Final Report Summary - NEAR2 (Network of European - Asian Rail Research capacities)

Executive Summary:
From the antiquity until today the Trans-Eurasian land bridge networks have contributed to the exchange of goods and ideas and to the economic growth of Europe and Asia. Today, Asia is one of the world’s largest geo-economic hubs and Europe places particular emphasis on trade relationships with it. The New Silk Road, as the Eurasian land bridge is often called, provides a land-based option for moving freight between the Pacific ports of Russian Far East and China, countries of Central Asia like Kazakhstan and European industrial centres. Under certain conditions, use of rail routes may comprise a noteworthy alternative to maritime and air transport. The NEAR2 Project, funded under the 7th Framework Programme examined the current conditions in Europe – Asia railway corridors, the problems hindering their further growth, and the actions and measures to be taken to improve their performance.

One of the most important outcomes of the project was the establishment of the NEAR2 Rail Research Network. Several rail research institutions located in countries along the Europe-Asia rail corridors have joined the NEAR2 partner institutions in the formation of the NEAR2 Network. Network formalisation and membership procedures followed those adopted by EURNEX, the European Rail Research Network of Excellence. An online inventory of the capabilities and competencies of the research institutions has been created and is hosted at the NEAR2 website (http://www.near2-project.eu/en-us/near2network.aspx). The NEAR2 Network members have been invited to become EURNEX members. Thirteen of them have been accepted to associate member status and four of them have become full members.

Ten Working Groups have been formed with participation from NEAR2 partner and affiliated institutions and ten Concept Documents have been produced, one from each group. Each Concept Document examined the Europe-Asia rail corridors of interest to the NEAR2 project from a different perspective, aiming to identify problems impeding their growth, suggest potential solutions, and identify future research priorities. The Concept Documents were validated by an extended group of experts representing both the international research community and the railway industry. The methods used for the validation of the documents included completion of questionnaires (both hard copy and online), personal interviews and workshop activities. Overall, 3 workshops were organized, in Vilnius (Lithuania), Warsaw (Poland) and Shanghai (China).

The project Final Publication is an illustrated document, which includes information on the relevant policies of the EC, China, Kazakhstan, Russia, India and other major Asian countries, information on existing services on the railway corridors and commodities transported by rail. It also includes identified problems, proposed solutions and research priorities. An executive summary has been produced as well, as a short version of the illustrated Final Publication.

Project findings indicate that the Trans-Eurasian railway corridors present a viable alternative to maritime and air transport. Railways, however, need to overcome several impediments related to policy, harmonization of documents, border crossings and interoperability, to become more competitive. It is also necessary to identify the commodities for which the railways are a good transport alternative, which are the most prominent corridors, and how the railways fit within the context of an international intermodal transport system, considering the future conditions of rail, but also of the maritime and air transport
The NEAR2 rail research network institutions have complementary strengths and expertise, and capacity to prioritize and address the research issues of concern to the Europe-Asia rail transport system.

Project Context and Objectives:
Trade between the major centres of Europe and Asia has played a major role since the antiquity. Today, trade between these areas has increased substantially due to the development of Asian countries, particularly China (the so called “China effect”) on one hand, and the emergence of countries such as Russia on the other. Rapid changes in Global Value Chains and the emergence of Global Production Networks have resulted in growth of trade and interconnected economic relationships between these areas.

After the recent financial crisis, which began around 2008, things started to change. According to the World Trade Organization (WTO), the decline in world trade in 2009 reached 12%, accounting for the sharpest decline in more than 70 years. This drop mostly affected the United States of America, Japan and almost all the countries of the European Union. China and India on the other hand are experiencing a slower growth but not recession, while some low and middle-income countries such as Brazil, Korea, Mexico, Argentina, Turkey and Indonesia have experienced growth in the past and are currently facing some downward economic pressures. Asia in general outperformed the rest of the world in 2009 in terms of trade volumes, having a decrease in exports of 18%, which was the lowest decrease of any region.

Asia has become a geo-economic hub and trading with it is very important for almost all continents and countries. The European Commission places particular emphasis on trade relationships with Asia. At $863 billion at the end of 2011, trade amongst ASEM (Asia-Europe Meeting) members represented 60% of the global trade. Asia accounted for 42.5% of the total EU trade in 2011.

Maritime transport has taken over the major share of these trade volumes, resulting in maritime traffic growing at rates of over 6% per year. High demand for maritime transport and the resulting economies of scale have helped in rationalizing freight. Shifting to land routes and especially to railway routes, however, would result in important decrease in travel times. To further improve rail competitiveness, the cost of railway services should decrease. Cost reduction could be achieved through improvement of the operating conditions (longer trains, efficient use of rolling stock and personnel, better connectivity among systems, etc.), addressing various interoperability issues, providing a proper regulatory framework, and improving border-crossing operations.

The NEAR2 Project has established a European-Asian Rail Research Network, following the structure and membership procedures of the European Rail Research Network of Excellence (EURNEX). Ten thematic Working Groups have been established according to the EURNEX Poles of Excellence, which are shown in Table 1.

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<th>Pole Topic</th>
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Table 1: EURNEX Poles of Excellence
The NEAR2 Research Network exploits the complementary strengths of the collaborating institutions to build coordinated integrated research capacity to support the railway industry at a strategic, tactical and operational level. This research network may become the resource arm for the relevant industry in addressing the issues noted above. The research community may support the industry efforts in a way that goes beyond resolving practical issues, into bringing specialized knowledge, analytical and scientific background, in depth understanding of the state-of-the-art developments and the ability to support the advancement of a major sector of the broader regions’ economy. In this context, the NEAR2 Project engaged the rail research community in a cooperation aiming to identify ways to improve railway transport and make it a sustainable alternative to maritime and air transport.

