



European
Commission

TEN-T Corridors:
Forerunners
of a forward-looking
European
Transport System

**ISSUES PAPERS OF
EUROPEAN COORDINATORS**

TEN-T DAYS2016
ROTTERDAM THE NETHERLANDS

Transport

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PURPOSE OF THE ISSUES PAPERS

The TEN-T – the trans-European transport network - is the master plan for a comprehensive transport infrastructure development throughout the Union. It sets the basis for transport to operate for the benefit of trade flows in the internal market and for citizens' free circulation across national borders. While responding to economic and private users' needs, this infrastructure development must fulfil key societal requirements – such as balanced accessibility and sustainability. Rapid technological progress, moving political, economical and cultural environments, changing consumer behaviours ... all this presents unprecedented challenges to transport whose societal obligation is to ensure mobility while drastically reducing its climate-harming emissions.

We – seven European Coordinators for the TEN-T – would like to raise a number of "Issues" which, in our view, deserve increased attention and entail a strong potential for the transport sector as a whole to contribute to the achievement of the objectives of the 21st UN Conference of the Parties on Climate (COP 21).

The development of TEN-T infrastructure – our field of responsibility - influences the shape transport and mobility takes. This implies at the same time that infrastructural requirements resulting from a steadily progressing transport policy are fully integrated into TEN-T development; that the linkages between TEN-T and transport policy developments are reinforced where necessary. At EU level, such linkage seems most advanced in air and rail traffic management / interoperability: areas with strong policy backing, legal frameworks and European implementation structures. For years already, EU funding under the TEN-T programme and CEF has helped implementing numerous projects in these fields, under a common European policy objective.

Many other transport areas present similar linkages. However, legislative and policy frameworks are more complex, projects and their promoters / industries are much more divers and the geographical scope of action is more scattered. Nonetheless, the future challenges and obligations Europe has to face call for stronger integration of TEN-T development and transport policy action. The awareness for and the commitment to relevant projects need to be enhanced and the range of participating players needs to be correspondingly broadened.

The TEN-T Guidelines' Regulation, adopted in 2013, has made a major step forward in this respect compared to its predecessors. It has introduced a genuine network policy that overcomes the disconnected priority projects' approach. Thereby, it opens up new opportunities for an infrastructure development and use that enables safer, more efficient and sustainable transport for all modes. By setting infrastructure standards and requirements, the TEN-T has taken up relevant legislation and policy objectives in various transport sectors, for example on road safety, interoperability or equipment for innovative, smart and clean transport solutions. It has also introduced provisions for multi-modal infrastructure and TEN-T related aspects in urban nodes. All this shows that the linkage between infrastructure and transport policy development is established at EU level. This has, not least, been the precondition for EU funding, under the CEF, of many projects in such fields.

Still, we share the view of the European Commission – both on the TEN-T and other transport policy sides – that more should be done to boost the implementation of relevant projects on the TEN-T. Established EU policy objectives should drive the identification and realisation of TEN-T projects in such "non-traditional" fields, and TEN-T implementation should seize progressing developments in EU transport policy.

SCOPE OF THE ISSUES PAPERS AND THEIR ADDRESSEES

As European Coordinators, we see the Core Network Corridors under our respective responsibility as a unique means to lead this integration process; to make these corridors forerunners of a sustainable and forward-looking European transport system. We note with satisfaction that along corridors, besides EU funded projects,, more and more initiatives are emerging in such fields thanks to players who seize opportunities to benefit from corridor dynamics. TEN-T corridors promise synergies and added value from the combination of different types of projects and involvement of different actors. Our mandate, which also involves much communication as well as discussion with decision-makers, can help boosting all types of projects.

We have identified five areas which, in our view, call for particular attention in integrating transport policy issues into further core network corridor development. We hereby present our “Issues Papers” on these topics. We chose them on the basis of their expected potential of sustainability enhancements, their transport policy relevance and future-orientation as well as the strong interrelatedness between infrastructure and transport policy. We have analysed them notably with a view to the policy challenges at stake as well as to experiences, opportunities and obstacles in generating and implementing relevant projects along corridors. The five selected areas cannot cover all issues at stake, neither is the analysis we have undertaken in these papers exhaustive. Given the different nature of the issues, their expositions are also not entirely coherent. The Papers should be understood as a first milestone of a process, as a door opener for further reflection and deeper analysis and as a catalyst for broader involvement and commitment.

Our « Issues Papers » are thus about:

- Multi-modality and efficient freight logistics
- Intelligent Transport Systems
- Innovation and Clean Fuel infrastructure
- Integrating urban nodes
- Cooperation with third countries.

We have given priority to these issues for the following reasons:

Multi-modal transport and freight logistics can only become more efficient and sustainable when the full range of infrastructure requirements (including terminals, seamless connections of all modes, ICT systems etc.) are in place all along the transport routes. This is of vital importance to enabling seamless transport chains across modes and future-oriented logistics solutions, and to stimulate the shift of long-distance traffic from road to rail, inland waterways and maritime transport.

In all modes, infrastructure must be equipped for advanced and interoperable **ITS solutions** which allow for enhanced safety, better capacity use and high-quality user and mobility services. TEN-T needs to continuously take up technological and organisational **innovation**, keep abreast of future trends and face the challenges of automation and digitalisation. In the same way as TEN-T, research and innovation encompasses all modes of transport. The progression of Europe-wide projects like SESAR or ERTMS demonstrates its success but many more projects should be deployed on the TEN-T. Infrastructure components for clean fuel fleets (charging equipment for e-mobility charging, natural gas and hydrogen) and many other areas not only lead Europe’s mobility system into the future but make a significant contribution to Europe’s industrial leadership.

Urban nodes, as Europe's main economical and social centres, involve substantial potential for the reduction of carbon emissions, with improved transport solutions playing an important role in this respect. TEN-T action must enhance multi-modal connections in urban nodes and at the same time take account of connections with local and regional transport to ensure smooth first and last miles in passengers' and freight transport. The smooth integration of urban nodes – as a newer TEN-T component – in the core network corridor poses another important challenge. Last but not least, it is key for Europe's transport, trade relations and international cooperation to ensure smooth connections with the rest of the world and, for this purpose, enhance **cooperation with third countries**.

We are aware that the contents of the papers are subject to both overlaps and gaps: The paper on urban nodes, for example, could have been more explicit on the full range of issues – multi-modality, ITS, innovation and clean fuels – since all this is important for transport in cities to become more sustainable and to enhance services for users. However, such issues are addressed in the specific Issues Papers. The paper on multi-modality and efficient freight services, on the other hand, lacks the passengers' dimension. This is referred to in the ITS and urban nodes papers. Digitalisation plays an increasing role for both passengers and freight transport, and problems such as data accessibility are common to both sectors. All in all: We had to be selective, and we see the main challenge now in starting to put our initial proposals into practice.

In the preparatory phase of these Issues Papers, Member States and other public and private stakeholders were given the opportunity to express their opinion. Many made use of it, and we were pleased with the large interest and support for the approach.

The Papers intend to address all actors who are already involved in identifying or developing TEN-T projects along core network corridors, i.e. in particular the members of the Core Network Corridor Fora. Regions and Cities, for example, might get motivated and guided to more active involvement. The papers address also others who have hardly involved in TEN-T so far but may see new opportunities (e.g. industry, experts on innovation and new technology, users) and benefit from the dynamic of the core network corridors. Last but not least the stocktaking and analysis we have undertaken in these Papers are for the benefit of our own further coordination and facilitation work. The proposals we make should help spreading successful projects and practices within and across corridors and well as across the core network as a whole. They may also be of use to regions outside the core network, for example for strong economic areas, which exchange high freight volumes with other parts of the Union.

CORE NETWORK CORRIDORS: FORERUNNERS OF A FORWARD-LOOKING TRANSPORT SYSTEM

Since December 2013, the European Union's trans-European transport network policy disposes of core network corridors – an instrument that combines the benefits of a coherent infrastructure development across national borders and transport modes, of a future-oriented transport policy and of a strong governance structure with each other. As European Coordinators, we facilitate and coordinate the identification, planning and implementation of the numerous projects which contribute to gradually completing these corridors and to ensuring their smooth and efficient functioning. For this purpose, we draw on comprehensive corridor studies undertaken by external experts, meet regularly in corridor fora (bringing together all public and private stakeholders concerned) as well as with national and European decision-makers.

Core network corridors follow major European transport axes. They carry huge amounts of goods' and passengers' flows and, in some parts, still require considerable investment in order to enable such flows as a basis for balanced development. These corridors constitute the backbone of the Union's economic and social life. Connecting international gateways and economic areas throughout Member States, they are key to the free circulation of goods, services and workers in the internal market as well as to the free movement of citizens. They link up with other TEN-T and national / regional / local infrastructure, thereby enhancing accessibility all over the European Union.

While the investment efforts for TEN-T corridor completion are vast, and rightly set out amongst the priorities of the Investment Plan for Europe, these corridors stand for a broad range of challenges of the European Union's transport system as a whole. Since major goods and passengers flows are concentrated on these corridors, they also promise highest impacts on transport decarbonisation; they offer vast opportunities for innovative, safer and more resource efficient infrastructure development in combination with high-quality and new-generation services for transport and mobility.

Core network corridors are predestined to lead the way towards a future-oriented European transport system that keeps pace with technological, societal and behavioural changes and challenges of the next years and decades; a transport system that also smoothly and firmly connects with third countries' transport systems. (Countries like Switzerland and Norway, due to their geographical location, are already associated to corridor activities.) The corridor work plans we are elaborating, as one of our main outputs, involve unique opportunities to address projects not only from the infrastructural but from an overall transport policy perspective. This entails also possibilities – in the transport policy areas concerned – to promote pilot action and spread best practices along and across corridors; to use corridors or sections thereof as test fields for new technological, legislative, organisational or policy approaches.

We consider that our work on the "Issues Papers" complements the work of our colleagues Karel Vinck and Brian Simpson on the "horizontal priorities" ERTMS and Motorways of the Sea. The work of Kurt Bodewig and Carlo Secchi on new financial schemes for transport infrastructure projects appears to be particularly important as a basis for projects to explore and expand possibilities for the application of such schemes, including for the mobilisation of private investment.

We hope that the action we propose as a result of our analysis of the five "Issues" helps the wide range of stakeholders in generating as many "new-type" TEN-T projects as possible and that it will stimulate Member States and the Commission – where appropriate – to further advance innovative approaches for the benefit of common transport policy objectives.

WIDER EU POLICY OBJECTIVES AND SYNERGIES IN TRANSPORT IN THE FOCUS

Economy and climate

The completion of the TEN-T Core Network by 2030 has been estimated to generate 10 million additional jobs. A significant share of them will result from new economic activities thanks to enhanced accessibility of regions and urban areas as well as from technological innovation in the transport sector. It is thus vital to strengthen investment, besides major TEN-T projects (cross-border projects overcoming geographical barriers, eliminating key bottlenecks on railway or inland waterway axes etc.) also in smaller projects like those addressed with the "Issues Papers". Only the efficient combination of major infrastructure projects and projects that enable a smart and sustainable overall transport system will allow maximum contribution to the objectives of the Investment Plan for Europe.

The projects addressed with the Issues Papers may broaden the range of potential cases for the use of new financial schemes. In this respect, relevant promoters should draw on the Action Plan for the development of project financing, established by the European Coordinators Kurt Bodewig and Carlo Secchi. Strengthening the role of such projects within the corridor context may not only increase their visibility and the interest of investors, it may also enhance their economic viability thanks to synergies which arise from a coordinated and all-encompassing corridor development.

Boosting such new type TEN-T projects is a clear commitment to the Union's ambitious objectives for the reduction of Green House Gas emissions, as agreed upon at the Paris Climate Summit in 2015. The transport sector is most notably called upon to improve its record. Between 1990 and 2013, overall GHG emissions from transport in Europe still increased by 19,2 % (compared to an overall decrease by 20,6 %) although – fortunately - for some years now, we see a reversed trend. To effectively contribute to the Paris objective of 40 % GHG reduction by 2030 (compared to the 1990 level), transport must take on genuine responsibility. This has already been reflected in the 2015 "Energy Union Package"¹ and should materialise in particular through alternative and cleaner fuel transport solutions as well as a broadened scope of traffic management.

¹ EC (2015), Energy Union Package: A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM (2015) 80 final, Brussels, 25.2.2015

The relevant indicators, set out in the European Commission's 2011 Transport Policy White Paper², shall continue to lead action in transport. They include notably the reduction of GHG emissions, between 1990 and 2050, by 60 % and an increase in energy efficiency (reflected in 27 % energy savings by 2030). The completion of the TEN-T core network by 2030, as one more of the White Paper objectives, highlights the challenge of combining ambitious GHG reduction targets with the enabling of seamless and sustainable transport services, in line with steadily growing mobility demand.

The transport system

The way the TEN-T, and in particular the core network, has been shaped in the 2013 Guidelines' Regulation anticipates infrastructural necessities for a future-oriented transport system (with, as an illustrative example, charging infrastructure for all types of alternative fuel solutions – e-mobility, natural gas and hydrogen-based). They conceive "infrastructure" in a broad way and set a clear though flexible basis for further specification of infrastructure requirements in line with evolving transport policy needs. This new infrastructural approach also enables automated and connected driving as well as innovative mobility and freight concepts based on digitalisation – a development which involves all sectors of society and does not stop at transport, and which does contribute to the objectives and implementation of the Digital Single Market Strategy for Europe³.

The transport sector as a whole draws benefits from core network corridor synergies, which build on the combination of nodes and on links, of construction projects and the efficient management of existing infrastructure, on equipment for intelligent and innovative transport as well as on connections between infrastructure and vehicles where needed for the smooth communication and smart solutions. Corridors stand for both continuity and innovation which must go hand in hand towards the development of a forward-looking European transport system.

The TEN-T challenges of a more "traditional nature" – building major cross-border projects, filling missing links, removing bottlenecks and interconnecting modes along key European transport axes, enhancing Europe's ports and airports as well as their hinterland connections to enable increasing global exchanges – remain top priorities for Member States and infrastructure managers throughout the next 15 years. Investment needs are enormous and can only be met when efforts are combined and concentrated on the commonly agreed projects, when private finance is mobilised where possible and when resources – both infrastructure assets and finance – are efficiently used. The state of "traditional" infrastructure development is different for the different core network corridors. Those where physical infrastructure is already largely in place involve more scope for innovative solutions while others – notably in cohesion countries – still require more substantial infrastructure investment in order to be able to draw full benefit from the areas we are tackling in these Issues Papers.

In any case, we see a strong potential for the generation of synergies between "traditional" infrastructure development and an increasing focus on such "newcomer" areas in TEN-T policy. In our view, the subjects of our "Issues Papers" should be given particular attention and priority in this respect.

² EC (2011), White paper: Roadmap to a Single European Transport Area — Towards a competitive and resource efficient transport system, COM (2011) 144 final, Brussels, 28.3.2011

³ A Digital Single Market Strategy for Europe (Communication for the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions of 06.05.2015, COM (2015)

PROPOSED ACTION FOR MUTUAL BENEFITS

Our initial work on the five papers leads us to a first set of proposals for action, in relation to both the integration of TEN-T and transport policy objectives in general as well as the specific issues addressed.

