport*
7. *Low cost applicable travel demand management*
8. *Rehabilitation/maintenance of non-paved rural roads with local material*

   Other themes:
   - Non traditional public transport financing mechanisms

- Pavement recycling intermediate technology
- Improved road maintenance techniques
- Barriers to PPP in the road sector.

ISRAEL:

1. *Integration of advanced mobility services (DRT, Ride sharing, parking reservation, soft modes etc.)*
2. *Incentives as a mean for promoting sustainable mobility for people and goods*
3. *Active safety systems*
4. *Advanced data collection techniques* (Advanced methodologies and techniques for data warehouse, data analytics and decision support systems)

   Other themes:
   - The role of social media in transportation.

LEBANON:

1. *Studies and rules in respect to "constraints on disaster prone" areas* (Natural Hazards and water resources vulnerability)

   Other themes:
   - Geophysical and Geotechnical soil investigations for transport projects
   - Monitoring of existing transport structures (e.g. bridges, railways)

MOROCCO:

1. *Rationalization of modalities of passage on borders;*
2. *Modelling for freight and passenger transport.*
3. *Study of the road safety*.

TUNISIA:

1. *Road Safety*
2. *Transport infrastructure construction (mainly road, rail)*
3. *Road traffic management*

   Other themes:
   - Environment and pollution
   - Energy conservation
   - Multimodal transport

As regards recommendations that are derived for this region the following can be noted:

A. Based on the experience from the European Technology Platforms (ETPs) success story, one could create similar Technology Platforms (MED-TPs) to strengthen R&D cooperation of the countries in the region

with the EU in the frame of Horizon 2020. ICT and the societal challenges where transportation research plays a key role would be the areas to start with.

B. The research stakeholders in each country (primarily: academia and research centre specialists, as well as research managers, and relevant industrial sectors) should be actively involved in forming policies and strategies for increasing the international research cooperation between Mediterranean Countries and Europe. They should be called in workshops and meetings to address the administration and governance changes necessary, to prescribe various collaborative activities for individual researchers and developers, and other *"capacity building" actions.* They should also be asked to consider specific recommendations as to how to improve integration of Mediterranean countries into the European Research Area.
C. The current FP7 frame and the future Horizon 2020 FP should give Mediterranean Countries the possibility to improve the research activities in which they have their highest quality and potential. The most immediate form of such cooperative activities should be twinning activities between the leading scientific and educational organizations in these countries with European partners leading to more integrated research collaborative actions.
D. Other complementary recommendations are:
    - Considering specific incentives for the research participation of the Mediterranean Countries in the new H2020 programme (mainly the co-funding requirements).
    - Involving the Mediterranean countries Diaspora
    - Tackling industrial issues
    - Expand ST & I geographical partnership
    - Participate in Regional Initiatives
    - Increase Maghreb ST & I Cooperation
    - Favouring researchers and student's mobility nationally and internationally

7.3.3 Cooperation potential with the "European neighbourhood" region

The Russian Federation is the biggest country of this region but other ones – such as Turkey and Ukraine are also "setting the pace" for the whole region.

Research is mainly executed by public entities, academies, the institute sector and state owned enterprises. Overall, it can be said that the region has considerable "potential" and Transport seems to be one of its core interests.

This means that the basic preconditions are there and it can initiate high quality research work in cooperation with EU teams in the frame of collaborative EU funded projects.
As regards themes and topics of interest:

A. Global Strategic Issues:

1. *The global aspects of climate change,*
2. *Innovative smart and green transport solutions in mega cities*
3. *Safe & secure transport*
4. *New financing and funding models,*
5. *Harmonization & Standardization methods.*
   Other themes:
   - zero emission energy,
   - transport and ageing society,
   - integrated transport systems
   - education and training in transport,

B. "Operational" topics

1. *Improving and harmonising the standards for construction and reconstruction of transport infrastructures* (this includes the development of the national standards and the need for new construction technologies as indicated in the Russian Transport Strategy).
2. *Setting up and running a trans-national Weather Warning Systems.* Application of non-meteorological models (geology/landslides, avalanches, flooding) to be implemented in the weather information systems. Emphasis on Rail Weather Information Systems and transferability of the information throughout the rail networks of the region. Also, *resilience of transport systems* (especially for the rail sector) .
3. *Rail System improvement* (Rolling Stock, Infrastructure, Signalling) a number of research Topic proposals were identified, and aimed primarily at producing novel engineering and design documentation for the railways (see also main text)
4. *Water Transport* i.e. inland waterways and Maritime: Issues suggested:
   - Avoiding bottlenecks at rivers of 4m depth
   - Enhancement of level of safety of navigable hydraulic engineering facilities (NHEF)
   - Cargo fleet update, average 33 years, improve cargo fleet
   - Topics at university: water survey, hydrological regime of rivers, reconstruction of hydraulic conditions,
   - Test centre for hydro-facilities, 120m long test basin

- Define tools and mechanism to break through, collaboration with Finland, proving conditions.