In line with the above, the specific project objectives include the following:

- Identification of rail research centres along the corridors under study and engagement of these centres in a continuous cooperation forming a Trans-Eurasian rail research network. The formalities of the network structure are specified along with the membership procedures, ensuring this way the official nature of the formulated network and most importantly, its continuation beyond the project period.
- Formulation of working groups inside the network based on the EURNEX categorization in Poles or fields of expertise. The project partners and associates are classified as members of specific working groups.
- Creation of a web inventory of the research centres’ capacities and their geographical representation in a colour coded map. Besides the project’s website, the inventory is hosted in the official website of EURNEX and will be sustained beyond the timeframe of the project.
- Identification of the important technology issues that should be dealt with in order to improve efficiency of railway transport, as well as identification of the gaps in the existing knowledge and of the most important barriers to interoperability.
- Definition of future research needs and industry oriented policy recommendations based on the previously identified gaps in technology and knowledge.
- Creation of one Concept Document per Working Group (10 in total) presenting the identified technology needs, knowledge gaps and market needs and demands.
- Validation of the Concept Documents with the assistance of various target groups and with the use of multiple methods, including personal interviews, on line questionnaires, workshops and collaboration with the Advisory Board members.
- Creation of a Project Publication including a synthesis of the Concept Documents and other key project findings.
- Liaison with other research projects funded under relevant topics (e.g. SST.2012.2.4-1) and platforms.
- Undertaking of extensive networking, exploitation and dissemination actions enabling a wide adoption of the project results and wide promotion of the project outcomes.

With the NEAR2 collaborating institutions being leaders in their respective areas of railway research, the proposed Network broadens and deepens the knowledge base and enhances the researchers’ ability to bring critical interdisciplinary and multinational insight to issues related to the railway industry. Through collaboration of interdisciplinary teams from various units, the network produces more understanding of interrelationships on issues such as infrastructure and capacity availability, economics, regulations and international policies, business decisions, strategies and operations.

The Network reinforces existing collaborations and supports the development of new initiatives drawing on the broad range of existing strengths and capabilities and matching them with the industry needs and desires. The Project sets a strong foundation for a sustainable network program with the aim to achieve international recognition as the leading network in railway research.

With the support of the Advisory Board members and other industry experts who have participated in the project, relevant topics for research projects that have a good chance for successful market uptake and are of mutual interest to stimulate joint
research have been identified and have been recommended for further development. Identification and matching of potential collaborating research partners and facilities from participating institutions has been performed.

Project Results:
In this section, the most important achieved results are described, in correlation with the objectives and expected outcomes that have been mentioned in the previous section.

1. Establishment of the NEAR2 Rail Research Network
One of the main goals of the project was to identify rail research and industry experts along the Trans-Eurasian land bridge and engage them in a fruitful collaboration in order to identify the prospects of the rail corridors in the geographical area under study. The first step towards the creation of the NEAR2 Network was therefore the identification of the potential members. In this respect, all of the participating partners identified a number of institutions and/or universities which they thought that would be suitable and of added value to the Network. Once the final list of potential new members was created, each one of them was allocated to a project partner, based mainly on the country of origin of both the partner and of the potential member, who undertook the responsibility to contact them and invite them to apply for Network membership.

At the early stages of the Project it was determined that the NEAR2 Network should become part of the already existing Network of Excellence (EURNEX) forming part of the extended EURNEX network. For this reason and in order to gather all the necessary information from the potential members, a questionnaire was created, following the categorization of EURNEX in Poles. At the beginning of the questionnaire, it was explained to the interviewees that the institutions that would accept to fill it in would be considered for future candidateship to EURNEX, following of course the foreseen procedures. This questionnaire investigated the experiences and competences of the potential members in all or some of the fields of expertise represented by the Poles of excellence. The questionnaire and summary of the survey outcomes is available in D2.2 “Data Collection Report”.

Overall, 30 Institutions were contacted by the project partners, 20 of which agreed to fill in the questionnaire and became members of the NEAR2 Network. Table 2 below presents the list of the NEAR2 Network members:

All the collected information regarding the new members is available in the relevant report (D2.2 “Data Collection Report”). Part of this information is also available in the online version of the NEAR2 Network, the so called online inventory of capabilities and competencies, which is hosted in the NEAR2 Official website (http://www.near2-project.eu/en-us/near2network.aspx). Figure 1 depicts the NEAR2 Network home page:

In order to protect the information provided by the new members and in response to relevant request, the detailed member information is placed in a password protected area. The users need to sign into the NEAR2 website and once they receive the necessary credentials, they can access the password protected information.

A document was created aiming to formalize the structure of the newly created Network and the membership procedures. This Code of Honour document is fairly simple and straightforward, to facilitate adoption by institutions of varying backgrounds (in terms of research fields and countries), including both the partners of the project and the new members of the Network. For this reason, it was decided to build upon the existing structure and framework of the relevant EURNEX Rules of Procedure. The corresponding document comprises an official project deliverable entitled D2.1 “Network formalization and membership procedures”.

Once the NEAR2 Network had been fully established, the members were invited to also apply for EURNEX membership. In this process, the official EURNEX procedures were followed. As a first step, an invitation was sent to the institutions to apply for membership. Following, the EURNEX Council reviewed the applications, studied the activities of each member in correlation to the EURNEX Poles and identified the Pole to which each member could be of added value. Twenty institutions expressed interest and underwent the review process. Following the statutes of EURNEX, legal entities having their main office out of the European Union can become corresponding members. Then, if the Assembly of Members so decides, they can become full members. This process was initiated on 25th September, 2013 resulting in the acceptance of 13 candidates as corresponding members, in addition to 4 candidates accepted as EURNEX members. Table 3 and Table 4 show the members accepted as corresponding EURNEX members and the ones accepted as full EURNEX members respectively:
2. Formulation of Working Groups

All project partners were categorized in specific Working Groups (WGs), based on the categorization of EURNEX in Poles and with a goal to create the 10 Concept Documents, one for each WG. The allocation of partners to WGs was made based on their scientific background, experience and interests. The aim was to have a balanced allocation of work among them and most importantly to involve each member in WGs of their expertise. Each WG included 2-6 partners-members, one of which was the leader and the overall responsible for the formulation of the relevant Concept Document.