Proposals for action of general scope

1. In further developing the core network corridors, the focus on the full range of transport infrastructure as identified in the TEN-T Guidelines shall be strengthened; the boosting of projects in the fields dealt with in the "Issues Papers" generates synergies which advance the European transport system as a whole, and contribute significantly to its further decarbonisation. The inclusion of relevant projects in the corridor work plans shall therefore be reinforced.
2. The comprehensive corridor studies as well as the coordination and governance system of the core network corridors shall be used in the best possible way to promote the identification, preparation and implementation of relevant projects. "Corridor synergies" are expected to lead to reinforced commitment along with potential benefits. The needs and contributions of infrastructure users shall be given increased attention.
3. TEN-T funding procedures – for example in areas such as multi-modality and freight logistics or alternative fuel infrastructure – should be enhanced to ensure continuity of projects along corridors; where appropriate, CEF and Structural Funds contributions (also including Interreg / Territorial Cooperation) should be aligned for this purpose; procedures for access to CEF funding may need to be adjusted to better reflect the nature of new TEN-T project promoters (such as industry).
4. Along with their potential to innovate the European transport system, such projects may also be suitable for the use of new financial schemes and the European Fund for Strategic Investment, thereby also contributing to the Investment Plan for Europe; such efforts should be appropriately supported by the European Commission and the EIB.

Proposals for specific action in the five issues analysed

5. To enhance multi-modality and efficient freight logistics, terminal infrastructure, terminal accessibility and relevant ICT infrastructure need to be developed from a reinforced corridor-wide perspective, as well as with a better integration of users' needs and demand forecasts; selected corridors shall serve as test cases for the digitalisation of freight transport.
6. To boost Intelligent Transport Systems, a coordinated ITS deployment beyond the so-called ITS corridors (also including in nodes) must be promoted; building on the C-ITS Platform and the Amsterdam Declaration, investment in digital infrastructure shall be stimulated to deploy cooperative intelligent transport services by 2019; new mobility services shall be enabled by enhancing data accessibility through national access points and by linking travel information services along corridors.
7. To further boost new technologies and innovation in transport, the governance and cooperation structure of the corridors shall be used to the best of its possibilities to deploy results of research and innovation activities in line with strategic transport policy objectives, to boost common commitment of actors (researches, industry, TEN-T stakeholders) and to create strong "flagship" cases.

8. To fully exploit the decarbonisation potential of the different options of alternative fuel propulsion systems - biofuels, electric, hydrogen and natural gas – and to ensure highest effectiveness of Directive 2014/94/EU on corresponding charging infrastructure, Member States' National Policy Frameworks⁴ need to be highly ambitious and cooperation across national borders needs to be reinforced; market take-up shall be stimulated through pilot action along corridors.
9. To better integrate urban nodes into core network corridors, it is not only important to remove bottlenecks and missing links on TEN-T infrastructure in such nodes; a stronger connection with Sustainable Urban Mobility Plans can vitally contribute to improving "last mile" connections for people and freight; urban nodes shall make best use of their exemplary roles on multi-level governance and as forerunners of innovative and low-carbon solutions.
10. Cooperation between the EU and third countries on transport infrastructure development is important in order to ensure continuity of the TEN-T and its corridors in different geographical areas and thereby to facilitate trade and international cooperation; this must also involve the common striving for coherent standards.

Common action to reinforce the integration of TEN-T and transport policy development will be a key basis for Europe's transport system as a whole to develop in a smart and sustainable way and keep pace with future challenges.

ISSUES PAPERS OF THE EUROPEAN COORDINATORS

- **Enabling multi-modality and efficient freight logistics**

Péter Balázs and Karla Peijs

- **Boosting intelligent transport systems**

Pat Cox and Catherine Trautmann

- **Boosting new technologies and innovation**

Catherine Trautmann

- **Efficiently integrating urban nodes**

Catherine Trautmann and Mathieu Grosch

- **Extending cooperation with third countries**

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ENABLING MULTI-MODALITY AND EFFICIENT FREIGHT LOGISTICS

PÉTER BALÁZS AND KARLA PEIJS

1. Introduction

This paper in particular addresses the issue of TEN-T and core network corridors enabling multimodal and efficient freight transport logistics. Essentially the issues paper shall discuss the opportunities TEN-T offers to enhance logistics performance and multimodal transport and how to realise these opportunities. It shall identify barriers of any kind which may hamper the development of suitable TEN-T projects, their successful implementation and continuation.

Further, the issues paper shall identify on-going best practices and relevant research and innovation results ready for deployment. It shall help identifying innovative concepts of legal, technical or organisational nature which could be promoted through the joined 'TEN-T transport policy approach'.

Eventually, the issue paper shall come up with proposals for actions and possibly ideas for pilot projects, exploiting thereby various funding mechanisms, the typical TEN-T/CEF grant, the European Fund for Strategic Investments (EFSI) as well as the benefits of European coordination.

2. EU transport policy challenges

Multimodal transport⁵ and the shift of road freight transport to other modes of transport such as waterborne and rail is one of the key objectives of the 2011 Transport White Paper, while the Freight Transport Action Plan⁶ established the ground for the EU logistics policy.

Transport modes shall be used in principle according to their strengths and weaknesses, while those transport modes with less infrastructure constraints and higher sustainability shall be used more.

Logistics⁷ chains shall be efficient, cost-effective and sustainable. Multimodal transport can be an important factor in increasing the performance of logistics chains in these respects, but is often perceived as not standing comparison with road transport on costs, transport time, flexibility and reliability. In order for it to be competitive with road transport it needs to offer the desired level of service quality for an acceptable price.

The EU aims at a network of integrated multimodal freight transport corridors, with a well-maintained and integrated physical and digital infrastructure, efficient nodal points, and advanced IT systems managing the traffic, infrastructure and cargo flows throughout the corridors.

Logistics performance depends on several factors, including the availability and quality of infrastructure, equipment, information, professional skills, as well as the regulatory framework. The planning and management of logistics chains and its optimisation is in principle a task for business. However the European Commission can help in establishing the right framework conditions to operate it, hand in hand with removing technical and administrative barriers and investing into the necessary infrastructure and the intelligent use of available resources and capacities.

A well maintained and integrated European transport infrastructure is a prerequisite for efficient logistics. The financial and environmental constraints on building new infrastructure require the best possible use of the existing network, which multimodal logistics can help to achieve. The role of nodal, preferably multimodal, points such as ports, inland terminals and consolidation centres – is key to these objectives, as is the integration of long-haul transportation with last-mile delivery. The main challenge for the future is to better coordinate investments along corridors including nodal points, and to upgrade them with the soft infrastructure that is needed for widespread use of ICT.

5 Multimodal transport means the transport of goods by at least two different modes of transport, while intermodal transport means the carriage of goods in one and the same standardised loading unit by successive transport modes without handling of the goods themselves when changing the mode. It is hence a form of multimodal transport. Combined transport is intermodal transport by rail, inland shipping or sea, whereby the road leg is as short as possible.

6 Communication from the Commission - Freight Transport Logistics Action Plan, COM(2007)607

7 The planning, organisation and management of purchasing, production, warehousing, distribution and reverse logistics.

The digitalisation of transport and logistics, the enhanced interconnectivity and exploitation of existing information systems and services and data sharing can greatly improve the efficiency of logistics in at least two ways: i) simplification of administrative formalities and reduction of red tape; and ii) optimisation of cargo flows and better exploitation of infrastructure and equipment.

A more co-operative approach between all stakeholders is needed; in which common business interests should take a more prominent role. Collaborative logistics and synchromodality⁸ have a significant potential for an optimised use of transport resources and the existing infrastructure through cargo bundling, making logistics less costly and reducing possible adverse effects of freight transport. IT and the digitalisation of transport and logistics is an important enabler in this respect.

Instruments in place to achieve the objectives are basically two-fold: establishing and maintaining the appropriate legislative and regulatory framework, and financial and operational programmes/actions supporting the development, testing and deployment of innovative solutions and policies.⁹

3. TEN-T policy as an enabler of transport solutions

The TEN-T Regulation established various channels for supporting multimodal and efficient transport logistics. Article 29 of the TEN-T Regulation in particular refers to the priorities for multimodal transport infrastructure development, namely

- Effective interconnection and integration of the infrastructure, including through access infrastructure where necessary and through freight terminals and logistics platforms
- Removing the main technical and administrative barriers to multimodal transport
- Developing a smooth flow of information between the transport modes and enabling multimodal and single-mode services to be provided across the trans-European transport system,

Logistics and multimodal transport are further addressed in the following areas of the TEN-T guidelines

- Urban nodes (Article 30)
- Telematics applications (Article 31)
- Freight Transport Services (Article 32)
- New technologies and innovation (Article 33).

TEN-T policy aims at the enhanced uptake of multimodal logistics through the closing of infrastructure gaps and the intelligent use of the existing infrastructure; it emphasises the importance of modal points and the integration of transport modes, as well as the digital dimension.

TEN-T should be used to support policy implementation and validation. This can happen through deploying mature results stemming from research and innovation, spreading best practices, promoting new ideas, concepts and business models.

But are the available instruments sufficient, the rules adequate to significantly change current transport patterns and promote smart logistics? What should be done differently? How can we promote the uptake of the opportunities offered by TEN-T? What hampers that uptake?

We have seen a large number of multi-modal projects, most of them addressing either the development of new or upgrading of existing intermodal hubs and their access and hinterland infrastructure.

Only some address the enhancement of IT systems for a better integration into logistics chains or environmental aspects. The first call for proposals under the new TEN-T / CEF instrument did not change significantly that picture. It is impossible to say which of these projects have a largely regional, national or cross-border effect.

⁸ Synchromodality means the optimisation of logistic chains through the efficient combination of transport modes, the allocation of freight to various modes according to available capacities, possible time and cost savings, including the re-planning of the transport and the booking of alternative capacities/modes in case of events, while alerting electronically supply chain partners about the changes.

⁹ More specifically, they are: Completion of the internal market (relevant modal policies), Combined Transport Directive (Directive 92/106/EEC), Marco Polo programmes (expired), Digital Transport and Logistics Forum (DTLF), TEN-T/CEF Horizon 2020, State aid rules, Structural funds

4. Shaping an integrated transport and TEN-T policy for the future

Multimodal logistics requires strong individual modes with an appropriate infrastructure, well-situated and equipped nodal points (ports, inland ports, dry ports, logistics platforms, rail freight terminals, urban nodes), with good access to and from their hinterland. The individual transport modes should be effectively interconnected at the appropriate nodes, physically and digitally. Long-haul transport and urban delivery should be better aligned.

This requires focused investments into physical infrastructures, superstructures and transshipment equipment including at nodal points. It also requires the establishment of the appropriate digital infrastructures and their interconnectivity and interoperability.

As a baseline, investments should take into account the actual needs of the freight transport market, the transport operators, logistics service providers and shippers. TEN-T should become more demand-driven as compared to the current largely supply-driven infrastructure policy approach. Multimodal transport services need to be accepted by the market; it is the shipper or service provider who eventually decides about the choice of transport mode.

Physical

Multimodality and logistics requires efficient modes, their better integration, and the appropriate physical and digital infrastructure including a network of efficient, corridor-relevant and connected nodal points. Infrastructure needs to be at a level which allows individual modes to provide efficient and reliable services.

Investments into physical infrastructure are capital-intensive and long-term binding. This requires a better understanding of the infrastructure bottlenecks and analysis of actual needs. Where are investments really needed in order to serve traffic flows and transshipments along the corridor best? What shall be financed, access infrastructure, terminal upgrade, superstructure, transshipment equipment?

Investments should be better focused, co-ordinated, prioritised. Focusing investments requires a good understanding of the actual needs and therefore good statistics and forecasting of traffic flows from origin to destination, taking into account economic, technological, societal and market trends; and the interdependencies between spatial planning that should cluster industries, infrastructure, environment and society; as well as the effects of new infrastructure on traffic flows. A good example is the ever-growing size of container vessels creating tremendous requirements on ports, terminals and hinterland access infrastructure. Ports in general being the natural entry point for a large volume of cargo generating large flows of traffic into the hinterland and their integration with continental flows in multimodal transport networks may need to be given particular attention.

More data would be also required as regards the transshipment of freight traffic through nodes, in particular inland terminals, in order to allow a strategic view of multimodal transport patterns to be made.

There might be a need for a stronger corridor perspective in analysing and prioritising multimodal terminals and logistics platforms, the integration of the rail freight corridor development with the core network corridor approach, as well as a reconsideration of funding eligibility, and possibly funding rates. One may also consider introducing elements of conditionality as regards the corridor/cross-border relevance of the action/project proposed.

Digital

Access to data, data sharing and smart and collaborative logistics are important enablers for the integration of modes, enhanced supply chain management and better use of resources and infrastructures. This requires apart from innovative technologies the appropriate digital infrastructure, in combination with new business models. Electronic data should flow as smoothly and seamlessly through the supply chain including the exchange of data with public authorities and between businesses.

All transport modes, in particular rail, maritime and inland shipping shall be better integrated into the logistics chains. The same applies to the nodal points. This requires the further digitalisation of the modes and nodes as well as their digital integration with supply chain management systems.

Logistics is to a large extent about process optimisation, requiring enhanced access to data and data exchange, better information management and predictive analysis to increase supply chain resilience. Big data, cloud, Internet of Things all make the amount of data growing at unprecedented scale, but to identify and analyse relevant data to generate added value and to optimise logistics processes will make the difference.

The issue at stake is not so much about technology, but about how to use the technology, overcome fragmentation, promote mentality change and generate new business models.

IT systems, services and data formats are still rather fragmented and lack interoperability, and the degree of digitalisation in the logistics sector differs, depending much on the entity size, with SMEs finding it often difficult to participate. Both require standardisation and low-cost solutions.

Companies are often sceptical towards data provision in order not to release any commercially sensitive information or as regards the security of their data. Data protection, neutral exchange platforms with clearly defined access rights can be solutions, as well as collecting best practice and demonstrating the benefits.

Collaborative logistics and synchronomodality are business-driven trends with a significant potential for cargo bundling and the subsequent optimised use of transport resources and infrastructure capacity. IT and the digitalisation of transport and logistics is an important enabler in this respect. In order to promote multimodal logistics, a more co-operative approach between all stakeholders is needed. Legal and competition aspects need to be taken into account.

Public and private data as regards position of vehicles/vessels/wagons, cargo, infrastructure conditions, traffic density etc. should be accessible. Compliance information should be required to be provided according to the 'once-only' principle to single windows. In particular modern cloud technology may induce a change from 'push to pull'.

The Digital Transport and Logistics Forum (DTLF) aims at establishing Digital Corridor Information Systems connecting cross-border existing IT systems and services to optimise the flow of cargo, facilitate supply chain management, reduce administrative burden and to make better use of existing resources. Digital Corridor Information Systems should provide access to data and services in an open and trusted way enabling also an easy addition of services and applications. These systems require an appropriate architecture, business model and governance structure.

The DTLF will identify frontrunner corridors and analyse data flows (flow of information from traffic and infrastructure managers, ports and inland terminals, to and between businesses, and authorities) in real business cases on those TEN-T corridors, identify related barriers, shortcomings, and best practices and will propose technical and organisational solutions with respect to the establishment of corridor-wide interconnected digital information systems.

This work should lead to concrete projects setting up such systems and the appropriate digital infrastructure. Investments would be focused on the core corridors, but solutions should be of a nature that they can be applied elsewhere and be promoted also beyond the corridors.

We have seen good examples of utilising the TEN-T programmes in support of policy implementation at modal level in the past, as for example in the area of River Information Services. Based on a legal framework, various research projects and the RIS Masterplan, TEN-T supports the deployment of RIS standards and services across Europe. The DINA will further develop RIS and emphasise the digital integration of inland navigation into the logistics chain. Similar developments take place in the other modes, such as in maritime, road and rail.