5. *Intelligent Transport Systems (ITS)* especially for road and railways.

Recommendations concerning this region include:

- Need for more coordinated calls for transport research between the EU and countries of the region especially with the Russian Federation utilizing the H2020 priorities and funding possibilities;
- Creation of a workgroup *EU - ASIA* with involvement of researchers at equal level to promote research cooperative work on the Eurasian Land – bridge corridors;
- Promote Energy efficiency improvement as well as promotion of "clean" vehicles and modes (including eco driving);
- Socio- economic issues are of interest too, including strategy & economic issues (societal/ human factor as drivers for user behavior and acceptance, new strategies/ financing methods / access charging / internationalization of the negative impact of transport e.g. through taxation and pricing to improve efficiency and quality of service);
- Define standards for seamless and efficient services for passenger and freight transport, logistics & smart terminals (border points), integrated (real time) travel and freight information and e-freight (paperless border crossing);
- On the Transport Infrastructure side, the following elements are of particular priority: safety, low maintenance costs, capacity optimization, modal information & traffic management systems, and climate resilience;
- Finally, research & Innovation on freight transport and logistics services and operations based on real time data, GPS/GLONASS and Galileo & supportive sensors is recommended.

7.3.4 Cooperation potential with the Australasian region

This region contains some major international "players" in terms of research capacities as well as transport related policies and funding. These "players" are quite different between themselves in terms of size, capabilities, and levels of development so it is necessary to refer to specific countries more than the region as a whole.

China has developed (and still is developing) excellent research facilities in the field of transport. There is a large number of high quality researchers and many national laboratories and research institutes. Many top universities also have excellent working relations with international similar institutions in the EU

and the US so International cooperation activities, in the top universities and research institutes of the country, are common and many researchers have experiences in international cooperation.

Japan also has excellent – world class transport research facilities and the government has been investing heavily into science and research in general. Japan has a large number of high quality researchers and research centres. Since international cooperation is always encouraged, many of researchers from top Japanese research institutes have experiences with international cooperation. Japan is a leader in many subjects in the transport field such as high speed train/railway and ITS.

India is the third largest pool of scientific & technical manpower in the world with large English speaking population. India has a very large number of universities, research institutions and annual PhD recipients with equally large numbers of engineering graduates, and professors. India increasingly focuses on talent development/improving employability.

Australia has world class transport research facilities and high quality researchers. Australian research institutes and researchers are keen in international cooperation, with both developed, emerging and developing countries. International cooperation activities include exchange of researchers/students, joint research and sharing of research facilities/infrastructures.

Overall, it can be said that the region has great "potential" for Transport research cooperation with the EU at equal par. Particular high marks should also be given for Human Capital, funding, and "champions". This means that the EU funding to be provided can be directed to joint programming and "common pot" models of cooperation so as to maximise "value for money".

For the individual countries in this region and their themes and topics of priority the reader is directed to see the relevant text in the chapter 5.3. Overall issues that seem to be of wider interest for the whole region are:

- Policy, Rules & Regulations, such as:
  - Transport Policy in energy crisis era
  - International comparison study on the railway policy after privatization
  - Role of culture/tradition/identity in local Transport System (end user comparison study)
  - Policy on transport safety and reliability, smart maintenance
  - Business and policy innovation in the public transport field
  - Transport in an ageing society, human science & behaviour

- Harmonisation of Standards, and more particularly:
  - Standardisation of statistical database between EU and Japan and common Transport Policies for international and harmonized cross border procedures
  - Harmonization of Standards in the ITS Sector on a global basis.
- High Tech Surface Transport and Intelligent Transport systems issues, such as:
  - Next Generation of ITS and Data & Information Management
  - Transport and the Climate change ,adaption & resilience to adverse weather
  - Efficient utilization techniques for disaster prevention and disaster information
  - Energy efficient rail systems and automobiles (incl. renewable energy sources, e-mobility, e-storage)
  - Development of low carbon and low environmental load construction materials & technologies through recycling
  - Maritime Transport Models to improve Routing load & stability
  - Technologies to increase Road infrastructure performance and enhance durability
  - Future Railways providing increased capacity, efficiency, quality in a co-modal environment by:
    - improvement of safety and reliability
    - interconnectivity to public transport
    - maintaining and development of railway networks
    - use of high-efficiency energy
    - harmony with the environment
- Improving Asset Management systems for transport infrastructure (Inspection methods ,risk analysis, maintenance for bridges, tunnels, pavement
- Transport Development in European & Asian Megacities and Agglomeration Areas

For all countries in the region the interest for international transport research cooperation is high. From lessons learned from past cooperation, it would be recommended that international collaboration and funding can be initiated by specific EU/ individual Country calls for projects to run in parallel to each other in a harmonized and synchronized way, or joint programming actions. Provisions have to be made for intensive consensus actions on mutually agreed needs, long term preparation and stability in specific areas of global interest and concern.