Table 5 presents the formulated Working Groups:

3. Identification of important technology issues, gaps in the existing knowledge and barriers to interoperability and definition of future research needs and industry oriented policy recommendations

Based on the project workprogramme, the partners had set the goal to examine the following issues:
1. Identification of Technology needs and knowledge gaps;
2. Identification of knowledge gaps regarding transport policy collaboration;
3. Systematic understanding of market needs;
4. Comprehensive study on interoperability issues along the Land bridge.

This goal was set towards the formulation of the 10 Concept Documents, assuming that each document will address all four of these issues. It was noted, however, by the Working Group members that these issues are mainly horizontal, touching upon more than one of the topics covered in the CDs and they should be treated in a separate document.

Table 6 shows how these issues relate to the Working Group topics:

Prior to commencing the activities of the Working Groups, the members of the consortium agreed that it was essential to identify and define the most prominent existing Trans-Eurasian railway corridors, on which the research would be focused. Relevant railway routes that connect Western/Central Europe to Asia and more specifically to Japan, via the sea of Japan, China and India were selected. This action allowed the:

- Identification of the relevant countries for the selected railway routes.
- Recognition of the relevant railway segments.
- Identification of existing problems that are related to the topics of interest to the WGs.

For the determination of the Eurasian railway corridors to be examined, important existing land routes have been considered, such as:
- The Trans-Siberian route that connects the Russian Pacific Ports of Vladivostok Nakhodka with Moscow;
- The TRACECA Corridor (TRAnsport Corridor Europe-Caucasus-Asia), which offers a number of itineraries along the once called “Silk Road”;
- The Trans-Asian Railway route (TAR) through Turkey and Iran;
- The railway corridors in Kazakhstan.

Based on the above, the selected NEAR2 Railway corridors are the following:

A: Connection: Western Europe – Russian Far East - Japan
A1: Via main Trans - Siberian railway network:
Poland -Belarus or Ukraine-Russia (Moscow- Novosibirsk – Irkutsk-Vladivostok or Nakhoka) – Japan (Sea of Japan)
Total length Warsaw – Vladivostok : 11,000 km

B: Connection: Western Europe – China via the Trans – Siberian route and its branches
B1: Via branch of the Trans - Siberian railway network and the Manchurian route:
Poland -Belarus or Ukraine -Russia (Moscow- Novosibirsk-Karymskaya-Zabaykalsk) -China (Harbin - Beijing via Manchuria)
Total length Warsaw – Beijing : 11,670 km
B2: Via branch of the Trans - Siberian railway network and the Trans Kazakh route:
Poland - Belarus or Ukraine - Russia (Moscow- Yekaterinburg-Kurgan) - Kazakhstan (Petrovavlosk - Astana - Dostyk) - China (Lanzhou-Zhengzhou-Beijing)
Total length Warsaw – Beijing : 11,670 km
B3: Via branch of the Trans - Siberian railway network and the Mongolian route
Poland - Belarus or Ukraine - Russia (Moscow- Novosibirsk-Ulan-Ude-Naushki) – Mongolia (Zamyn Uud) - China (Beijing)
Total length Warsaw – Beijing : 11,560 km

C: Connection: Western Europe – China via the TRACECA corridor (Silk Road)
C1: Via the TRACECA – Turkmenbashi rail route
C1.1: Western Europe - Slovakia (Bratislava) - Hungary (Budapest) - Romania (Bucharest, Constanta) or Bulgaria (Varna) - Black sea - Georgia (Poti -Gardabani) – Azerbaijan (Boyuk Kasik-Baku) – Caspian Sea - Turkmenistan (Turkmenabad) – Uzbekistan (Khodza Davlet -Keles ) – Kazakhstan (Sary Agash - Almaty - Dostyk) - China (Lanzhou-Zhengzhou-Beijing)
Total length Bratislava – Beijing : 10,090 km + (water route via Black sea =1,270 km)
C1.2: Western Europe - Slovakia (Bratislava) – Hungary (Budapest) - Romania (Bucharest) – Bulgaria – Turkey (Edirne - Istanbul – Sive - Kars) - Armenia (Akhuragan – Ayrum) or Georgia - Azerbaijan (Boyuk Kasik-Baku) – Caspian Sea - Turkmenistan (Turkmenabad) – Uzbekistan (Khodza Davlet -Keles ) – Kazakhstan (Sary Agash - Almaty - Dostyk) – China (Lanzhou-Zhengzhou-Beijing)
Total length Bratislava – Beijing: 12,170 km + (water route via Caspian Sea =270 km)

C2: Via the TRACECA – Aktau route
C2.1 (land detour of the Black Sea through Ukraine and Russia): Western Europe – Slovakia (Bratislava) – Ukraine (Chop-Fastov-Dnepropetrovsk) - Russia (Rostov -) -- Azerbaijan (Yalama - Baku) – Caspian Sea - Turkmenistan (Turkmenabad) – Uzbekistan (Khodza Davlet -Keles ) – Kazakhstan (Sary Agash - Almaty - Dostyk) - China (Lanzhou-Zhengzhou-Beijing)
Total length Bratislava – Beijing : 12,885 km
C2.2: In C1.2 the section Caspian Sea - Turkmenistan (Turkmenabad) – Uzbekistan (Khodza Davlet -Keles ) – Kazakhstan (Sary Agash - Almaty - Dostyk) is replaced by the section Caspian Sea - Kazakhstan (Aktau-Makat-Kandagash - Sary Agash - Almaty - Dostyk)
Total length Bratislava – Beijing: 12,710 km