5. Promoting project implementation

The core network corridors can be a suitable framework for working across borders and connecting systems and services, facilitating knowledge exchange and developing more permanent incentives for horizontal and vertical co-operation, for introducing tests and pilots and for changing traditional ways of thinking. They can be used as test beds based on real business cases to be extrapolated to the rest/ other corridors.

They can support policy implementation and validation through deploying mature results from research and innovation and best practices, and promote and pilot new ideas and concepts.

A critical factor for future actions enabling and promoting multimodal and efficient freight transport logistics will be the mobilisation, co-operation and co-ordination of relevant stakeholders (national and regional authorities and infrastructure managers, operators and users), whereby more weight should be given to the needs of the actual users of the transport infrastructure.

Emphasis should be put on the development, strong promotion and 'marketing' of flagship projects to raise awareness and create best practice. Flagship projects should give clear political signals and support policy implementation in a harmonised and co-ordinated manner across the EU to overcome fragmentation and non-interoperable transport and information exchange systems.

The European coordinators can facilitate this process and help generating interest and commitment from stakeholders as well as support the proliferation of results and best practice.

6. Recommendations

- **Enhanced collection of transport statistics, in particular multimodal/cross-border/transshipment transport statistics**

In spite of an existing and evolving framework for modal transport statistics, there is a need for more national and cross-border multimodal transport statistics (per modal combinations, loading units and transshipment terminals, volumes, performance, lengths, costs, origin/destination etc.)

- **Re-assessment of the validity of corridors in regular intervals**

Traffic volumes and flows need to be regularly updated and forecasted, taking into account economic, political, market, technological and social trends and developments. Corridors and corridor plans should be regularly revisited in view of those updates and forecasts.

- **Better focus of investments along corridors and into nodal points**

Investments should be focused in view of the resulting actual and future needs. In particular to facilitate multimodal transport, investments should be better aligned from a cross-border perspective, taking into account also the need for regional cohesion and accessibility to core infrastructure.

- **Prioritisation of investments into multimodal terminals and logistics platforms in view of their relevance and complementarity for a given catchment area and corridor**

Identification of criteria to facilitate the prioritisation process, e.g. the importance of the area served by a terminal/platform in terms of inhabitants/employment/type of industries/transport volumes generated for international transport, the cross—border relevance in terms of international transport volumes, integration into regional /local land use plans for proper governance of terminal development etc.

- **Funding eligibility and funding rates should be better focussed to promote multimodality and efficient transport logistics chains**

Re-assessment whether relevant definitions, funding eligibility and rates are adequate to serve multimodality and efficient logistics best.

- **Provision of information on (cross-border) multimodal transport services, terminals and logistics platforms**

Better provision and access to information on transport and logistics services, terminals and logistics platforms in terms of accessibility, availability, transshipment facilities, services offered, performance etc. through data platforms

- **A more demand-driven infrastructure policy approach**

Infrastructure policy has been in the past largely supply-driven. Remote regions will continue to need such approach to improve connectivity and cohesion, but in order to better align corridor investments with actual user requirements more attention needs to be paid to the demand side.

- **Enhanced support to the digitalisation of transport logistics and the cross-border interoperability and interconnectivity of IT systems and services**

The better integration of modes, nodal points and logistics chains depends on physical infrastructure in combination with the seamless flow of information. The CNCs should become forerunners for the digitalisation of transport and logistics.

- **Assessment and possibly better streamlining of the relevant modal regulatory framework in support of multimodal freight transport**

The regulatory framework is largely composed of rules per mode which may hamper their flexible use.

BOOSTING INTELLIGENT TRANSPORT SYSTEMS

PAT COX AND CATHERINE TRAUTMANN

1. Introduction

This paper tackles two issues: intelligent transport systems for road and digital multimodal passenger mobility services. It aims to use the Core Network Corridor approach to promote these issues as an integral part of TEN-T policy development.

'Intelligent Transport Systems' or 'ITS' means systems in which information and communication technologies (ICT) are applied to transport, including infrastructure and vehicles, (road) traffic management, mobility services, as well as interfaces between road and other modes of transport; They rely on computers, electronics, sensors, telecommunications and satellites, in order to foster a cleaner, safer and more efficient transport system¹⁰.

The ultimate task of intelligent transport systems is to contribute to a safe, sustainable and inclusive transport and to address growing mobility needs using optimised transport services, thus creating European added value generating jobs and growth. They are the foundation of the transport data-(infra) structure, the "data layer" supporting the optimisation and potential transformation of transport systems.

ITS have the capacity to do more with less compared to physical network building or expansion. ITS deployment will benefit from a focus on functional requirements. Greater use of ITS will enhance the efficiency of transport networks for all users through flexible and dynamic response to evolving traffic conditions in real time. ITS can improve road safety through on-board driver assistance technologies. While environmental improvements, especially as regards air quality, can be anticipated through freight logistics being supplemented by route optimisation on TEN T Corridors and in urban nodes.

2. EU transport policy challenges

Decarbonising transport

Transport is responsible for around a quarter of EU greenhouse gas emissions. Decarbonising transport is a challenge, especially for road transport, since this sector generates more than two-thirds of transport-related greenhouse gas emissions. Road intelligent transport systems can make a key contribution to achieving the COP21 objectives by supporting the transition to a low-carbon EU economy by 2050.

Accelerated rise of technologies

At the same time, the accelerated emergence of new technologies such as Internet of Things, big data analytics and 5G is rapidly creating a new generation of ITS services and business models. Services increasingly will be software-based, real-time, customer-tailored and user-centric. This will not just be a technical transition but in effect will be a paradigm shift in transportation through digitalisation.

Cooperative systems, Connected and automated driving

The digitalisation/automation of vehicles is changing the automotive landscape towards connected semi-autonomous and automated driving. Indeed, vehicles are becoming more and more intelligent, providing new on-board and connected and cooperative services. The Commission has launched a number of initiatives to accompany this change: a High Level Group for the automotive industry, GEAR 2030, to address the challenges faced by the European automotive industry, a High-level Roundtable on connected and automated driving to address digital issues such as connectivity and mobile broadband coverage,

¹⁰ Examples of road applications include: electronic tolling, dynamic traffic management (including access management, variable speed limits, dynamic lane management, parking guidance, real-time navigation support and tracking systems, information service on safe and secure parking, emergency call system in case of accident and other driver-assistance systems.

and the C-ITS platform¹¹ (Cooperative Intelligent Transport Systems). C-ITS will allow road vehicles to communicate with each other directly, with traffic signals and roadside infrastructure as well as with other transport users. With alerts based on previously unavailable information, these systems have a strong potential to improve both road safety and the efficiency of road transport. The benefits are expected to be large, will increase with uptake and will be driven by relatively modest deployment costs. Hence the strong policy interest in enabling developments at a European wide scale. Such early deployment allied with a strong push towards a mass market will both increase the benefits to society and generate economies of scale. Hence the need to invest in coordinated pre-deployment projects that promote harmonised implementation of C-ITS in Europe, continuity of services and consolidation of standards.

Currently, a shared vision on cooperative Intelligent Transport Systems is being built within the C-ITS platform to remove obstacles, to create the enabling conditions and to identify how the Commission, Member States and industry can foster the deployment of such systems across the Union. The Dutch Presidency has raised the issue of connected and automated driving at political level and the Declaration of Amsterdam¹² was endorsed on 14 April 2016. This Declaration invites the Commission to continue the work of the C-ITS Platform and to widen its scope to investigate the links and alignment with automation. Furthermore the Declaration asks the Commission to develop a shared strategy on connected and automated driving, building on existing initiatives, such as the C-ITS platform, GEAR 2030 and the Round Table mentioned above.

The C-ITS platform addresses the following challenges:

(a) Data protection, privacy and cybersecurity

A major challenge, paramount to the deployment of C-ITS in the EU, is security of communications. Without a common approach, interoperability will not be guaranteed. The development of EU-wide commonly agreed solutions for security, privacy and compliance assessment processes are essential to ensure interoperable, seamless and secure C-ITS services on the European road and transport network.

(b) Hybrid Communication approach

To meet all demands for communication, such as vehicle-to-vehicle (V2V) or between vehicles and other C-ITS equipped road users (V2X), and vehicle to infrastructure (V2I), which is two-way communication between road users and road infrastructure, a hybrid communication approach must be considered, thus combining the benefits of complementary technologies, namely ETSI ITS-G5 and cellular-based 3G/LTE/4G/....

(c) Connectivity and automation

The links between connectivity and automation will be further detailed in the C-ITS platform, focussing on both physical and digital infrastructure, road safety and traffic management, and aligning those activities with GEAR 2030 to ensure complementarity. There is a need to better understand the impact of highly connected and automated vehicles, including on mobility and transport as a whole.

(d) C-ITS for freight/trucks and for public transport

The potential of C-ITS should be fully exploited. New focus areas will look at the benefits for cities and urban areas, for freight transport, for vulnerable road users and so on.

11 <http://ec.europa.eu/transport/themes/its/doc/c-its-platform-final-report-january-2016.pdf>
12 <http://english.eu2016.nl/documents/publications/2016/04/14/declaration-of-amsterdam>

Access to and right to use in-vehicle data

Access to in-vehicle data is becoming a hot topic as well. Specific data that were previously accessed via a physical connection in the vehicle are now more and more accessible remotely. Independently of the model/solution retained to give access to in-vehicle data and resources, the challenge is to allow customers the freedom to choose which service they desire, meeting their specific needs, in order to ensure open choice for customers and at the same time open market for services providers. A common view has to be built on how data can be accessed, different strategies towards on-board application platform, different governance of the data server platform, different views regarding concrete implementation and possible legislation.

The data being collected along corridors will be of great help to the traffic manager in order to make more accurate and informed traffic decisions. It is foreseen that the investment on infrastructure-based sensors will gradually decrease as the access to vehicle data will become more open. Service providers could act as an interface between vehicles and the traffic management centre. It is important to promote open exchange of data under fair e terms and conditions across Europe and especially on TEN-T.

Cooperation

Moreover, cooperation and exchange of experiences/best practices between pilots and projects, addressing C-ITS deployment issues surfacing through cross-testing and adopting a "learning by experiencing" approach are key elements to achieving functional interoperability, continuity of services and maximising the benefits from C-ITS.

Cost of equipping vehicles and infrastructure

According to the C-ITS platform final report, it is estimated that up to 30 million vehicles will be connected annually (i.e. installing in-vehicle communication modules, including aftermarket devices), representing an equipment cost of up to €3Bn per year. Infrastructure costs on the other hand are estimated to an annual investment of some €95M.

eCall

eCall is an important opportunity for government and industry to work together to reduce emergency services response times for road users involved in accidents and to save lives in the EU. Although the majority of EU Member States have moved quickly to ensure eCall readiness, some Member States still have much work to do and risk running out of time if they do not start the deployment of the necessary Public Safety Answering Point (PSAP) upgrades within the coming months, to make sure that their PSAPs can process eCalls by 1st October 2017.

Moreover, a new eCall-related topic is currently emerging: the eCall aftermarket devices for the retrofitting of vehicles. This topic is specifically relevant for Member States where the share of new vehicles in the total number of sold vehicles is very low and where the second-hand vehicles are often old and imported from other EU countries. There seems to be a need for EU standards providing minimum requirements for the introduction of such eCall aftermarket devices.

Mobility: shared economy, new behaviours, new services, new markets

Digitalisation is changing the way mobility services are offered to people and the way they move. At the same time, travellers' needs and expectations in such a digitalised world are also changing. Hence, digitalisation can help to drive individual behavioural change towards shared and sustainable mobility based on the shared economy and the related change of mindset from car ownership to "car usership". In this sense, ITS also represent an opportunity for better managing the flows in cities or around business centres generating commuter journeys, contributing to the goal of "smart cities" and better urban air quality.

This is the context for the emergence of new mobility services, where service providers could offer travellers easy, flexible, reliable, value for money, environmentally sustainable everyday travel options, including for example public transport, bicycle-sharing, ride-sharing, car-sharing, car leasing and road use, as well as more efficient goods shipping and last-mile delivery possibilities.

"Mobility as a service" is strongly promoted by some Member States. Finland, for example, wants to create a supportive operating environment for digital services and associated new business models. Transport and communications are seen as key policies to address road congestion issues. Sweden believes that it is important to support more pilot projects within the field.

"Mobility as a service" could also be considered as a viable alternative to the concept of "integrated ticketing". Moreover, a concept which focuses more on "car usership" within the framework of mobility as a service rather than on car ownership might have a considerable impact on managing congestion.

Better services for persons with disabilities and for persons with reduced mobility

Digitalisation should also improve access to mobility services for persons with disabilities or with reduced mobility. This starts with planning a journey.

Regulatory challenges

To allow/foster the transition to "Mobility as a service", European policy should take a holistic approach, encourage and enable an innovation friendly transport environment, target service quality and be "future-proof", with an emphasis on interoperability and a service and market orientation.

But further steps could be needed. For example, new technologies such as sensors will change the way things are identified. Will driver licences or car plates be needed in future? Digitalisation and automation may lead to cross overs in responsibilities and liabilities of different actors in the transport and mobility supply chain. Technological convergence will blur traditional boundaries for example between safe and sustainable mobility, product and service supply, e-commerce, security, communications and data reliability, privacy and access. Finding the right mix and striking the right balance between policy and legislative change will be a challenge but one vital to securing and maintaining European technological capacity and leadership into the future.

For example, to be ready for the global explosion of mobility markets, Finland has launched the reform of its transport regulation¹³. Sweden believes that it is important to reduce institutional and other barriers for companies and other organisations in order to implement Mobility as a Service.

Harmonised approach to interoperability, interoperable data provision

From the technical point of view and to avoid fragmentation, the deployment of (C-) ITS should be compliant with harmonised standards to assure continuity of high quality services for all European end users. Interoperability is indispensable for such a system to properly function. Consequently cross-border testing is of paramount importance to ensure that deployment in one Member State is compatible with its neighbouring states in the internal market.

Common understanding

Moreover, as the frontiers between transport and other policies become increasingly blurred, there will be more stakeholders around the transport table adding to the need and urgency to have a common understanding of what is being talked about the better to understand each other. Building common definitions ("semantics") thus will be important.

Continuity of services on urban roads

Linking urban roads to motorways is necessary but will pose challenges, for example in ensuring continuity and quality of service in these distinct and differentiated environments.

Cohesion

Intelligent transport systems are about connecting. Policy makers consciously need to avoid a two-speed deployment in Europe, between digital transport leaders and the rest, between North and South, between East and West, between islands and the continent. The highest benefits will arise from large-scale deployment of ITS. This should provide rich opportunities for SME's through market led growth.

Limited capacity and expertise

There may be an issue of limited capacity and expertise in public authorities, which could be a barrier to increasing the use of ITS and C-ITS. Some consideration should be given to developing skills to make the most of the transport digital revolution.

Investment in digital infrastructure: financial capacity to be leverage

A wide range of financing options exists at EU-level for transport infrastructure including the European Structural and Investment Funds (ESI Funds), European Fund for Strategic Investment (EFSI), the Connecting Europe Facility (CEF) and its related financial instruments. These complement Member States funding resources. Meeting needs in the coming years will remain a major challenge for the sector. Addressing this challenge requires strategic and efficient use of public resources, transport planning and regulatory stability. This approach can be an enabler in attracting private sector finance. Investments will have to target not only traditional infrastructure but also Intelligent Transport Systems.