7.3.5 Cooperation potential with the Latin America region and South Africa

Overall, it can be said that the region of Latin America has good "potential" for Transport research cooperation. As major "frontrunners" for such cooperation should be seen the three most "active" – in terms of transport research countries: Brazil, Chile, Argentina (in order of priority).

Brazil has many excellent research institutes and universities that enjoy high reputation worldwide. Due to historical reasons, Brazilian researchers have longstanding tradition in cooperating with European countries, particularly with southern European countries such as Italy, Portugal and Spain. The country's recent high economic growth and development is also a positive factor for initiating further international transport research cooperation.

In Chile the government, and increasingly the private sector and academia, are looking into innovation as a major growth engine. During the last decade, the Government of Chile has consulted and collaborated closely with international organisations and commissioned several studies by consultants with the purpose of identifying the weaknesses and opportunities of the National Innovation System. Chile also benchmarked several 'like-minded' countries that had successfully added value to traditional natural resource industries, and were able to reach high levels of national development. Since 2005 the Chilean research policy has been one of the central focuses of the Government.

Finally, Argentina, although having increased its R&D spending budget over the last few years, still has a limited potential for research funding especially international research funding. The country has however an excellent human resource potential and a traditionally European attitude in its administration and work ethics.

South Africa is considered separately here, although not of course part of the Latin American region. The Council of Scientific and Industrial Research (CSIR) of South Africa is the leading scientific and technology research, development and implementation organisation in the country but there are a number of very high standard University research teams and researchers in the main Universities of the country in both Johannesburg / Pretoria area as well as in the Cape Town area. Multidisciplinary research, technological innovation as well as industrial and scientific development in the field of transport does take place and the cooperation potential is quite high.

Overall, it can be said that in South Africa particular attention should be given to the existence of high quality Human Capital, and research infrastructures. This means that the EU funding to be provided can be directed to high level teams and there may be room for successful joint programming and "common pot" models of cooperation.
As regards the themes of interest for international cooperation in the Latin American region, the following can be noted:

Topics for Brazil:

1. *Clean vehicles* (fully electric vehicles, hybrid vehicles or bio-fuel powered vehicles)
2. *Information services for travellers*/users
3. *Traffic control centres and Open data sources in the transport field*
4. *Standardization in transport*
5. *Innovative public transport services*.

Other topics:

- Reducing environmental impacts from transport sector
- Urban logistics
- ICT (future internet) in transport

For South Africa, the main themes of interest for international cooperative research are the following:

6. *Public transport in urban areas* (mainly, provision of efficient and sustainable mass public transport services to serve the needs of the lower income urban residents);
7. *Traffic safety* (road primarily with emphasis on information – education actions especially for the "vulnerable" road users i.e. young, old, educationally underprivileged, and handicapped people).);
8. *Efficient and integrated transport infrastructure networks* (inclusive of rural areas);
9. *Interoperability and harmonisation of transport infrastructures* (also vis-à-vis neighbouring countries). Most notable note: Social aspects of transport infrastructure and service provision and most notably: social acceptability and inclusion in transport provision, labour enhanced transport infrastructure development[23], and human capital development in transport service provision;

[23] There is also a Presidential Commission on infrastructure development with a view to enhancing provision of jobs.

10. *Transport modelling* (Development of network based, multi-modal public transport cost models, as well as general passenger and freight related models

Recommendations coming from the Latin America region include:

- Simplification of procedures for contracting and managing a research project to reduce turnaround times from proposal conception to project execution and results.
- Having smaller consortia in research projects.
- Better communication and standard channels of information concerning calls and procedures.
- Bilateral cooperation seems to be more welcome than multilateral one. This is based on the realisation that EC funded activities involve a number of countries in the region with different interests and priorities and thus such projects may not be as efficient and interesting as "bilateral" ones.
- Finally, give consideration to the interests (social, commercial, and scientific) of the cooperating countries and not of the EU only. This issue sometimes discourages top researchers from cooperating in international cooperative projects.