D: Connection: Western Europe – China via the Central Corridor in Kazakhstan
Western Europe - Poland -Belarus or Ukraine - Russia (Moscow- Aksaralskaya ) - Kazakhstan (Ganushkino –Makat - -Kandagash-Almaty - Dostyk) - China (Lanzhou-Zhengzhou-Beijing)
Total length Warsaw – Beijing : 11,645 km

E: Connection: Western Europe – India via the Trans- Asian railway route
Western Europe - Slovakia (Bratislava) - Hungary - Bulgaria - Turkey –Iran- Pakistan - India (New Delhi)
Total length Bratislava – New delhi : 7,970 km

Figure 2 shows the above mentioned corridors:

In order to organize the work in the most effective way, the leaders of all WGs identified several topics of interest to each WG and distributed them to the participating partners who were asked to comment upon and identify any missing topics. Once the list of final topics of interest had been compiled, these topics were allocated to the partners of each WG based on their interests and expertise, asking them to provide short descriptions of the topic(s) both under a general perspective as well as with a focus on the Euro-Asian corridors. This process led to the identification of specific barriers and needs per WG, as well as of specific research priorities which were included in the 10 Concept Documents.

4. Formulation of the 10 Concept Documents
One of the most important results of the project was the formulation of the 10 Concept Documents, which was the outcome of the work conducted by the 10 Working Groups. The topics of the 10 CDs along with a brief description of each, are the following:

- **CD1 – Strategy and Economics**: addresses the topic of Strategy and Economics at the Trans-Eurasian land bridge development with the aim to increase trade volumes between EU and Asia as a result of decreased railway service cost, travel times and improved operating conditions.

- **CD2 – Operations and System Performance**: addresses the operations across each Eurasian corridor as a system, aiming to define key aspects critical to interoperability, be it the regulatory frameworks or the technical equipment, and proposes the rationalization of regulatory frameworks and guideline documents for the harmonization.

- **CD3 – Rolling Stock**: examines issues related to the rolling stock of the Eurasian railway links and more particularly rolling stock issues related to aspects of safety, efficiency, etc.

- **CD4 – Product Qualification Methods**: analyses the legal conditions to be fulfilled for the creation of transport corridors as well as the necessary legal, technical and tariff harmonization. Business models, the promotion of innovative solutions and the sharing of best practices are also key topics.

- **CD5 – Intelligent Mobility**: refers to new communication, navigation and surveillance technologies able to answer the needs for safe, clean and intelligent rail transport systems. CD5 covers technologies, legislation, architecture, organizational and human factors related to safety as well as mobility solutions for cargo traffic.

- **CD6: Safety and Security**: The efficiency of a Eurasian railway link, like any railway system, is ensured through the rational operation of three components: the railway infrastructure, the rolling stock and the transportation process. CD6 examines issues related to railway safety and security as well as the increased cost of system maintenance, which is emerging as another problem.

- **CD7: Environment and Energy Efficiency**: considers issues related to environment and energy efficiency on the Eurasian railway links and more particularly to issues related to, energy consumption and efficiency, electromagnetic contamination, noise and vibration, influence of weather conditions on railway operation, greenhouse gas emission, energy- and resource-conserving technologies.

- **CD8 - Infrastructure and Signalling**: examines issues related to railway infrastructure of a Eurasian railway link and more particularly issues related to railway infrastructure upon which freight trains are routed either in a mixed train operation (both freight and passengers trains) or a freight corridor (presence of freight trains only).

- **CD9 – Human Factors and Societal Aspects**: examines human capital at two levels: “micro level” (interactions of rail personnel with rail technology, other rail personnel and other persons) and “macro level” (interactions between rail industry institutions, performed by their members/staff).

- **CD10 – Training and Education**: focuses on the modernization of the rail education system required by the integration of the railway systems of Europe and Asia as well as the development of new technologies, which have caused urgent need to improve the training system, upgrading qualification, development and harmonization of training standards for railway experts in Europe and Asia.

In order to formulate the above mentioned CDs, the members of each WG identified topics of interest to each group and analysed them in relation to the Trans-Eurasian railway corridors. The topics per CD are listed below:

**Topics of interest analysed in CD1: Strategy and Economics**
1. Scenario building and system analysis;
2. Demand analysis for freight;
3. Costs and prices;
4. Appraisal of options;
5. Regulation and organization;
6. Transport Policy analysis;
7. Transport finance;
8. Subsidy and infrastructure development;

Topics of interest analysed in CD2: Operations and System Performance

1. Intermodal freight operation as a part of the global logistic chain,
2. cause/effect links between maintenance and operations,
3. rules/regulations interoperability,
4. lines/stations performance evaluation methods and models,
5. railway traffic regularity monitoring and dispatching.

Topics of interest analyzed in CD3: Rolling Stock

1. Heavy load bogies;
2. Vehicle dynamics;
3. Power supply;
4. Traction system;
5. Braking system;
6. Freight wagons;
7. Motive power;
8. Train communication network and control
9. Gauge

Topics of interest analyzed in CD4: Product Qualification Methods

1. Intercontinental transport policy
2. Increasing role of intermodal freight transport
3. Implementation of the ICT measures
4. Harmonization and Standardisation as Keys to Efficiency
5. Cross-acceptance – a “bridge” to interoperability

Topics of interest analyzed in CD5: Intelligent Mobility

1. Technology for intelligent mobility
2. Transport telematics
3. System design and integration
4. System architecture and software
5. Service definition, human factors and cognitive skills (EIRC)
6. Internal knowledge sharing and mobility and external communication and promotion.

Topics of interest analyzed in CD6: Safety and Security

1. Rail safety & security systems of European and Asian countries.
2. Safety certification and authorisation in the Europe-Asia Railways.

Topics of interest analyzed in CD7: Environment and Energy Efficiency
1. Energy consumption and energy efficiency of diesel and electrified traction systems, electromagnetic contamination
2. Noise and Vibration on board and on the ground.
3. Influence of weather conditions on railway operation.
4. Controlling the greenhouse gas emission on railway transport.