Analysis from stakeholder perspectives together with assessment of corridor performance will facilitate identification of potential win-win and provide justification of investments.

3. TEN-T

There have been a number of TEN-T¹⁴ and CEF-funded projects¹⁵ implementing intelligent transport services. These projects cover some corridors with the implementation of ITS services ("ITS corridors"). Core network corridors should not substitute ITS corridors, but should make sure that the services they have deployed are expanded to the whole TEN.

Moreover, the Core Network Corridors offer unique opportunities to advance forward-looking ITS solutions, through both EU funding and, in particular, the broad involvement of all relevant stakeholders and the promotional activity of European Coordinators. Action in relation to ITS projects should strongly focus on corridor-based pilot actions.

TEN-T core network corridors offer opportunities to advance projects from research or pilot phase to full scale deployment; to integrate and share the knowledge acquired; to enable interoperability bottom-up and to apply a learning-by-experiencing approach.

They could bring on-going initiatives to the attention of a wider and non ITS stakeholder community. Corridor forums can be a platform to bring together technologists, users, industry and public authorities.

14 <https://ec.europa.eu/inea/en/ten-t/ten-t-projects/projects-by-transport-mode/its-for-road>

15 <https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/projects-by-transport-mode/its-for-road>

4. Promoting project implementation

To increase the efficiency of the TEN-T Core Network Corridors, interoperability and continuity of intelligent transport services must be discussed, designed, tested and finally deployed on the basis of the evolution of technology, standards, specifications and open interfaces.

Moreover, to assess their effectiveness, a wide range of indicators related to deployment and benefits have been developed and could be considered as true key performance indicators.

Over the past years there have been remarkable technological developments in the C-ITS field. The time now is ripe for linking various national and European initiatives into a coherent and strategic deployment.

Using the potential of ITS can only be achieved if their deployment in Europe is an inclusive EU-wide one. Trans-national deployment of continuous cross-border services can only be successful if all the players involved in implementation, including regional, local authorities, are real partners.

Therefore, coordinated action (in particular private-public) and Member States commitment will have a greater impact leading to economies of scale that can push the markets. The role of stakeholders along TEN-T core network corridors is key to make it happen swiftly, tapping on the good work started by EU co-funded projects.

However technical issues are not the only obstacles towards the realisation of efficient TEN-T core network corridors. Further political cooperation and coordination among relevant players (national ministries, regional authorities, road authorities, road operators and all stakeholders involved in the ITS value chain) are key elements for a successful deployment of ITS along corridors. An exploitation of the win-win potential will provide a market for ITS service providers.

Another potential added value of EU-funded projects is their focus on cross border sections along the core corridors, and also the promotion of ITS deployment on remaining stretch of corridors (i.e.: "close the gaps" and "last mile").

Through the strategic use of EU-financing instruments, a frontrunner core corridor may be identified for roll-out of ITS as example for the others. Similarly, a group of Member States that are more advanced in the pre-deployment of C-ITS may provide useful lessons learnt and move forward policymaking. The use of innovative financial instruments in the framework of the European Fund for Strategic Investment (EFSI) should be further explored.

5. Shaping an integrated transport policy for the future: the backbone for new services

Developing an effective and comprehensive integrated transport policy requires many steps and building blocks. As aforementioned, Europe as a whole has many transport related objectives to accomplish, ranging from emissions to efficiency to safety and ITS will sit at the heart of this process.

In this context, the TEN-T corridors can support the development of an integrated transport policy by supporting the effective deployment of ITS in a step-wise approach and building the foundation for a further integrated policy development across all of Europe. Corridors can service as both the testing ground for new ITS technologies and the backbone of established solutions as well.

Data is an integral and essential 'fuel' for Europe's transport sector. Together with the physical network capacity, the need for an interoperable data layer is essential. Building a data layer will help facilitate data exchange and the 'free flow of data' and support the development of new services and comprehensive travel, traffic and logistic information services.

In that context, and as a first step, core network corridor stakeholders should support the deployment of national data access points to road and multimodal travel data on core network corridors and the linkage of multimodal information services/journey planners along core network corridors to enable a data-sharing backbone.

On top of that, it is important to build the road infrastructure of tomorrow by deploying cooperative intelligent transport systems. Stakeholders in the spirit of better regulation principles should support a deployment along core network corridors, through a "Learning by experiencing" approach.

Services

There should be better/new fit-for-purpose user-centric mobility services offered along the core network, e.g. journey planner and booking apps, and mobility offers such as "mobility as a service". As aforementioned, the needs and expectations of travellers in terms of access to real-time information are much higher in a digitalised world and easy access to interoperable data can support the framework of such user-centric mobility services. Such platforms can have a powerful impact in supporting modal shift and positively influence travel behaviour that is urgently needed to tackle the growing urbanisation and environmental challenges. The TEN-T network can act as a backbone to support the deployment of such services across the EU.

6. Recommendations

- The "ITS corridors" should be expanded to cover all core network corridors.
- Coordination is key for sharing experiences, lessons learnt and best practices between Member States and their stakeholders with different level of advancement in the pre-deployment of C-ITS. This should be supported by the Commission to make sure that the recommendations of the C-ITS platform are implemented and that there is a feedback loop.
- Core network corridor stakeholders should support the deployment of national access points to road and multimodal travel data on core network corridors and the linkage of multimodal information services/journey planners along core network corridors to enable a data-sharing backbone.
- Coordinator should ensure cohesion of (C-)ITS deployment along their corridors between digital leaders and the rest, between North and South, between East and West, between islands and the continent. This should provide opportunities for SME's through market led growth.

Annex

The following paragraphs illustrate some ITS projects whose development has been promoted in the framework of the TEN-T.

ITS services

The Arc Atlantique Corridor delivers improvements to the Trans-European Road Network stretching from Ireland to Spain through implementation or improvement to the following traffic management services: provision and / or improvement to Real Time Traffic and Travel Information, road Safety related traffic Information, implementation of Traffic Management Systems and / or Plans. The network incorporates both the North Sea Mediterranean (full) and Atlantic (partial) Core CEF corridor networks with 80.5% of investment on the CEF core network itself, as well as 19.5% of investment on critical elements of the comprehensive network directly supporting the CEF Core routes.

MedTIS is a deployment project on the TEN-T Mediterranean Corridor to deliver high-level Travel Time Services and enhanced Traveller Information services including road user awareness to European travellers. Along a 6.800 km Corridor, addressing cross border information continuity under peak seasonal periods. MedTIS Action involves 4 Member States from the European Union: France, Italy, Spain and Portugal. 22 road operators from these 4 countries are in charge of the onsite deployments of services and systems.

Within CROCODILE public authorities, road administrations and traffic information service providers of in total 13 European Member States are committed to set up and operate a data exchange infrastructure. That infrastructure will be used to exchange data and information between all involved stakeholders, including private partners, with the goal to support the provision of harmonised cross-border traveller information services along the whole corridor. A specific focus within CROCODILE will be on safety-related and truck parking information services. The CROCODILE corridor project involves the Central and Eastern European (CEE) countries along three main road corridors: Baltic – Adriatic, Rhine – Danube, Orient-East-Med. Participating Member States include Austria, Cyprus, Czech Republic, Germany, Greece, Hungary, Italy, Poland, Romania and Slovenia, as well as Bulgaria, Croatia and Slovakia in the status of associated Member States. To ensure access to data CROCODILE Member States and partners will setup access points. Finally exchanged data will be integrated in end-user services by CROCODILE partners as well as interested ITS Associations.

The North European Cross-border ITS – NEXT-ITS – corridor covers the Northern part of the Scandinavian-Mediterranean CEF corridor from Oslo and the Finnish-Russian border in the north via Copenhagen, Hamburg, and Bremen to Hanover in Germany. The Services covered in NEXT-ITS are Safety related information service and high quality Real-time traffic information (Traffic condition information, Travel time information, Weather information).

URSA MAJOR aims at improving international freight traffic on the TEN-T road network in a corridor linking North-Sea-Ports, the Ruhr and Rhine area, metropolitan areas in southern Germany and in northern Italy. Applicants come from Germany, Italy and the Netherlands. Switzerland and Austria are included in their role of transit countries. URSA MAJOR covers most of the CEF core corridor RHINE-ALPINE and parts of the CEF core corridors Scandinavian-Mediterranean and RHINE-DANUBE.

The “EU ITS Platform” provides guidance on technical specifications to enable harmonised deployment and brings together European key players, cooperating to establish an open “forum”, aiming at providing valid contribution for the future strategy and policy recommendation for better development of ITS service along European road Core Network Corridors. By monitoring, processing, evaluating and disseminating results delivered by the 5 above mentioned ITS Road Corridor projects, the EU ITS Platform claims to be the technical European ITS “Knowledge Management Centre.

e-Call

Two projects, I_HeERO and eCall.at are preparing the European public emergency services (Public Safety Answering Points) to handle eCalls. These projects are particularly important in view of the forthcoming mandatory introduction of eCall in Europe. Combined, these projects will engage at least 13 Member States, complementing and following the previous very successful projects editions HeERO and HeERO2.

Intelligent Truck Parkings

Two projects are aiming at the implementation of Intelligent Truck Parkings in Belgium (Safe and secure infrastructure in Flanders) and in Spain (Repsol Security Parking)

C-ITS

Moreover, the roll out of Cooperative ITS is underway on several locations and corridors in Europe, including CEF-funded projects¹⁶.

C-ITS corridor (Rotterdam – Frankfurt/M. – Vienna) German¹⁷, Dutch¹⁸ and Austrian¹⁹ road operators have started the gradual introduction of cooperative systems in Europe.

SCOOP@F is a test deployment project of cooperative intelligent transport systems in France²⁰.

NordicWay²¹ is a pilot project that seeks to enable vehicles to communicate safety hazards through cellular networks on a road corridor through Finland, Norway, Sweden and Denmark.

Both projects, SCOOP@F and NordicWay will test vehicle-to-infrastructure and vehicle-to-vehicle interactions by using both short-range and cellular communications.

Moreover, the CEF call 2015 will hopefully support other C-ITS projects.

C-ITS in cities

Over the course of three years, public and private partners have worked closely together in the frame of the EU co-funded project Compass4D²² to implement, operate and evaluate three C-ITS services in seven European cities (Bordeaux, Copenhagen, Helmond, Newcastle, Thessaloniki, Verona and Vigo). As Compass4D was due to end in December 2015, the Consortium has decided to continue operating the C-ITS services, without EU co-funding, for at least one year with the ultimate goal of moving from pilot to large scale deployment for a self-sustained market.

C-ITS for freight and logistics

The sister project CO-GISTICS is also focusing on the deployment of cooperative intelligent transport systems (C-ITS) applied to logistics where seven C-ITS services will be deployed in 7 logistics hubs, Arad (as the most important trans-European road and rail transport junction point in Western Romania, included in the 4th Pan-European Transport Corridor (Romania), Port of Bordeaux (France), City Logistics in Bilbao (Spain), Frankfurt Airport and Hessen Area (Germany), Port of Thessaloniki (Greece), Port of Trieste and cross border activities (Italy) and City Logistics in Vigo (Spain). The project will ensure successful deployment and after-project life of the piloted services, aiming at proving that cooperative logistics services (including intelligent cargo) combined with existing freight relevant services result in a more sustainable and cost effective goods transportation.

16 <https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/projects-by-transport-mode/its-for-road>
17 <http://www.c-its-korridor.de/?menuId=1&sp=en>
18 <https://itscorridor.mett.nl/default.aspx>
19 <http://eco-at.info/>
20 http://www.developpement-durable.gouv.fr/IMG/pdf/49b_DGITM_scoop_GB_2p_def_web.pdf
21 www.nordicway.net
22 <http://www.compass4d.eu/en/continuation/>

Traffic management

TM 2.0²³ aims to agree on common interfaces, principles and business models which can facilitate the exchange of data and information from the road vehicles and the Traffic Management and Control Centres (TMC), and back, improving the total value chain for consistent traffic management and mobility services as well as avoiding conflicting guidance information on the road and in the vehicles.

Spatial data

The mission of TN-ITS²⁴ is to facilitate and foster, throughout Europe, the exchange of ITS-related spatial data between public road authorities as data providers, and map makers and other parties as data users.

Mobility services

Several projects have also been (co-)funded by EU, including SocialCar, Opticities, European travellers club, MyWay, Masai, EUtravel, Bonvoyage, Mobinet, Mobiwallet, AllWaysTravelling, IT2Rail, Shift2Rail Joint Undertaking's Innovation Programme 4 related to "IT solutions for attractive railway services" will aim at enabling the emergence of innovative solutions for passengers, in the domain of travel shopping, booking and ticketing. Moreover, the 2016 H2020 call contained the topic "innovative concepts, systems and services towards mobility as a service".

Other projects

There are national report on ITS deployment available at : http://ec.europa.eu/transport/themes/its/road/action_plan/its_national_reports_en.htm . Projects relevant for TEN-T core network corridors could be selected from these reports to be further deployed.

BOOSTING NEW TECHNOLOGIES AND INNOVATION

CATHERINE TRAUTMANN

1. Introduction: A key role of Innovation for TEN-T

Innovation is key for the development of an advanced, seamless, sustainable multi-modal transport system, which is interoperable across national borders and capable of tackling today's challenges and future needs. Research & Innovation and its implementation are critical to deliver against EU policy objectives and performance targets, in particular decarbonisation, and jobs, growth and investment by boosting European industrial leadership.

In order to reach these ambitious goals, the overall chain of transport innovation should entail a strong inter-connection between Research & Innovation and deployment. This is crucial to ensure that on the one hand Research & Innovation actions result in appropriate systems and solutions that are fit-for-purpose with clear added value, while on the other hand only the larger scale implementation and deployment of those systems and solutions will prove their benefits in real life.

However, both in transport and in other sectors, several challenges have persisted as barriers to the transition from Research & Innovation to deployment – the so-called "valley of death". For several reasons, including lack of awareness, business cases, financing, incentives, standards and regulatory framework, a wide range of final results, products and solutions from R&I were often unable to proceed to the full implementation phase.

This innovation gap is very costly: not only does it imply the write-off of direct losses of value and returns from the investments in research, but also indirect loss of missed opportunities from the continued inefficiencies and the non-implementation of innovation.

A key factor fuelling this "valley of death" has been the lack of information exchange and missing feedback shared between R&I and deployment actors. On the one hand, R&I has not always considered short-term, concrete solutions tailored to actual market, or missed appropriate deployment planning. On the other hand, potential investors/deployers have not clearly voiced their need for new technologies or solutions to the R&I work stream, or are not aware of what has been made available by research providers.

Furthermore, varying degrees of engagement and commitment of EU Member States, Industry and other stakeholders have resulted in partial, uncoordinated, desynchronised or delayed deployment.

The different governance processes for innovation and investments, varying between (public and private) stakeholders, also contribute to slow advances in innovative solutions' market uptake.

The TEN-T and the Core Network Corridors could become a new "space for innovation". They present a unique opportunity to promote cooperation amongst stakeholders, Industry, Member States and Public Authorities at local level; to pilot innovative solutions and facilitate large-scale deployment – thus enhancing Europe's transport sector efficiency, providing better transport and mobility solutions for citizens and businesses and reducing its carbon footprint. Corridors in particular can be used as show cases / "fab labs", where partners put together their contributions to ensure and demonstrate cross-border operational capability, acting as front-runners for implementing transport innovation and represent "show cases" for their replication.

Furthermore, the transfer of these experiences to the Comprehensive Network has the potential to speed up its completion by 2050 as planned, with increased levels of performance to respond to future mobility needs.