Finally, as regards South Africa the main recommendation seems to be the need for relaying open, timely, and reliable information concerning the various calls and opportunities for international cooperative work as well as facilitating the networking with partners and teams from EU member countries. A "special purpose tool" like an internet based platform or similar, directly aimed at international teams for their information and better inclusion into EU proclaimed calls and consequently consortia, has been suggested by several South African researchers.

The close cooperation and leading position of South Africa within the African Continent and furthermore its position in the so called BRICS should merit special attention and is of value for the EU. Cooperation between South African research Organisations and Brazilian, Indian, and Chinese similar Organisations is increasing and already some interesting success stories exist. The potential future EU – South African cooperation in transport research should build upon these success stories and proceed further in securing – through South Africa – links and connections between the EU and these other countries (i.e. African and BRICS).

7.3.6 Other, more horizontal, recommendations

In addition to the above recommendations which have been presented on a region by region basis, a small number of overall recommendations which are

"horizontal" in nature were also derived from the work in this phase of the project. These are presented in summary form here, and will be incorporated in the overall proposed "framework" for international cooperation to be submitted with the Deliverable 4.1 of the project.

These recommendations concern:

d. the need for creation of a permanent mechanism that will monitor and benchmark international transport research cooperation status and progress;
e. the creation of international transport research promotion centres devoted to supporting and promoting international cooperation activities, and
f. Establishment of ERA-NET types of activities in the international scene.

These are presented in summary form below.

7.3.6.1 Monitoring and benchmarking of activities related to international transport research cooperation

This recommendation is based on the need for the creation of monitoring and benchmarking mechanisms that will be used to further promote international cooperation in transport research. Such monitoring mechanisms should aim to assess the progress, effectiveness and impacts of international cooperation activities in transport research, by exploiting both the results of completed as well as on-going projects and also by monitoring and analysing the progress of international transport research related activities during the next years.

Furthermore, benchmarking tools and indices reflecting the progress made and the prospects in the main fronts and areas of international cooperative research actions – e.g. funding mechanisms, evaluation procedures, facilitation mechanisms, etc. - need to be created and quantified. Outputs of such monitoring mechanisms could be used as inputs to multi-annual roadmaps for transport research international cooperation, as laid down in respective EC communications.

7.3.6.2 Centres for the promotion of international cooperation in transport research

The main scope and aim of these Centres will be to undertake a number of activities particularly aimed at promoting international cooperation in specific fields and areas of transportation research (e.g. sustainable transport services and mobility, climate change, etc.). These activities will include for example

researcher training and exchanging activities, facilitating networking among research centres - in the area of interest – at global level, benchmarking activities, etc. The aim will be to develop and promote the creation of a global network of well trained and motivated "champions" of international cooperation as well as building the necessary "capabilities" in terms of the human capital involved in international cooperation activities are required.

These cooperating research centres, that will be connected in such networks will act together forming ***International Cooperation Promotion and Networking Centres (ICPNCs)*** each of which will be focussed in a particular global transportation challenge,

Both from the viewpoint of the European Commission, and also from that of related bodies in many countries across the world, such activities would be important value added activities aimed at building the necessary networks of cooperating research stakeholders at global level. Activities undertaken towards this direction could contribute to strengthening global cooperation in tackling the issues of sustainability in the field of Transport, improve capabilities for international cooperation work in countries not so much exposed to such work at the moment, and disseminate European strategies and know-how for transport sustainability.

7.3.6.3 ERANET types of activities

The idea behind this suggestion is to utilise the successful European model of the cooperation among transport research administrations for pursuing collaborative research calls and facilitating common funding in joint transport research programmes. At the international level similar structures can be developed and funded aiming at *promoting cooperation among transport research funding administrations* between several countries.

Initial ERA-Nets – which in this case would have to be named differently, e.g. IRA-NETS (for *International Research Area – Nets*) would be created and follow a model of cooperation and operation very similar to that of the European ERA-Nets. Their aims and objectives would be also similar.

8 REFERENCES

DETRA deliverable D2.3 (2012) Research Infrastructure Roadmap, FP7 project, Grant Agreement 266051

ERAWATCH: European Commission's information platform on European, national and regional research and innovation systems and policies http://erawatch.jrc.ec.europa.eu

Implementing arrangement, between the EU/DG RTD and the US DoT/RITA, for "Cooperative activities in the field of Research, Development, Technology and Innovation applied to all modes of transport" signed in 2013 in the framework of the initial Agreement for Scientific and Technological Cooperation between the European Community and the Government of the United States of America, signed December 5, 1997.