Topics of interest analyzed in CD8: Infrastructure and Signaling

1. Maximum axle load;
2. Maximum train length;
3. Track gauge;
4. Maximum speed of freight and passenger trains;
5. Track capacity;
6. Rolling stock static and dynamic gauge (clearance);
7. Traction system;
8. Signalling system;

Topics of interest analyzed in CD9: Human Factors and Societal Aspects

1. Interactions of rail personnel with rail technology, other rail personnel and other persons, hence the realm of Human Factors research in the traditional sense, but also organizational studies, communication research and others.
2. Interactions between rail industry institutions, performed by their members/staff, as analysed by political science, political economy, history of economy and technology or organizational studies.

Topics of interest analysed in CD10: Training and Education

1. Comparison of European and Asian rail education systems
2. Harmonization of rail educational standards of Europe and Asia.
3. Rail e-learning (in Europe and Asia)
4. Using web-technologies and simulators in rail education
5. Gender aspects of rail education
6. Rail labour market (in Europe and Asia).
7. Rail clusters (rail educational clusters)
8. Development of cooperation between universities and rail industry;
9. Creating Eurasian university of railway (Network University)
10. Harmonization of standards in the development of training courses and e-courses;
11. Differences in rail competences needs in Europe and Asia
12. List of courses to be included in a potential MSc in railway engineering.

The topics of interest were analysed both in general and in relation to the Trans-Eurasian railway corridors. The outcome was the identification of specific problems in the development and promotion of the Euro-Asian rail corridors, as well as of specific research priorities that should be dealt with in the near future. All of the identified problems and research priorities can be found in deliverables D3.1-D3.10 of the project.

5. Evaluation of the 10 Concept Documents
Once finalized, the 10 CDs were validated through an extended group of experts coming both from the industry and from the
research community. Given the limited time that experts often have to dedicate to such actions, it was considered necessary to provide them with various options in order to participate in the evaluation procedure. These options can be summarized as follows:

- Interviews for the completion of the questionnaire;
- Completion of the questionnaire online;
- Participation in workshops.

Prior to organizing the above mentioned validation actions, the partners had to identify and mobilize the suitable experts. The NEAR2 partners along with the NEAR2 Network members based on the strong connections they have in both the research sector and the industry managed to recruit several experts and involve them in the evaluation. The Advisory Board members also assisted significantly in this task. The organizations, institutions and companies from which experts were mobilized are listed in Table 7, which is included in section 1.4.2 of the report.

Regarding the evaluation methods, first a questionnaire for each one of the 10 CDs was prepared to be used in cases in which the experts could not participate in person in one of the 3 workshops. These questionnaires were sent to the expert in advance of an interview with a project partner.

Another methods used for the evaluation of the CDs was the completion of the online questionnaire which was similar to the hard copy one used during the interviews. The online questionnaire however, gave experts the opportunity to provide their opinion and views on the documents, at their convenience. The online questionnaire may be accessed via the link [www.europeasia-rail.eu](http://www.europeasia-rail.eu). It includes 10 sections, one for each Concept Document and 2 different questions for each section. These include:

- Prioritization of identified topics of interest (the respondent is asked to explain the selected prioritization, as well as to propose new topics);
- Prioritization of identified problems/issues/barriers/needs (again, the respondent is asked to explain the selected prioritization, as well as to propose new problems/issues/barriers/needs).

Prior to completing the questionnaire, the expert is requested to indicate the Working Group(s) on which they have expertise so that in subsequent steps they will be provided only with the relevant questions.

Figure 3 and Figure 4 present the online questionnaire:

The final, very efficient evaluation method that was used was the organization of 3 workshops, two in Europe and one in Asia with the goal to not only evaluate the CDs, but also to engage the experts in a discussion regarding the prospects of the Trans-Eurasian railway corridors, gaining this way significant input for the next major project outcome, the Final Project Publication. Below, brief information regarding each one of the workshops is provided:

1st NEAR2 Workshop: This was organized on the 4th of February, 2014 in Vilnius, Lithuania at the Amberton Hotel. The goal was to invite experts coming from the research community and mainly from Europe. Overall 17 experts and 21 project partners participated. The main items of the agenda included the presentation of the 10 Concept Documents and their discussion. During the workshop, questionnaires were distributed to the experts, giving them this way the opportunity to evaluate the CDs on the content of which they considered themselves to be experts. The specific comments on each CD have been included in the relevant deliverable D4.2: “Minutes of the 1st Workshop”.

2nd NEAR2 Workshop: It was organized on the 12th of June, 2014 in Warsaw, Poland at the premises of IK. The goal this time was not to present again the CDs to the experts, but rather to initiate a more in-depth discussion on the issues and prospects of the Trans-Eurasian railway networks. In this respect, experts both from the industry and from the research field were invited, coming mostly from Europe. Overall, 10 experts and 20 project partners participated. The main items of the agenda included the presentation of the existing Trans-Eurasian railway corridors from the project partners, as well as their critical presentation from the participating industry and research experts. Interesting conclusions were drawn, both country specific and general, which have been included in the relevant deliverable D4.3: “Minutes of the 2nd Workshop”.

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3rd NEAR2 Workshop: It was organized on the 10th of July, 2014 in Shanghai, China at the premises of IRRT. The goal was to continue the discussion on the Trans-Eurasian railway networks, involving this time mostly industry experts coming from Asia and around the world. Overall, 16 experts and 23 project partners participated. The main items of the agenda included the presentation of the Trans-Eurasian railway corridors, the existing problems and potential solutions by the invited experts. Interoperability of the railway transportation system and rail transport safety were noted as bottlenecks for the Eurasian Railway Transportation Corridors. Future research should focus on these topics. Other interesting conclusions that were drawn have been included in the relevant deliverable D4.4: “Minutes of the 3rd Workshop”.