Over the past decade, a series of new developments in transport R&I have materialised²⁵. Progress has been achieved in infrastructure innovation and the development of new systems and operations. In particular, big steps have been undertaken in alternative fuels and electrification, Intelligent Transport Systems (ITS) and automation, safety, network/traffic management (SESAR, ERTMS), vehicle and infrastructure design, urban mobility and logistics (see examples of success stories in Annex 1).

²⁵ A long list of transport R&I projects funded by the EU or National Programmes can be found here:
<http://www.transport-research.info/web/projects/index.cfm>
http://cordis.europa.eu/projects/home_en.html

Stronger cross-border coordination and co-decision on strategic developments are crucial to achieve the highest value of implementation of innovation in specific parts of the Network.

The box at the end of the paper provides a particular focus on the implementation of alternative fuels infrastructure across the TEN-T network, where a strong role is played by Member States to create the right enabling environment (regulations and incentives) to deploy alternative powered vehicles, with high decarbonisation potential.

2. The need to coordinate and accelerate the uptake of Innovation in the TEN-T Network and Corridors

A number of experiences and issues are emerging from across the TEN-T and in particular within the Core Network Corridors. Hundreds of projects have been in execution to jump-start the roll-out of New Technologies and Innovation across Europe²⁶. It is now opportune to consolidate and assess the feedback and lessons learnt, in order to alleviate barriers, facilitate coordination and accelerate the deployment of R&I solutions. In particular, building upon the experience of past years, it is now acknowledged that a stronger coordination within and between the Corridors can facilitate the timely uptake of innovation to ensure an efficient functionality of the entire network for the years to come.

A positive example is the Automatic Train Operation (ATO) successfully conceived, researched and tested/validated, till the industrialisation and deployment phase. At present, ATO is primarily implemented for urban, metro or local operations. The technology is ready for expansion on a larger scale, including for mainline and cross-border railways. Major benefits and synergies could be realised if ATO would be combined with the European Rail Traffic Management System (ERTMS), generating benefits to be utilised to further promote and co-fund further deployment of the technologies.

Digitalisation of the logistics chain is a key driver for a modern and efficient transport system and a well-functioning network. Collection, access and data sharing are important enablers for enhanced supply chain management and better use of resources and infrastructures: the use of digital information along entire Corridors via e-CMR (e-consignment notes of the Convention on the Contract for the International Carriage of Goods by Road) can deliver sizeable benefits to Member States and stakeholders. The optimal result though is linked to a large network of interlinked hubs, rather than the optimisation of single nodes. More R&I is needed to achieve this result, and actions have already been initiated under the Horizon 2020 Framework Programme.

Airports are vital elements in the TEN-T corridors. The airborne access is addressed by SESAR, in its deployment phase. Implementation is still fragmented though, as a number of issues relate to national sovereignty on airspace, the creation of Functional Airspace Blocks and streamlining standardisation and regulatory activities, as well as social dialogue concerns. TEN-T Corridors can be leveraged more heavily to promote the deployment of SESAR, complementing the Commission's Aviation Strategy.

In the Waterborne sectors, R&I solutions such as IRIS Europe on new River Information Services and the AnNa Project for the realisation of the maritime National Single Window provide opportunities to modernise waterborne transport operations and integrate them with door-to-door logistics chains of the future. However, challenges continue to persist due to technical and regulatory constraints and diversity. A new focus for deployment along TEN-T corridors could overcome these issues.

Urban environments are a focus area where innovation deployment is urgent and where many local innovation start-ups on new technologies and mobility (car and bike sharing, mobility services, cargo bikes and urban deliveries) are supported by EU R&I. The potential for replication has not yet been used widely although Innovation could act as a catalyst to align the progress and concurrent development of Corridors and Urban nodes. And an "innovation network" could be generated in the TEN-T, whereby Urban nodes and hubs would be important hooks for Innovation.

Energy efficiency in the TEN-T network and the Corridors is an important and urgent dimension to be addressed. Despite the Clean Power for Transport (CPT) Directive, the deployment of new technologies is still slow; partially due to technological issues (recharging, batteries, costly technology for refuelling, etc.). Once again, Corridors, as case studies for Member States, can lead by example: demonstrating full range capability to accommodate alternative fuel and electric vehicles, embedding the necessary

26 A long list of individual projects funded under TEN-T and CEF can be found here:
<https://ec.europa.eu/inea/en/ten-t/ten-t-projects/projects-by-transport-mode>
<https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/projects-by-transport-mode>

innovative re-fuelling / re-charging infrastructure.

Smart infrastructure maintenance monitoring tools and advanced construction materials are increasingly becoming available through R&I (e.g. NR2C project). Some local progress is also being achieved at EU ports, through the greening of port infrastructures and operations, the development of port-hinterland connectivity and ports' transformation into large multi-modal transport hubs (e.g. Antwerp port extension). However, such "local" projects, pilots and best practices need to now expand into a larger scale of innovation implementation across Member States, Corridors and the entire TEN-T network. More feedback from Corridors on their actual needs would help and speed up the identification of available solutions.

Early collaboration between R&I and CEF projects, even in the inception phase, would be essential to ensure both a focused development of research results and a concrete case for validation and application of R&I solutions. Impact would be higher if such collaboration is foreseen between deployment cases and 'clusters' of R&I projects offering each a part of a global innovative solution.

Economic stability, jobs and growth depend on both small (SMEs) and large Industry engaged and having a key role to play: not only from participating in the development of the original R&I solutions, but through to their implementation in real cases. Industry is also a critical actor to help bridge the R&I / Deployment "valley of death" and contribute to 2-way dynamic feedback loops between implementation and R&I: Industry-driven initiatives could be leveraged and synergies realised from Pilot Common Projects, thus allowing Industrial partners in the R&I phase to become first implementers of R&I solutions, in return for a first-mover advantage.

For the deployment of large-scale pan-European innovation projects, appropriate governance structures with both public and private sector involvement could be particularly beneficial, facilitating and complementing standalone Industrial (and/or public) initiatives.

Another important "cross-cutting" theme, which is also appearing from across the Corridors is the need to increase the level of public support (e.g. regulations, standards, procurement rules, etc.) at local, National and EU level. This is particularly important, to incentivise and kick-start deployment in a number of areas (cf. the case of Alternative Fuels), as well as to ensure sufficient critical mass is achieved across Europe. This would of course need to be executed in line with Internal Market, Competition and State Aid rules, where applicable.

At EU level in particular, it is important to leverage and optimise the use of EU's existing funding tools (Horizon 2020, Connecting Europe Facility, European Fund for Strategic Investments, European Structural and Investment Funds and European Investment Bank financing products), but also to consider new tailor-made instruments to support all phases of the innovation chain, fill in existing financing/risk gaps and address market failures (cf. the Christophersen/Bodewig/Secchi report and the Action Plan "Making the best use of new financial schemes").

All in all, the main message from across the TEN-T network is that the Core Network Corridors can indeed be better utilised as leading test-beds for new solutions, technologies and governance schemes and being the first deployers in order to achieve critical mass for large scale market introduction of New Technologies and Innovation. Other parts of the network can also be leveraged as required, to ensure that both wide-scale and local deployment progress is being achieved, while at the same time, comprehensive feedback and links with further R&I need to be ensured.

In particular, a coordinated approach both on R&I and on the deployment side is necessary between the EU and the Member States. For instance, a significant boost of innovation on the TEN-T network is anticipated if Member States adopt a wider perspective, focusing more on the Corridor and their European deployment dimension. The involvement of Industry is also critical in this process: to support the entire spectrum of activities from early Research & Innovation, to rapid industrialisation and large-scale deployment across the TEN-T network.

Only once all these elements are in place can the TEN-T network benefit from a continuous flow of Innovation, whereby local or one-off success stories could easily become transferrable on a much wider scale.

3. Conclusions and recommendations

On the R&I side, the 3rd Horizon 2020 Strategic Programming Exercise (2018, 2019 and 2020) and the mid-term evaluation of H2020 have already started and are due to be completed by 2017. This will also lead to a first development of EU's next R&I Framework Programme beyond 2020.

On the deployment side, the timing coincides with the concurrent need to appropriately allocate the remaining CEF budget within this Multi-annual Financial Framework until 2020. At the same time, discussions have already started on the potential future financial envelope for CEF beyond 2020.

A number of conclusions can be drawn from the issues highlighted in this Paper. First of all, the importance of ensuring that appropriate feedback is being collected from the Corridors and across the TEN-T, consolidated and raised to the attention and action of all stakeholders. Today, more intelligence is needed to build a good "match-making" between old/new projects and concurrent initiatives. At the same time, "success stories" are developing in parts of the TEN-T, but good projects and experiences need to be disseminated: within the same Corridor, but also across Corridors and throughout the entire Comprehensive TEN-T network.

A number of issues identified relating to technical aspects can be solved by further targeted research actions. In other cases, technological solutions are well tested and robust, but implementation is falling behind due to non-technological aspects. These include insufficient standardisation and regulation; lack of appropriate market forces and new business models; high investment costs and uncertain revenue flows leading to unfavourable stakeholder business cases and inadequate returns; lack of incentives and sufficient public funding support to engage investors and to remedy financing gaps and market failures, leading to the last-mover advantage phenomenon.

The above-mentioned issues are bearing relevance across all transport modes, which remain largely segregated in the implementation of New Technologies and Innovation, inhibiting the necessary development of the integrated multimodal dimension. The implementation of new technologies and innovation across the TEN-T still proceeds too much on an ad-hoc basis, in a fragmented and unsynchronized way and calls for a more holistic systemic view of transport in Europe. The level of deployment maturity of R&I actions also varies from one Corridor to the other. Furthermore, the link between transport and energy needs to be strengthened.

A deployment progress map (for instance as part of the Core Network Corridor Work Plans), could make it immediately visible where progress is on track by 2030, where it is delayed but could still deliver on time and where there are real red flags to be addressed and how R&I can help achieving the target. Along these lines, it is necessary to formulate a longer-term perspective on both R&I and full scale deployment, a process which is already underway with the development of EU's Strategic Transport Research and Innovation Agenda and the formulation of TEN-T/Corridor deployment roadmaps. This context will also contribute to better align the concept of innovation in the two frameworks.

The following list contains several concrete Recommendations which could be taken forward.

Recommendations on R&I in general

- TEN-T Corridors should become first implementers of R&I results, New Technologies and Innovation.
- Coordination across H2020 and CEF Work Programmes should be improved, to ensure building up and delivering useful Innovation Pipelines.
- Interaction between transport R&I and Corridor Coordinators should be enhanced, leveraging Coordinators' role to promote R&I output, in particular from EU funded projects. Coordinators could become "catalysts" for the deployment of Innovation along the Corridors and in the wider TEN-T.
- A new process for clustering R&I and deployment projects, from kick-off to the full market penetration, should be established.

- A deployment progress map on the roll-out of New Technologies & Innovation across TEN-T/Corridors should be developed.
- Adequate budget for transport R&I, market-sided Innovation and deployment of R&I solutions – not only from EU R&I Framework Programmes, but also from CEF, EFSI, etc., in this MFF and beyond 2020, could help accelerating the implementation of R&I results.
- EU R&I deployment to non-EU / 3rd countries should also be addressed under the "Issue" of extending cooperation with third countries.

Innovation Enabling Measures:

The case of Alternative Fuels Infrastructure – Innovation to reduce dependency from oil

The specific aspects relating to the deployment of alternative fuels infrastructure require special attention. The actual maturity of the respective technologies (electric, natural gas and hydrogen) must be taken into account.

The Clean Power for Transport Package launched by the Commission in January 2013 lays out a comprehensive alternative fuels strategy for the long-term substitution of oil as energy source for transport, for all transport modes. It provides a framework to guide investments and technological development. The strategy advocates that there is no single fuel solution for the future of mobility; all main alternative fuel options - biofuels, electric, hydrogen, natural gas - compressed (CNG) and liquefied (LNG) - must be pursued, with a focus on the needs of each transport mode – road, Inland Waterways and maritime.

The main tool to achieve the strategy above is Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure. It sets out minimum requirements for the building-up of alternative fuels infrastructure (for electric and natural gas) and pursues several interlinked objectives:

- to break the "hen or egg" problem that there are no alternative fuel vehicles because there is no infrastructure and vice versa;
- to make sure that common technical standards are being developed;
- and to make certain that EU-wide mobility with alternative fuel vehicles is possible.

The Directive contains mandatory elements, together with common standards, for the build-up of an appropriate alternative fuels infrastructure. Member States will have to adopt National Policy Frameworks and submit them to the Commission by November 2016 – thus setting their own objectives and targets for the market up-take of alternative fuels vehicles/vessels and the related infrastructure. The Commission needs to make sure there is cross-border continuity and the plans are ambitious enough.

The main alternative fuels to be deployed on the National Policy Frameworks are electricity and natural gas. The decision to implement a hydrogen infrastructure is left to the choice of the Member States but, if they decide to include it they will need to put in place a minimum numbers of refuelling points.

The aim of the Directive on the deployment of alternative fuels infrastructure is to achieve the market up-take of alternative fuels vehicles and vessels thereby ensuring the competitiveness of EU industry. The market development of alternative fuels is still held back by technological and commercial shortcomings, lack of consumer acceptance, technical specifications and common standards and missing adequate infrastructure. Although, those criteria cannot apply equally to all alternative fuels since the technological and commercial development of each fuel (electric, natural gas and hydrogen) is now at different stages. The purpose of including alternative fuels in the "Innovation and New technologies" priority is precisely to bring financial support to specific technologies for which market viability has not been reached yet. Furthermore, an increased attention to this area within core network corridors should help ensuring cross-border cooperation and continuity.

The Directive aims at the technology-neutral rollout of an alternative fuels infrastructure network with common standards for electricity, natural gas (in the forms of CNG and LNG) and hydrogen. In line with the principle of subsidiarity, Member States are responsible for deciding on the regulatory framework, territorial localisation and other implementation measures. The Directive mainly relies on private investments for the deployment of the minimum infrastructure and aims at avoiding, also through the availability of the EU funds, that the strained public finances of Member States are burdened with the creation of this infrastructure.

However, to avoid European market fragmentation, it is important to create an infrastructure at European level, in order to facilitate EU-wide and cross-border mobility of alternatively fuelled vehicles and the development of an optimum market size to trigger the necessary private investments in such infrastructure. The Directive expressly designs the CEF as a major tool to trigger a European market for alternatively fuelled mobility.

Regarding the relation with the CEF and TEN-T, the Directive refers to it inter alia in its Recitals 16 and 20:

"In accordance with Regulation (EU) No 1316/2013 of the European Parliament and of the Council²⁷, the development of new technologies and innovation, in particular regarding the decarbonisation of transport, is eligible for Union funding. That Regulation also provides for additional funding to be granted for actions which exploit the synergies between at least two of the sectors covered by it (namely transport, energy and telecommunications). Lastly, the Commission is assisted by the Connecting Europe Facility (CEF) Coordination Committee in coordinating the work programmes with a view to allowing multi-sectorial calls for proposals in an effort to take full advantage of possible synergies between those sectors. The CEF would, therefore, contribute to the deployment of alternative fuels infrastructure."

"The TEN-T guidelines recognise that alternative fuels serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport, contribute to its decarbonisation and enhance the environmental performance of the transport sector. The TEN-T guidelines require, with regard to new technologies and innovation, that the TEN-T is to enable the decarbonisation of all transport modes by stimulating energy efficiency as well as by introducing alternative propulsion systems and the provision of corresponding infrastructure. The TEN-T guidelines also require that inland and sea ports, airports and roads of the core network established by Regulation (EU) No 1315/2013 ('TEN-T Core Network') provide for the availability of alternative fuels. In the CEF, the TEN-T funding makes the deployment on the TEN-T Core Network of those new technologies and innovation, including infrastructure for alternative clean fuels, eligible for grants. In addition, the deployment of infrastructure for alternative clean fuels on the broader comprehensive network will be able to receive financial assistance from the CEF in the form of procurement and financial instruments, such as project bonds".

The investment required for the deployment of alternative fuels on the TEN-T core and comprehensive networks - a precondition for the completion of TEN-T network and the achievement of the alternative fuels strategy for transport - exceeds the capabilities of public funding. In particular, funding is an issue in the current climate of budget constraint. It is therefore important to determine funding and financing mechanisms that would facilitate public and private investments for the deployment of such infrastructure.

When applying to "Innovation & New technologies" priority project holders can analyse the viable commercial deployment of alternative fuels infrastructure along the TEN-T network through studies and through pilot and demonstration projects. In this context the corridors should be used as test-beds for new concepts.

²⁷ Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010 (OJ L348, 20.12.2013, p. 129).

Pilots and studies for the deployment of alternative fuels infrastructure (and vehicles for testing purposes) on the TEN-T are crucial, as the TEN-T constitutes the backbone of the EU transport system and a successful project along a TEN-T corridor can have a huge positive impact on the policy makers and general public, also in a sense of promotion and recognition of alternative fuels. Particular importance should be paid to the urban nodes along the network. Moreover, consumers' acceptance and education are equally necessary and key to the success in the long run. Innovation and new technologies supported on the TEN-T network should help to achieve a new approach to mobility. Alternative fuels, being at the cross-road between energy and transport, represent a unique opportunity for a positive change in consumption patterns towards the sustainability. Thus, their deployment along TEN-T should be regarded also from this perspective and with this aim.

Taking into account the above, pilot projects for alternative fuels should demonstrate business cases (profitable on the long term), clearly address consumers' needs and solve the "chicken and hen" dilemma.

As an example of a pilot project, the Rapid Charge Network project, co-financed by the TEN-T funds, successfully deployed 74 rapid charge points in 64 locations along the TEN-T route in the UK²⁸. Realising a similar project involving one or more alternative fuel infrastructure along the whole TEN-T Corridor could potentially bring numerous benefits and is therefore worth considering. The North Sea-Baltic Corridor, due to its localisation (connecting countries that are more advanced when it comes to alternative fuels with those that are less developed in that regard) and massive flows of passengers and freight, could be a proper place for such a project. In this context the role of TEN-T Coordinators is crucial as a catalyst for deployment of innovative alternative fuel solutions along the Corridors.

Stakeholders, who had the possibility to comment on the subject of this issues paper, largely support the need to boost the development of alternative fuels. The points they raised included:

- the issue of state aid: how should it be tackled, especially when financial support from State or EU (including cohesion / structural funds) sources is granted for the deployment of recharging points;
- the question of whether to concentrate EU funding on a few alternative fuels to maximize its impact and deliver a comprehensive distribution network throughout the EU in order to facilitate the shift of end-users to alternative fuels;
- the opportunity for the EU so develop also innovative financial tools (supported by the European Fund for Strategic Investment) to speed up user switch to alternative fuels, not only through pilot projects but also through wider retrofitting programs;
- the possibility of adopting a whole corridor approach in piloting and testing new technologies and innovation to ensure transition from research to wider deployment. For example a pilot project could be implemented in one section of a corridor with a view to subsequent wider implementation along the full corridor;
- the potential role for TEN-T funding to help overcoming problems in the phases of legitimization²⁹ and market formation³⁰ while building on results of Horizon 2020 R&I in knowledge creation and entrepreneurial experimentation as well as of Joint Undertakings - e.g. Shift2rail, CleanSky;
- the need for an ex-post evaluation of CEF funded projects in relation to the deployment of alternative fuels infrastructure (and possibly other innovation projects) as a basis for future EU funding to be as efficient as possible.

28 <http://rapidchargenetwork.com/>

29 Legitimation of an innovation is important for its successful path to the market. For several of the innovation cases investigated (such as electromobility, bio fuels aviation, biofuels surface transport) the need to prove the benefits of the innovation has been important in the legitimization context. The functionality of TIS appeared to be sub-optimal for the cases where there were problems with demonstration of benefits of the innovation. In contrary, where the positive benefits have been clearly demonstrated or proven this had positive impacts on functionality of TIS and facilitated market take-up of the innovation.

30 The assessment conducted in Market-up cases studies - including a set of cases on alternative fuels - confirmed such market formation problems for several Technological Innovation System (TIS)

Recommendations on alternative fuels issues

- An ex-post evaluation of CEF-funded projects in relation to the deployment of alternative fuels infrastructure (and hence in support to MS to implement the Directive 2014/94/EU) should be performed. This assessment should be comprehensive - assess the impact of the EU financial support to projects dealing with alternative fuels infrastructure irrespective whether they concern nodes, long distance, core or comprehensive networks, Cohesion or general envelope.
- The deployment of alternative fuels infrastructure in line with vehicle/vessel technology maturity & cost and in line/in support of EU legislation should be fostered.
- A reflection should be undertaken on prioritisation and extra tools/incentives needed.
- The funding for projects on alternative fuels infrastructure deployment for road and Inland Waterways (as for LNG under Motorways of the Sea) should be streamlined.
- Interoperable solutions along the corridors (beyond the already mandated standards for the connectors; i.e. interoperability for payment and use) should be promoted.

Annex - Success stories for the deployment of R&I solutions

A recent example of an innovative approach to boost new technologies and innovation in the TEN-T is coming from the European co-financed EIBIP project (European Inland Barging Innovation Platform). This project aims to establish a European platform of "innovation centres", in order to promote the uptake of innovation in the inland waterway transport sector. It brings together several existing and fully established centres across Europe, whose objective is to facilitate innovation transfer to the market, regarding technological, organisational and financial issues. The project will be undertaking promotion and awareness actions for all stakeholders in the value chain, including demonstrators, thereby clearly supporting innovation implementation. The value of such Innovation platforms can indeed be remarkable: even in areas where no more technological or validation work is required, impeding implementation can be unlocked through "softer" innovation awareness, promotion and additional demonstration activities.

In the area of alternative fuel-powered and electric vehicles, the deployment phase is starting to gather pace, most recently with the adoption of Directive 2014/94/EU on the deployment of alternative fuels infrastructure. Funding possibilities have been significantly enhanced under the CEF, however access to grants could still be streamlined. Concrete examples include the emergence of hybrid and all-electric road vehicles across the TEN-T – e.g. electric buses in Sweden (implemented without EU funding); fast-charging infrastructure roll-out in the UK and Ireland (TEN-T project with 50% grant); 100% electric ferries already in operation in Scandinavia (e.g. Ampere in Norway, Movitz in Sweden); LNG service stations for road vehicles operating in Italy, Sweden, Spain, Belgium (port of Antwerp), etc.; shipbuilders delivering orders of LNG-powered vessels (tankers/ferries/catamaran); the HIT Project on hydrogen deployment along the TEN-T Corridors, as well as a few prototype Fuel Cell Hydrogen buses / passenger cars already available.

One of the leading Corridors in digitalisation is the North Sea-Baltic Corridor, having already implemented best practices for information technology solutions in the freight sector at both ends: e.g. in the Helsinki-Tallinn twin-port and in the Dutch ports. This is particularly important for a Corridor that is accommodating extremely high volumes of freight (and passenger) traffic flows in an efficient and "green" manner.

Furthermore, a number of innovations for both Maritime and Inland Waterway Ports are currently being implemented, albeit by a limited number of EU Member States. Examples include electronic reporting and Port Community Systems (PCS), the roll-out of the National Single Window, as well as multimodal/port-hinterland interconnections.

The latter example of cross-modal port-hinterland (e.g. port-rail) connectivity, leveraging Innovation in communications technologies, hub design and logistics, is of particular interest for most (if not all) Member States along the TEN-T Corridors and even to States beyond Europe (e.g. China). This is an area with great potential for further development, whereby small projects can have a large impact: firstly, through the diffusion of local success stories multiplied and implemented by a number of Member States, along Corridors and throughout the TEN-T; and secondly through the very nature of increased cross-modal activity, where major synergies and efficiency improvements can be realised.

Successful R&I solutions have also been delivered in the area of Infrastructure innovation, relating to "smart" & safe infrastructure (incl. maintenance), greening & resilience, as well as materials & construction. A number of relevant projects include NR2C, TRIMM, RE-ROAD, MAINLINE, etc. Deployment is progressing (e.g. in the Netherlands), but further work is required along all TEN-T Corridors.

It is evident from the above-mentioned examples that a number of success stories from R&I projects and solutions are continuously becoming available through the Innovation pipeline. The TEN-T is clearly dependent on transport R&I and is gradually proceeding with implementation.

EFFECTIVELY INTEGRATING URBAN NODES

Catherine Trautmann and Mathieu Grosch

1. Introduction

With an increasing urbanisation rate, cities are now more than ever engines for economic growth, employment and competitiveness. Almost three quarters of the European Union's population live in urban areas, where 85 % of Europe's GDP is generated. Urban areas will have to respond to growing mobility needs and ensure transport modes' seamless interconnection, but at the same time tackle issues such as urban/peri-urban congestion, poor air quality, exposure to noise and road safety. This is key to ensuring a more sustainable development of Europe's urban areas and, at the same time, make sure urban areas properly support the construction and intelligent use of the European transport network.

"Urban nodes" have become an integral part of the development of the trans-European network (TEN-T). 88 urban nodes are listed in Annex II of the TEN-T Guidelines³¹: they were identified on the basis of a set of socio-economic criteria, and have been key in structuring the TEN-T core network³². These nodes ensure the connection between the different transport modes, as well as the connection between long-distance and urban/peri-urban/regional transport. With core network corridors acquiring importance as socio-economic environments too, urban nodes play a key role as socio-economic and technological centres.

The origins or destinations of most transport flows along core network corridors are situated in urban nodes. Transport planning in these nodes has an impact on flows along the corridor (e.g. on modal distribution) and vice-versa. Beyond the urban nodes of the core network, corridors also link to other urban nodes. This implies wide possibilities for all urban nodes to reinforce exchanges between them and to enhance their "functioning" as flourishing cities. Urban nodes feature a strong potential to promote the most environmentally and climate friendly transport modes and to contribute to smart, safe, sustainable transport both within the nodes and between them.

This paper aims at stimulating the transport related aspects of urban nodes as integral parts of core network corridors. Article 30 of the TEN-T Guidelines specifies these aspects. They address in particular the connection of TEN-T infrastructure within nodes (through ports, airports, railway stations, logistic platforms and freight terminals) as well as access to these nodes and the seamless connection between TEN-T and urban and regional infrastructure. It also looks into aspects which might benefit from promotional action at EU level, in light of the new importance given to urban nodes in TEN-T policy. These aspects include, for example, the relation between transport and urban planning / the integration of mobility planning and land use, the impact of major TEN-T infrastructure developments on citizens and urban/peri-urban functions, the "greening" of cities - in particular the decarbonisation of its transport system - and the introduction of innovative mobility solutions.

The paper highlights issues of TEN-T relevance within urban nodes and their integration into corridors. It looks at the combination of TEN-T related goals and the objectives of sustainable urban mobility planning, as promoted by the Commission in the 2013 Urban Mobility Package (UMP)³³. Within this framework, it also opens the perspective for forward-looking practices which both enhance transport solutions and stimulate synergies with other urban functions. Hence, a wide range of actors at different governance levels – national, regional and local level – are involved and have to cooperate. The needs and proposals of those indirectly concerned – such as enterprises and companies, employers and workers, citizens and relevant administrative bodies – also need to be taken into consideration, to ensure wide understanding of the nodes' potentials.

31 Regulation (EU) N° 1315/2013 of the European Parliament and the Council of 11 December 2013 on Union Guidelines for the development of the trans-European transport network

32 Planning methodology for the TEN-T Core network:

http://ec.europa.eu/transport/themes/infrastructure/doc/web_methodology.pdf

33 Commission Communication of 17 December 2013 entitled "Together towards competitive and resource-efficient urban mobility" (COM(2013)0913)

2. Boosting TEN-T projects in urban nodes and generating synergies with urban mobility objectives

Urban nodes' projects, as integral parts of the TEN-T, may be promoted through the relevant implementation instruments (both CEF and coordination through the European Coordinators). In this respect, European Coordinators have been engaging with local authorities as key players along the core network corridors, namely for aspects such as the establishment of connections between airports and TEN-T railway lines, the interconnection of TEN-T railway lines within urban nodes and connections between different core network corridors in urban nodes. In the near future further steps shall be foreseen, in close cooperation with local authorities, in order to analyse transport flows in core urban nodes. Moreover, the potential to strengthen the most environmentally friendly transport modes, to ensure the proper multimodal connections and to organise local transport flows in a smart and sustainable way will be explored.

Ensuring an effective multi-level governance requires a broad involvement of actors. Therefore, urban actors and networks may contribute to activities of the corridor forum meetings, i.e. assume a more active role in the core network corridor governance system and take part in special working groups. Enhanced cooperation, especially along a Corridor, can contribute to generating action to smoothen the transport flows. In those urban nodes, which are located at the intersection of corridors, it is also important to ensure cross-corridor synergies.

The Core Network Corridors offer new opportunities to advance the whole range of TEN-T relevant issues in urban nodes. This also includes, as an issue of high priority, the enhancement of safety. Where appropriate, inclusion in core network corridors may help stimulating the implementation of the Urban Mobility Package. (The latter could also address issues such as cycling and pedestrian traffic, restricted traffic areas or special "reward and penalise" schemes in relation to city access for motorised traffic).

Enhancing communication and cooperation between cities along core network corridors may generate new concepts and mutual benefits for long-distance and urban transport. Such mutual benefits may include: (1) the removal of 'urban bottlenecks' (physical, technical, organisational) along main arteries of the TEN-T: this allows congestion reduction and improvement of long-distance traffic flows as well as better connections between TEN-T and local transport networks; (2) the enhancement of multi-modal transport solutions and seamless connections, with a shift towards more sustainable transport modes and urban freight solutions; (3) the mitigation of negative effects of transiting rail and road transport on the urban environment (issues such as noise, safety, environmental impact).

Integration of urban areas in the TEN-T corridors presents different challenges:

- Urban areas offer broad opportunities to demonstrate and implement the mobility schemes of tomorrow. They may be used as test-beds for transport innovation projects (such as electro-mobility, cargo electric bikes for last mile, ICT, automation, innovative mobility services – for both passenger and freight), some EU co-financed under HORIZON 2020, hence such demonstrated/tested solutions could be scaled-up quicker at the level of urban nodes with benefits for both urban mobility and TEN-T policy. There is reasonable space for development to generate spill-over effects from fast-moving innovation in urban areas to the corridors as a whole, and even beyond the corridors in the future.
- Long-distance freight transport by sustainable modes (rail/waterborne) presents particular challenges for last-mile deliveries within urban nodes. This requires stronger focus on relevant terminal infrastructure and their integration in the wider supply chain, in combination with enhanced urban logistics operations. It is the basis for more efficient overall logistics chains and high quality user services.
- The most important transport nodes of the TEN-T core network (ports, airports, other terminals) and the major TEN-T urban nodes are often coinciding. This highlights the importance of such transport nodes as economic factors and generators of commercial benefits in the cities concerned. Missing inter-modal connections of the TEN-T may be mapped to raise awareness of their importance. Their implementation also strengthens the potential of enabling seamless, sustainable and innovative transport chains across the different modes. Sustainable last mile connections in cities – both for freight logistics solutions and passengers -, may involve light rail and bus, walking and cycling.