6. Final Project Publication

Initially, and as mentioned in the project workprogramme, the partners had set the goal to formulate a publication that would include the executive summaries of the 10 Concept Documents, once those had been validated through the various methods previously described. As the project progressed, however, it was agreed that capturing additional information, mainly coming from the workshops and from the partners’ own research, would enhance the usefulness and relevance of the publication. It was also agreed that the publication, apart from being an official deliverable, would also be turned into an illustrated edition with the assistance of a professional printing company. To further expand the content of the publication it was agreed to delay the deadline of the specific task so as to include the outcomes of the presentations and discussions that would take place in the Final Conference scheduled to take place in Moscow in October.

In brief, the Project Publication includes the following:

- Historical Background and recent developments in Europe-Asia rail transport;
- The Trans-Eurasian railway policy context, specifically in the European Union, the Russian Federation, China, Kazakhstan, India and other Asian countries;
- Existing bilateral and multilateral agreements between countries along the Europe – Asia corridors;
- Existing Trans-Eurasian railway corridors;
- Examples of operating Europe-Asia railway lines;
- Projects Underway in the Trans-Eurasian corridors;
- Developments in World and EU-Asia trade in terms of major commodities transported, O/Ds and volumes;
- The current needs of shippers and freight forwarders;
- The existing railway services along the Trans-Eurasian land bridge in terms of service providers and shippers using the railway corridors;
- Identification of existing bottlenecks in the Trans-Eurasian railway corridors and associated solutions;
- Identification of future research priorities based on the categorization of the 10 Concept Documents.

It should also be noted that the extensive executive summary has been included in the Chinese and Russian language.

Finally, apart from the full report document, a 16-page summary has been produced as a short, concise, illustrated version, capturing the most important parts of the report, as well as of the project itself. This summary gives the opportunity to interested parties to have a quick but informative look at the work done, the lessons learned and the outcomes achieved throughout the course of the project.

Figure 8 and Figure 9 depict the Project Publication and the 16-page summary of the Publication respectively.

7. Liaison Actions

One of the most important goals of every project is to efficiently spread the project results and to strengthen the cooperation with other relevant initiatives. For this reason, special attention was placed on the liaison actions from the beginning of the project. The establishment of the NEAR2 Network and its further connection to the existing Network of Excellence, EURNEX, was one of the most important liaison actions, through which several experts were contacted and invited to participate in
various events and actions of the project. The project created links with the relevant expert groups from UNECE, transport committees and industry groups interested on the Eurasian Rail Land Bridge, the Russian and Chinese Ministries of Transport.

8. Networking and Dissemination actions

The specific dissemination actions that have been undertaken throughout the whole course of the project are described in section 1.4.2 of the report. In brief the dissemination actions resulted in:

- Inclusion of the Project’s description in the official websites of all partners. Some of the partners have included information in both English and in the official language of the respective country.
- Presentation of the Project to the EURNEX Assembly.
- Presentation of the Project to various related conferences and workshops, as well as interested stakeholders such as Universities, operators, ministries, etc.
- Submission of articles related to the project to various professional magazines and websites.

Potential Impact:
From the beginning of the project, the NEAR2 partners have been working towards achieving two major objectives. The first one was the identification of major rail research institutes along the Trans-Eurasian land bridge and the establishment of the NEAR2 rail research Network, building on the experience and structure of EURNEX. The second objective was the thorough examination of the existing Trans-Eurasian rail research networks in order to identify existing bottlenecks, barriers to interoperability, assess the market needs and propose potential solutions and major research priorities.

Regarding the first objective and as described in the previous section, the NEAR2 Network has been successfully established, while most of the 20 member institutions have proceeded with their accession to EURNEX as associate of full member status. More specifically, 13 have been accepted as associated members and 4 have been accepted as full members. With the new institutions, the European Network of Excellence has been expanded both in terms of number of members but also in terms of geographical coverage. The new members may bring into the network significant knowledge regarding the Trans-Eurasian rail corridors, providing the potential of identifying, assessing and solving existing problems. Further cooperation with new partners from non-European Countries may stimulate research that is of mutual interest and intensify scientific exchange among member institutions. The expected impact from the integration of non-EU researchers in a well-established research network is:

- scientific exchange at an international level,
- training of junior scientists and researchers (using also the EURNEX assets),
- identification of research areas that are of mutual interest, and
- solving of problems in the international railway sector exploiting European know-how.

Moreover, at the 3 workshops that were held in the framework of the project, as well as at the Final Conference, several experts coming from around the world and representing both the research community and the industry were invited. Apart from the very interesting events that took place, the most important outcome was that an extensive network of experts has been created, views and ideas have been exchanged and an ambitious research agenda has been set. Factual information has been collected in a systematic manner, providing significant input for the final outcome of the project, the Project Publication.

Coming to the identification of problems and associated solutions, the partners, as already mentioned, conducted thorough
research in order to formulate the 10 Concept Documents. Following, these documents were evaluated by using various methods and by the previously mentioned network of experts. Apart from the validated documents, a final document was prepared which comprises the Final Project Publication. Among other issues, the specific document includes a summary of existing problems in the Trans-Eurasian corridors, which impede the improvement and increase of the attractiveness of the Trans-Eurasian railway corridors along with some potential solutions have been summarized. Most of the noted problems are not unique to the study corridors. The great length of the Euro-Asian rail corridors, the large number of countries involved and other unique elements of these rail networks, however, make the identification of solutions to these problems more demanding. A summary of the most important of these problems includes the following:

- Regulation, competition and open access to the railway: The opening of the market could attract private investment, supporting the solution of some of the noted problems;
- Border crossing issues: major delays in railway operations across the trans-Eurasian land bridge occur due to delays at borders.
- Harmonization of freight documents: this comes hand in hand with the previous issue, creating equally significant delays.
- Achievement of interoperability: the seamless running of trains could reduce to a large extent the already competitive travel times of the railways.
- Operational issues having to do with empty runs.