Connecting the planning of transport infrastructures with territorial planning is of particular importance in urban areas. Citizens have to be appropriately involved in decision-making, to bring forth strong and innovative projects and to enrich the whole area's functionality and attractiveness. Only through an open dialogue process will it be possible to maximise benefits for both citizens and economic/urban operators.

3. EU funding possibilities for urban nodes

Urban nodes that determine the core network are listed in Annex II.1 of the TEN-T Guidelines. These core urban nodes are complemented by a wider range of nodes listed in Annex II.2, which contain core network infrastructure or comprehensive network infrastructure elements such as airports, maritime ports, inland ports and rail-road terminals. A number of these nodes are included in the list of "pre-identified projects" for CEF funding (Annex 1 of the CEF Regulation), with interconnections between transport modes being amongst the highest priorities (e.g. ports interconnections in Gdynia or Trieste; ports and airport interconnections in Barcelona, rail node improvement in Ljubljana, etc.).

- The first call in 2014 for project proposals of the CEF led to a total allocation, of €49 million for projects in seven urban nodes: Birmingham, Frankfurt, London, Norrköping, Malmö/Copenhagen, Paris, and Lyon. EU funding was mainly focusing on enhanced interconnections of TEN-T infrastructure in those nodes.
- The second CEF call, of 2015, also supports actions implementing transport infrastructure in the listed nodes of the core network: €50 million budget under the general call and €50 million budget under the cohesion call (co-financing rate up to 85% for the latter).

In parallel with the TEN-T/CEF calls, HORIZON 2020 - Work Programme 2016/2017 "Smart, green and integrated transport" includes the topic "Innovative approaches for integrating urban nodes in the TEN-T core network corridors" in order to better and more effectively integrate urban nodes into TEN-T corridors by using efficient and sustainable solutions for 'last mile' delivery (such as alternative fuel vehicles); this entails making greater use of intermodal urban freight logistics and developing approaches for linking long-distance with last-mile freight delivery in urban areas.

Urban nodes pick up the TEN-T policy challenges on decarbonisation, air quality and congestion. The efficient and effective integration of urban nodes into TEN-T corridors requires further research and innovation efforts. Producing recommendations for deployment of innovative solutions in urban areas can be very helpful in this exercise. To this end, expert networks should be set up, building on existing practices to ensure efficiency, further developing current practices and opportunities. These expert networks should focus on how to deploy novel combinations of existing technologies/services, while considering the related business and economic implications of innovation. The networks should also consider how to best involve new combinations of different stakeholder groupings - for example from research and innovation programmes, urban planners, infrastructure constructors/operators and investors - putting emphasis on creating synergies between results of HORIZON 2020 funded projects and CEF funding; TEN-T policy, both through "non-financial" action of the European Coordinators and funding under CEF, can pick up these concepts and recommendations and potentially fund implementation-related studies, pilot actions and relevant works.

The European Structural and Investment Funds (ESIF), with over €13 billion already planned for urban mobility projects over 2014-2020 (an increase of +56% compared to the previous financing period) offer the highest EU grant source for urban mobility projects. While their scope of eligibility goes beyond the TEN-T, it is important for an effective overall action at EU level to combine contributions and ensure complementarity where possible. This contributes to integrated territorial and urban development and supports accessibility to the TEN-T.

Support action can broaden in the following years. TEN-T support action shall gradually and systematically cover aspects of the urban nodes, where strategic partnerships (both private and public) will also represent a step forward in improving urban nodes projects. Urban nodes should also involve a good potential for projects benefiting for the European Fund for Strategic Investment (EFSI). The broad eligibility criteria should stimulate cities and project promoters to engage with the EIB, the European Investment Advisory Hub and the National Promotional banks to benefit from EFSI.

4. Promoting project implementation to generate mutual benefits and boost synergies

With European Coordinators working to encourage the establishment of connections, all actors directly involved at different governance levels have to be on-board in this endeavour to develop urban nodes. Sound governance of the implementation process demands constant monitoring of the projects, where necessary allowing for interventions to optimise the effectiveness and limit the sunk costs of any obsolete program.

The Commission should promote the whole range of TEN-T relevant issues in urban nodes and use these possibilities, where appropriate, to help stimulating the implementation of the Urban Mobility Package.

The TEN-T planning methodology has identified the most important urban nodes, ports and airports, as well as border crossing points. Wherever possible, those transport nodes are to be better connected with other modes. Multimodality can represent a sustainable solution in finding the right transport mix, with the possibility of also integrating light rail and bus, walking and cycling.

Projects on multimodality are often aimed at channelling freight transport in a quicker and more efficient way. Railway links allowing swifter connection between ports and TEN-T corridors are a living part of the urban nodes. Analysis and studies on these aspects are welcome, further building on existing practices. Projects aimed at making freight more efficient have been planned in Venice and Genoa, for example, where goods are transported from ships to rail with a quicker and efficient procedure. But also inland ports and inland navigation have high potential to contribute to multi-modality and render urban nodes more efficient elements of the transport system.

The smartPort project in Hamburg:

The Hamburg port area covers some 10 % of the territory of the city and is located centrally, in the vicinity of residential areas. Growing transport volumes from and to the port challenge rail, road and inland waterway capacity, both within the port and the city and in connection with the hinterland – also along the three core network corridors which cross Hamburg. Spatial constraints limit physical infrastructure extensions. To reduce harmful effects on residents and urban life as well as to ensure resource efficient and high-quality transport solutions beyond the port and the city, Hamburg Port Authority is developing the smartPort project. This project is about the gradual implementation of a long-term strategy (currently covering about 25 individual projects, partly implemented and partly in preparation) for the intelligent exchange of information in order to optimise transport flows. The information exchange involves incoming vessels, ports logistics operations and transport flows rail, road and inland waterways. It helps reducing urban road congestion and – more generally - promises a significant impact on the sustainability and efficiency of flows of all transport modes within the city and further on along the core network corridors.

Ensuring sound accessibility to and from the city is key to sustain general regional development and social cohesion. Interchange stations, for example, are a point of interest for citizens with a high commercial potential.

Urban nodes as business development hubs have high potential to deploy environmental-friendly solutions and facilitate connections for people and freight. The People Mover project in Bologna, for example, providing for a driverless monorail connection between the railway station and the international airport, will allow passengers to swiftly move from the high speed station to the international airport. With solar panels partly producing energy required, this plan would increase quality and environmental benefits while facilitating surface access system to the airport. Similar measures, already existing across Europe, would contribute to the goals of transport decarbonisation, innovation deployment and services facilitation.

5. Reinforced actions for an integrated transport policy

Member States and local/regional actors should grasp the great potential of urban nodes development to boost competitiveness. Existing initiatives (such as the "Urban Node Berlin-Brandenburg Partnership Declaration") and their recommendations for action (e.g. establishing Corridor Node Working Groups that involve European, national and regional stakeholders from the node region as well as from neighbouring regions) may serve as examples. Urban nodes also represent a possibility to mobilize regions - connecting them with the Core Network Corridors' dimension - where shaping the node helps them in reaching the goals of regional development.³⁴ Local authorities should team-up to tackle the issue of competitiveness and to better handle the challenge of efficient nodes on the TEN-T corridors.

The Commission has been and will continue to strongly promote the use of SUMP as successful tools for sound policy coordination in the framework of sustainable urban development. These plans are most efficient when integrating both passengers' and goods' mobility needs with the wider urban and territorial development strategy. SUMP should be linked with TEN-T action in urban nodes, especially along corridors. Where relevant city authorities pave the way in developing sound SUMP, their examples could be followed across the EU through best practice exchanges. Growth opportunities would then become more evident and easy to seize. Currently, SUMP are not a pre-condition for EU funding. Strengthening the link between long distance transport and city mobility is a great occasion for Member States to boost economies of vital nodes of their transport system.

While on the one hand national priorities on urban nodes' development should be strategically defined, on the other hand the municipalities may develop a clear vision for implementation of these priorities, to allow the sound integration of urban nodes in the TEN-T system.

Existing tools have to be available for relevant stakeholders to promptly use them. ESPON programme can provide relevant data on the impact which the improvement of infrastructures may have for regional and urban development. Urbact III and CIVITAS Networks also represent a source to exchange best practice, collaborate and provide financial support between the authorities involved.

Cooperation between MS to develop urban nodes

Organisations of The Netherlands, Sweden and Belgium have been developing together the NUVit (Networking for Urban Vitality), an initiative for smart collaboration between national road authorities and urban regions to integrate land-use, mobility and infrastructure planning across all levels. In the NUVit approach, workshops have been organized offering space for dialogue between the different stakeholders at various scales (local/regional, national), to build on common interests of the (inter)national networks and ameliorate quality of life in the local and peri-urban fabric.

NUVit has the ambition to develop into a European network of specialists on integrated planning of infrastructure and spatial development, multi-level governance and integrated strategies.

The following fields of action should be further explored in order to strengthen the effective integration of urban nodes into TEN-T corridors:

- Promoting integrated strategies, platform(s) for exchange of experience, market places for public and private actors concerned (including the promotion of joint clean public procurement), drawing on existing experiences, such as INTERREG projects;
- Promoting a multi-level governance approach; increasing motivation and supporting enhanced cooperation, where commercial benefits can progress hand in hand with better liveability of the involved area;
- Quicker deployment of tested solutions by identifying promising HORIZON 2020 funded projects (in CIVITAS and Smart Cities) and/or CEF funded pilot actions mature enough to be proposed to EIB and private investments (with EFSI support) and/or suitable for blending (with ESI Funds);
- Focus on the following elements which contribute to the EU priority of Growth, Jobs, Competitiveness and Investment:
 - Transport system efficiency and accessibility to/from urban nodes and multi-modality for passengers, including active traveling options
 - Logistics operations – the link between urban logistics operations and national, EU and international supplies chains
 - Urban nodes as business development hubs - interaction of transport and regional development
- Focus on the following elements which contributes to digitalisation and the Energy Union:
 - Service quality levels (time, comfort, safety), traffic management and better information services
 - Smart cities initiatives - with ICT as an enabler - to put together transport and energy aspects
- Mutually reinforcing benefits to stakeholders and general public; consider creating communication tools/pilot projects actively involving urban nodes users to facilitate dialogue and cooperation at different governance layers;
- Designing a business model to support the take-up of mobility as a service.

6. Conclusions and recommendations

A number of conclusions can be drawn from the issues highlighted in this Paper and which need to be readily addressed to deliver effective integration of the urban nodes with the TEN-T policy. A smooth trans-European transport network will be achieved only if underpinned by urban nodes in a pro-active manner and if integrated with the respective urban realities, which consist of spatial structure, existing infrastructure, local economy and needs of the population.

Accessibility, sustainability and intermodal connections are important elements to be high in the agenda of urban nodes' development. Cooperation at different levels of governance is key to success and to accrue competitiveness. Attractive places to live with a good accessibility are the best characteristics of a functioning city.

The different development formulas for the urban nodes of the Core Network should be shared and applied, where possible, to all nodes playing a role in the TEN-T transport system.

A shift from a silo-thinking to a more integrated and adaptive planning approach can benefit at a time Member States national authorities and relevant regional/local planners, where big projects investments do not turn out to hinder local mobility and increase negative effects on citizens' quality of life (noise emissions etc.).

More attention shall be given to creating synergies with existing efforts to develop urban nodes, such as Smart cities projects and innovation along the Corridors. Actions should be coordinated accordingly to build-on experiences and respond to a sustainable long-term vision for transport's development.

Tackling the issue of integrating urban nodes in the TEN-T Corridors' effective functioning must be higher in the working agenda of the Corridors Fora, where thematic work groups can boost this process.

The link between the results of the Core Network Corridors' studies and work plans' conclusions as well as the EU funding programs should be strengthened.

Recommendations:

- The link between Sustainable Urban Mobility Plans and TEN-T action in urban nodes shall be reinforced and duly promoted (possibly creating additional resources for elaboration of integrated SUMPs); a strengthening of multi-level governance (including European, national, regional and local actors) is vital for this purpose;
- European Coordinators shall reach-out to insist on the importance of urban mobility integration with long-distance transport; added focus on opportunities linked to conceiving and implementing projects affecting urban nodes;
- The integration of urban nodes in the core network corridors shall be enhanced and, as far as possible, modal split and origin-destination analyses should be included in the corridor studies to assess reciprocal effects between urban nodes and corridor links and to optimise the organisation of traffic flows;
- Learnings shall be applicable, where possible, to all urban interchanges and nodes of the Comprehensive Network affecting the over-all performance of the TEN-T transport system.
- Cooperation of urban nodes along corridors in working groups and with input by the stakeholder organisations (such as URBACT platform) should be strengthened;
- Expert networks shall be set-up, where it can provide for added efficiency, in order to take stock of learnings and further develop current practices and opportunities related to urban nodes (such as mapping existing barriers and identifying flaws);
- Opportunities for the development of a project pipeline for urban nodes for EFSI should be explored; obstacles to EFSI funding and ways of overcoming them should be identified, including the accounting, technical and legal aspects; coherent financial commitments should follow.

EXTENDING COOPERATION WITH THIRD COUNTRIES

Paweł Wojciechowski, Péter Balázs and Laurens-Jan Brinkhorst

1. Introduction

Transport is by nature international and transport cooperation between the EU and its neighbours covers all transport modes (maritime, aviation, rail and road) and policies (network development, research, technology, standardisation, safety, environment, trade and competition). Historically, infrastructure connections have been of great political importance as a mean for trade and integration of regions and countries. However, in a more recent past, the construction of infrastructure in each single country was primarily aiming at satisfying national needs and often not being really coordinated with the neighbours. This resulted in bottlenecks and missing links preventing the smooth flow of people and goods and at the same time increasing transport costs.

The European Community and later on, the European Union have realized the importance of abolishing transport barriers and filling-in missing links for the strengthening of the European integration and for the creation of the Single Market. In parallel to the development of a common transport infrastructure planning, transport services have been gradually liberalized; technical as well as administrative obstacles are being removed. Through the years, important progress in drawing and developing coherent infrastructure network planning in the EU has been achieved. The ultimate result is the "core network" as identified in the Regulation 1315/2013 related to the Trans-European Transport Network (TEN-T).

With the ever deepening internationalization of the economy, efficient transport infrastructure beyond the EU borders are gaining in importance. In an increasingly more inter-dependent world, the TEN-T contributes to the good functioning of the internal market, but also represents a key element to connect with our neighbours. While the TEN-T infrastructure policy has been primarily devoted in the past twenty years to satisfy internal needs, Europe and its partners cannot ignore that other world powers - like China through its new long term vision "One Belt One Road" (OBOR) - are now developing long distance infrastructure plans. They are likely to affect deeply our own plans and programmes, in particular the TEN-T ones and also challenge the leadership of Europe in the transport and logistic sector. Future planning will therefore have to take in due account the potential development of new long distance trade routes (maritime, land or air) and assess their impact on the current network priorities.

In expanding cooperation with third countries, it is not sufficient to extend the TEN-T networks to our neighbours (and "put our neighbours on our maps"). Increasingly, with the success of the European transport policies over the last decade, the corridor approach is becoming a very useful instrument, or even a necessary requirement to ensure that Europe could "re-connect" with its neighbours, and neighbours of the neighbours, in the most coherent and mutually beneficial way.