Railway travel time may be affected by various other issues as well, including isolation, adverse climatic conditions, inhospitable terrain, challenging railway conditions and most importantly, ongoing wars and/or disputes between countries. These conditions may lead to disruptions in the network and hence significant increase in travel time and transportation costs.

The identification of the above problems along with several of the solutions suggested, could be used by relevant authorities and organisations interested in developing and promoting the Trans-Eurasian railway networks. Apart from the major problems, several future research priorities were identified in the framework of the formulation of the 10 CDs, which were then evaluated by the experts. The most important research priorities per working group are summarized as follows:

Strategy, economics and rail infrastructure management: investigate and analyse border-crossing procedures at commercial, operational and technical levels to reduce train dispatching time; harmonise the various current legislative frameworks and establish market-oriented and customer-friendly bilateral agreements; examine the relevant laws applied in the corridor which are in conformity with the EU transport policy; investigate and propose modern logistics technology to enable seamless train operations. The outcome shall be an integrated action plan for the corridors under research; investigation of the impact of modern logistics on demand; risk management.

Operations and System Performance: research the effects, strengths and opportunities of a single infrastructure manager for each land bridge corridor, the so-called corridor manager, thus offering a one-stop-shop. The concept would introduce a certain degree of competition among the corridors and open up investment possibilities for the non-state sector in rail operations. Further research shall be carried out on the effects of rail-wheel technologies on infrastructure, environmental constraints on operations and system performance in a geographical region with extreme climate.

Rolling Stock: Three key research areas, include heavy load bogies and vehicle dynamics, interoperability of railways in regards to rolling stock, and loading gauge utilisation.

Product Qualification Methods and Harmonisation of Technical Standards: alternative legal and policy frameworks to ensure harmonised standards, level and legal type of the guideline documents, and harmonised system of entities in all states.

Intelligent Mobility: Two key research items include telematics, comprising a broad range of related systems and activities, and system design and integration comprising both physical and legal requirements.
Safety: Three key research items include common rail safety policies and common safety methods, certification and authorisation, and rail safety monitoring and risk control.

Environment and Energy Efficiency: Full and reliable energy support of the transportation process; reduction of the consumption rate of fuel and energy resources; innovative development of production facilities and technical means of railway transport, ensuring minimized negative impact on the environment; innovative development of production facilities and technical means of railway transport; improvement of management structures based on modern information technologies, tracking and monitoring of energy and resources consumption; measuring noise emissions; establishment of a single legal framework for the noise and vibration emissions; technical specifications for “noise interoperability”; definition of “noise technical specifications” for rail vehicles currently in operation; programme for retrofitting of existing rolling stock.

Infrastructure and Signalling: Evaluation of the current track gauge change techniques; harmonization of the technical solutions; ensuring of a common track maintenance policy; formulation of a maintenance plan to equate the maximum permitted speed to the design speed and for the upgrade of the existing infrastructure; action plan for ensuring interoperability along the railway corridor; feasibility studies on alternative solutions for the traction and the signalling system; common method for calculation of track capacity; feasibility of dedicated freight corridor operations.

Human Factors and Societal Aspects: Inventory of existing human factors solutions; inventory of existing staff working conditions; assessment of human resources present along the corridors and establishment of future human resource needs; analysis of logistical chains regarding their processes of establishment and operation; new work arrangements and facilities for uninterrupted long-haul operations; reducing the need for location-specific knowledge and information; harmonizing man-machine interfaces.

Training and Education: Mechanisms for developing cooperation between universities, research centres and railway companies; obstacles for gender gap and recommendations regarding increasing the interest of women in the railroads field; comparative analyses of higher education systems in Europe and Asia; conducting research with European and Asian railway company cooperation; opportunities for the development of the Eurasian Virtual Railway University; use of web technologies in railway education; creation of scientific and educational clusters or railway technologies.

The above identified research priorities may be used by the European Commission in order to formulate research priorities for future calls and, in general, in order to set the basis of the Commission’s future rail research agenda. Based on the experience of the project, the proposed research items cannot be addressed single-handedly. They would require a sustainable network of research institutes along the corridors to be able to produce results that can be implemented on a consensus basis. The research institutes participating in the NEAR2 research network may be the foundation of such a sustainable network.

Finally, the project raised several questions that should be answered in the future and which are relevant to the future developments of the railways in the Trans-Eurasian land bridge. Some of the major conclusions and/or questions are the following:

• It is important to identify the ways to formalize the Trans-Eurasian networks, meaning that each corridor should be handled and monitored by one authority. This way several delays will be resolved and the railways will become more competitive both time and cost wise.
• Not all commodities are suitable to be transported by railways. It is therefore essential to identify potential demand for railway transport.
• The rationalization of flows of products from Asia and to Asia will minimize the empty runs, decrease transportation costs.
and hence make the railways more competitive.

- The identification of future emerging markets is important as well as the potential of China and India to continue to grow.
- How do railways fit within an intermodal transportation system environment?
- What will be the effects of 3D printing in trade volumes?
- The policy context within which the railways operate in each of the countries and regions must be closely examined with the ultimate goal to achieve harmonization across policies, processes and procedures.

1.4.2 Main Dissemination Actions
The dissemination actions that were undertaken throughout the whole course of the project had as an ultimate goal to achieve the wide visibility of the project’s objectives and its results. These actions can be grouped in the following 3 major categories:

1. The production of dissemination material
2. The organization of the final dissemination conference
3. The development of the NEAR2 website

Below the actions taken under each one of these categories are presented.

Production of dissemination material

The first step in the framework of the production of dissemination material was the design of the project logo. In cooperation with a graphics design expert several logos were created which were put under voting among the partners of the project. The final selected logo was used throughout the project in all deliverables and other official documents and can be found in Figure 10:

The logo was also included in all of the dissemination material that was prepared in the course of the project and that was used in workshops and conferences as well as standalone documents (newsletters, etc) sent to interested parties in order to ensure the dissemination of the project. Other dissemination material included the following items:

- The NEAR2 Project poster, which was also produced during the beginning of the project and can be seen in Figure 11:
- The NEAR2 Project Brochure, which was formulated in the beginning of the project, included the project’s motivation, strategy and objectives and can be found in Figure 12:
- The NEAR2 8-monthly Newsletters. Overall 3 newsletters were produced throughout the course of the project, informing the interested parties on the recent developments in regards to the project. Figure 13 presents the 2nd newsletter:
- The Final Project Brochure including brief information on the achieved results. The Final Brochure is presented in Figure 14:

At the end of the project, a report (D5.9) was prepared which includes all of the dissemination actions that took place throughout the course of the project.

Organization of the Final Conference

The Final NEAR2 Project Conference took place on the 21st of October, 2014 in Moscow, Russian Federation at the Holiday Inn Moscow Suschevsky Hotel. The Conference was organized by the local partner, the Moscow State University of Railway Engineering (MIIT) in cooperation with the coordinator, CERTH/HIT and the rest of the project partners. The local organizer was responsible for the following actions:

- Formulation of the agenda;
- Identification of potential speakers;
- Compilation of the list of invited experts; All the experts that had participated or had been invited to the 3 workshops were also invited to the conference;
- Booking arrangements for the conference room;
- Organization of coffee breaks and lunches;
• Organization of the official conference dinner;
• Arrangement of interpretation services;
• Booking and paying for the trips of invited experts and speakers;
• Production of dissemination material distributed during the conference;
• Organization of one technical visit and one cultural tour.

The goal of the conference was twofold; on one hand it aimed to disseminate the project results and on the other to continue further the fruitful discussion and cooperation already initiated among experts in regards to the existing problems and prospects of the Trans-Eurasian railway corridors.

The Conference program was split in two parts; the first one dealt with the Europe-Russia-Asia rail policy issues while the second one examined the views of experts on the use of the Eurasian railway corridors. The presentations that took place during the first part were the following:

• The European transport policy. Its impact on the Eurasian rail corridors. European Commission representative;
• New East-West Transport Corridors: the future trends. Russian Transport Academy;
• Rail Transport along the Euro-Asian routes: myths and realities. UNECE - Sustainable Transport Section, Division of Transport;
• International Problems of Rail Freight Development. UIC;
• The Trans-Siberian Railway Potential and Problems. Coordinating Council on Trans-Siberian Transportation.

The presentations that took place during the second part were the following:

• Extension of the broad gauge network to Bratislava/Vienna. MC Consultants;
• The TransContainer point of view on the current situation and challenge of Eurasian railway lines. JSC TransContainer;
• Ways of increase of efficiency of the Eurasian railway corridors. OSJD;
• COSCO experience in the Eurasian land transportations. COSCO Network e-Logistics Co;
• The Trans-Eurasian railway corridors. RZD.

On the following day two visits, one technical and one cultural were organized in order to provide the participants with further possibilities for cooperation and discussions. The participants were therefore taken to the terminal at Kuntsevo and the rail station and then they participated in a guided tour in the centre of Moscow city.

In order to achieve the wider possible participation in the conference and hence the wide dissemination of project results, the project partners contacted several experts around the world and invited them to the conference. The organizations, institutions and companies represented by the invited experts are listed in Table 7:

Overall 46 experts and 33 project partners participated in the conference, while 14 presentations were made by experts and project partners. All of the presentations made during the conference are available through the project’s website, via the link http://www.near2-project.eu/Events/ProjectEvents/tabid/121/Itemid /1007/language/en-US/Default.aspx).

Development of the NEAR2 Official website

The website was launched in the very beginning of the project and has been updated ever since. Its operation will continue for at least two years after the end of the project period. The NEAR2 website is thoroughly presented in section 1.5 below. In addition to the public website also an internal area acting as a workspace for the project partners has been created.

Apart from the three main dissemination activities, several others took place. These included:

• Participation in Conferences with project related papers
• Attendance of relevant to the project’s content conferences
• Liaison with other projects and initiatives
More information on the liaison actions taken has been included in section 1.3 of the present document, while information on the presented papers and posters is provided in Chapter 2.

List of Websites:
In order to ensure the wide visibility of the Project’s outcomes, an official website was created at the very beginning of the Project. The website was systematically updated with relevant and useful information regarding the project, related events taking place in the framework of the project or in the framework of other similar actions, the outcomes achieved throughout the various WPs, etc.

The Project website is available to any interested party at the url www.near2-project.eu. It also contains information regarding the project overview, objectives and involved partners. The official website of the project also hosts the on line inventory of the NEAR2 Network (please refer to D2.3 for further information).

Finally, through the particular website a Workspace is available which, however, is accessible only by the project partners. This system is used for the efficient exchange of documents and other files between the partners.

The website’s structure includes the following components:

- Home page
  - Overview
- Project
  - Description
  - Outcomes
- Consortium
- Events
- Project Events
- Relevant Events
- Publications
  - Newsletters
  - Brochures
  - Press Releases
  - Reports
  - Other Documents
- Links
- Contact

As mentioned above, the Workspace and the NEAR2 Network are also available through the NEAR2 website.

Figure 16 presents the Home page of the NEAR2 website:

The NEAR2 Project and hence the official website was coordinated by the Hellenic Institute of Transport (HIT), which is part of the Centre for Research and Technology Hellas (CERTH). The Coordinator was Dr. Maria Boile, whose contact details are the following:

Dr. Maria Boile
CERTH/HIT
Tel: +30 211 1069591
Email: boile@certh.gr
More information on the rest of the project partners and their contact details can be found in section 1.6. Table 8 lists the partner institutions involved in the NEAR2 Project, along with the country in which they are established, the main representative and the relevant e-mail address.

### Related information

<table>
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<th>Europe-Asia Railway Transport: Issues and Prospects</th>
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