The paper will focus on the areas and countries where the most remains to be done, where the wish to be better connected is high, as high as the desire to ensure stronger and more solid political ties with the EU.

2. Forward planning

The intensity, the deepness of the relations with our neighbours remains, however, un-even. While, some key neighbours – like Switzerland or Norway are already fully aligned with the TEN-T network policy, and are in certain areas in advance with respect to our own transport policy framework- the situation we find beyond the EU borders in the East and towards the Western Balkans is far from being optimal. Poor cross-border connections, infrastructure bottlenecks and non-infrastructure barriers preventing an efficient, cost effective and safe transportation of passengers and goods – are remainders of the fragmented European policies of the past.

Looking at the close neighbourhood of the EU, the question which is raised now is how to make the TEN-T policy cooperation with our neighbours more effective, in order to ensure mutual benefits for both EU and its partners. The extension of the TEN-T maps towards the neighbouring countries is a first step in order to ensure coherence in infrastructure planning. Such an approach brings benefits to the overall EU transport system ensuring the continuation of the infrastructure beyond our borders. It is also a first step to promote the use of EU standards (rail signalling – safety on roads – air traffic management – reduction of overall polluting emissions- in these countries, creating the largest seamless transport area in the World. This will contribute to the reduction of transport costs and to an increase of the overall efficiency of the transport operations. It will benefit to our neighbours, facilitating the intra-regional connectivity and the access to the EU market. This is also the way to secure our trade routes with our partners.

In agreeing on the extension of the TEN-T maps, and thus considering land connections, we should not forget about maritime ports and airports. These are important gateways to the European single market, and constitute an integral part of the work of the European Coordinators. In particular, the horizontal priorities of the Motorways of the Sea should provide an important contribution of traffic volumes in the European maritime ports.

The same attention should be devoted to airports, mostly located in major urban nodes along core network corridors, where the interconnection with other transport modes exists, notably rail connections. For European and international air transport, more generally, the implementation of SESAR³⁵ within the framework of the TEN-T traffic management solutions is of great importance and naturally subject to broad cooperation with third countries. Although this paper does not go into further detail on aviation, it is important to recall that the Commission – to cope with the challenge of the increased internationalisation of transport - recently presented an "Aviation Strategy for Europe"³⁶ to bolster the competitiveness of the EU aviation sector in particular versus non-EU countries competitors.

Hopefully, this paper will pave the way for a reflexion on our future cooperation with non-EU countries both with an extension of the TEN-T, but also going beyond infrastructure or network cooperation, filling the financial gap, and looking beyond our immediate neighbours.

3. Different challenges for different regions

Neighbourhood countries³⁷

Western Balkans countries and Turkey

The relations with Turkey as well as with Western Balkans (candidate countries and non-candidates) are deep and well established since more than a decade. Regarding Turkey, the ongoing definition of a core TEN-T indicative network on its territory shall be instrumental in the EU's ambition to secure significant presence and influence in the Southern Caucasus, Central Asia and Northern Mediterranean and to ensure efficient multimodal transport corridors between the EU, the Southern Caucasus, Central Asia and the Middle East. As in the Western Balkans, the European Commission is supporting the development of the transport infrastructure and administrative capacity through IPA II fund (Instrument for Pre-Accession); alongside actions in urban transport, intelligent transport services and road safety, the EU co-finances major rail projects which aim to significantly improve the connectivity between Turkey and the EU.

35 Single European Sky Air Traffic Management Research

36 COM(2015) 598 final of 7/12/2015

37 For these countries there is already a very high level of integration with the internal market. They are therefore not considered in this paper.

As far as Western Balkans countries are concerned, our respective networks are highly interdependent – the Western Balkans ones being even "embedded" into the TEN-T one. For these countries, the extension of the network already goes in parallel with the implementation of a transport policy which fully converges with the policy of the EU. This is a significant challenge as their vision of transport remains mainly based on "hard infrastructure", while the EU transport policy now also includes an increasing number of "soft elements" like intelligent transport devices – promotion of use of clean fuels and vehicles – inter-modality rather than mere competition between the modes. There is therefore the need to revolution this view as soon as possible to avoid a situation where the development of infrastructure in the immediate neighbourhood would not match the development of the EU transport network. In this context, the latest developments of the "connectivity agenda" between the EU and the Western Balkan region allowed the endorsement of the indicative TEN-T core network for the region as well as an extension of three core network corridors and of the mandate of their respective coordinators into the Western Balkans.

Although this represents a dramatic progress for the integration of the region into the wider EU transport market, the network implementation is only one of the conditions to ensure that Western Balkans could benefit from new economic opportunities. This is the reason why the agenda for an improved connectivity also includes a series of "soft measures" (policy reforms in transport but also in other related sectors) and is instrumental to bring the Western Balkans countries closer to the EU standards. It is worth mentioning now, that Chapter 21 (Trans-European Networks) and Chapter 14 (Transport Policy) have been now open for Montenegro. In addition, it is not excluded that it could also happen for Serbia (starting by Chapter 21) before the end of the year. It is also important to recall that the ECAA (European Common Aviation Area) is also starting to bear fruits, with an increased cooperation among the main Western Balkans countries leading to a quick modernization of the aviation sector in the region.

The fact that all our regional partners have accepted the extension of the "core" network to the region and they have also committed themselves to implement, in the framework of the WB6 agenda, a series of key transport reforms is a first tangible sign showing an emerging "maturity" of the region as regard transport policy and infrastructure planning. If such changes take place, the geographic situation of the Western Balkans could help to make the region a very valid route option – not to say the natural one - to connect the "core" of Europe to its south-eastern border and further to Turkey, the Caucasus and central Asia. It is not only by coincidence that China has begun to invest in Greek ports and seems now interested in developing rail and road infrastructure in the South East of Europe. However, the road is still long before getting all these countries at a level equivalent to the EU average in terms of transport and logistic capacities³⁸.

In a nutshell, Western Balkans countries will have to cope with three main challenges which would require a strong political support to the reform process in the transport sector:

(i) The infrastructure planning still responds to short term and often political priorities and requires to be more integrated in a regional – or European – perspective. Road development remains – from far predominant – while other modes, like inland waterways or rail are under-used. Rail transport, in particular due to the combined action of the poor quality of the services and infrastructure is collapsing. The size of the Western Balkans countries and their network interdependence plead for the development of one single transport strategy in these sectors. Otherwise, the risk is high that investments or reforms carried out in one single country remain ineffective due to the lack of continuity after the borders of this country.

The definition of a regional strategy – complementing the WB6 initiative - would address the current difficulties and propose coordinated – infrastructure and non-infrastructure solutions to renew the attractiveness of these modes, in line with the EU policy guidelines. Such strategy should therefore be considered as a key priority for the region.

(ii) Furthermore, the innovation gap of the region - with respect to the EU - is increasing. New technologies – innovative solution in transport - are not among the focus of the decision makers in the Balkan countries. The TEN-T planning and policy extended to the Balkans will therefore be instrumental to ensure a re-balancing of the priorities. Our neighbours should integrate this key dimension in their respective transport strategies.

(iii) Last but not least, financing remains a key issue. In terms of financial support, transport is one of the priorities for the cooperation between the EU and Western Balkans, but financing support available is far below the identified needs (roughly 30 billion Euros by 2050). In addition to IPA financing, the Western Balkan Investment Framework (WBIF) has earmarked one billion Euros for the support of infrastructure projects in the six countries of the Western Balkans.

The available financing resources are therefore scarce and the mix between grants and loans support is imbalanced - giving a high priority to the loan component in a region - where the bankability of transport projects remains low. Most of the countries have a limited fiscal space or are already under the strict scrutiny of the IMF, which therefore limits the capacity of these countries to get loans to the main international financial institutions (IFIs) for infrastructure development and therefore not very much adapted to the EFSI (European Fund for Strategic Investments).

Increasing the capacity to allocate grants – in particular for cross-border projects – would certainly be highly and mutually beneficial for these countries as well as for the EU. It would therefore be desirable that the European Commission pays more attention to this key financial question, as it has been for the EU cohesion countries. The problem is, however, not only linked to the amount of available funding, but also to the ability to identify bankable projects.

The main challenge for the region will therefore remain its capacity to better define its transport infrastructure needs and accompany them with an ambitious reform programme, aiming at removing all the non-infrastructure barriers that exist and undermine the performance of the transport sector: under these conditions access to financing will be made easier, in particular if the "mix" between loans and grants is rebalanced in favour of this latter.

The Eastern Partnership countries (EaP)

Within the European Neighbourhood Policy (ENP), the principles of its transport element were set out in the 2011 Communication on "The EU and its neighbouring regions: A renewed approach to transport cooperation"³⁹ and confirmed in the recent ENP review. This approach is supported by the Member States. It aims at increasingly integrating the EU and the ENP countries' transport markets as well as at promoting infrastructure connections by defining networks, prioritising projects and mobilising financing.

On this basis, the EU and six partner countries established in 2009 the Eastern Partnership (EaP), a joint initiative building also on bilateral relations. This cooperation was stepped up with the 2014 Association Agreements and DCFTAs (Deep and Comprehensive Free Trade Agreements) signed with Georgia, Moldova and Ukraine while two (Georgia and Moldova) have also signed Common Aviation Area agreements. This means that these countries will have to implement regulatory convergence bringing their transport system at the levels of the EU ones. In the medium and long term this process should allow the transport companies of these countries to have full access to the EU transport market. One should note that for reasons going beyond transport cooperation, the relationship with Belarus is less developed.

Significant work has already been done in the Eastern neighbourhood, culminating in the political agreement in 2013 on a comprehensive priority transport network based on the TEN-T methodology. It covers all modes except the inland waterway network, the definition of which is still pending due to the bilateral dispute on the Danube delta between Romania and Ukraine. The definition of a core network as indicative in the EaP region shall help focusing the financing priorities on a more restricted number of key axes and implementing in parallel a series of "soft actions" to make transport operations on these corridors more efficient. To this effect, a single coordinated national pipeline of priority projects promoting a well-functioning, safe, secure and environmentally friendly transport system must be defined.

As for the Western Balkans – the main challenges will lie in the capacity of these countries, the EU and other donors to identify the appropriate financial resources to implement projects in the region – compliant with the TEN-T priorities. However, the success of these investments would definitely rely in the capacity of the EaP countries to implement in parallel reforms to align their transport system with the EU one. The removal of the existing non-infrastructure barriers and inefficiencies which lead to high transport costs, low connectivity undermining the competitiveness of the overall region could help in attracting new foreign investors, to the benefit of the EaP economy and of its citizens.

The Mediterranean Region (EuroMed)

Transport plays a central role within the Euro Mediterranean cooperation in the southern neighbourhood (Mediterranean Partners are Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, Syria -cooperation suspended since 2011-, and Tunisia). Despite the situation in the region, the active technical dialogue remains unchanged among the countries themselves and with Europe. The EU is promoting the TEN-T policy approach at a regional level through, firstly, regulatory reform and convergence in maritime, civil aviation, road, railway and urban transport through a Regional Transport Action Plan (RTAP) 2014-2020. Secondly, this is complemented by the establishment of an integrated multimodal Euro-Mediterranean transport network, to be connected to the TEN-T maps building on the process of regulatory convergence and interoperability. A process is on-going to define the network of the southern Mediterranean countries (Trans-Mediterranean Transport Network).

While there are no land connections between the respective networks, projects of the Motorways of the Sea are already been implemented with a specific attention to improved port infrastructure and related services. A Common Aviation Area is also promoted by implementing agreements signed so far with Israel, Jordan and Morocco and negotiating new agreements. The integrated network in the Mediterranean region (TMN-T) could represent a possible first extension of the TEN-T towards Africa and the Arabian Peninsula as well as Asia. The important growth potential of the Sub-Saharan Africa, where the transport connections remain still very weak, requires a particular attention in terms of development of transport infrastructure as well as regulatory reforms and convergence. There are however issues which remain common among all the neighbouring countries. The key one is the limited funding available, especially if one compares it with the possibilities offered to the EU Member States through the Connecting Europe Facility.

Thus, more attention should be paid in the following three areas. Firstly, on promoting the quality, not the quantity of the infrastructure, as the infrastructure policy in these countries remains very "construction" oriented, and little attention is paid to maintenance, safety or management of the infrastructure. Secondly, a multimodal approach should be supported, to ease the fierce competition among various modes. Thirdly, a greater attention should be given to the borders, as they constitute still significant constraints/barriers preventing efficient transport operations.

The Northern Dimension and Arctic

The EU has also developed since 2009 a transport policy cooperation towards the Northern Dimension partners which involves in addition to EU Member States, Norway, Russia and Belarus. The NDPTL (Northern Dimension Partnership on Transport and Logistics) is aiming at increasing the overall efficiency of the transport system in the great North, through regional projects/initiatives involving our Member States and at least one of the non-EU partners. This partnership could be a good basis to further develop the cooperation in an area which is until now almost virgin, but which has a tremendous economic potential and is critical in terms of environment: the Arctic. In its joint communication on "An integrated European Union policy for the Arctic"⁴⁰ the Council has invited the Commission "to explore the ways in which the EU can contribute in the development of industry and infrastructure" in the region. In this framework, there are significant challenges to address for leisure but also for industrial purposes since the area is rich of oil, gas and rare minerals.

New maritime routes – in particular the Northern Sea route, through the Arctic sea - have been explored in the recent past. This route would shorten the journey from North China ports to Europe of about 40%. For instance, in less than three weeks it would be possible to connect Tianjin (China) to Kirkeness (in Norway). Pilot journeys have already taken place to demonstrate the potential of such a route. At this stage only seasonal traffic is possible, and due to heavy constraints, the peak of traffic registered in 2013 has not been repeated in 2014 and 2015. The potential of such route still need to be further assessed but if it would become a regular route, it would have a significant impact on the EU transport and logistic system.

In this context, Russia plays an important role in the development of this new sea routes as it plays in the development of the land connections between China and Europe. Transport relations between Russia and the EU are, however, very difficult. In principle, they are supported by two cooperation instruments: (1) the transport dialogues and (2) the partnership for modernisation (P4M) launched at the end of 2010. In practical terms, very slow progress has been noticed since the dialogues were set up in 2005 and the mechanism did not prove to be efficient to prevent or resolve disputes. As regards the P4M, little progress has been achieved in transport before the political situation froze the process.

Until now, relations with Russia have been heavily affected by the lack of willingness to honour its international commitments on aviation and to remove the so-called irritants affecting transport. Given all this background and the present political situation, it is clear that enhanced cooperation in the field of transport with Russia – despite the high potential it could represent - is not a realistic option in the short term.

The neighbours of the neighbours

Looking beyond our direct neighbours, there are two areas of interest for the EU. One goes towards the South and in particular beyond the Euro-Mediterranean region, with the aim to better connect Africa with the Mediterranean. In this region, the potential for growth is high and the need for better infrastructure – and also better governance of the transport system – is massive. There is no doubt the EU alone, will not be able to cope with all the challenges arising in this area. There is no doubt either that EU's interest is to ensure that infrastructure development in Africa complies with EU standards to ensure safe, secure, reliable and interoperable transport operations.

One goes towards Asia with key trading partners of the EU such as China and Japan, as well as the fast growing economies of the Eurasian landmass. The geographical particularity of the Eurasia creates additional opportunities for developing land connections. In this context, the position of Russia and Central Asian countries has a particular importance. Trade from South East Asia heavily relies on maritime routes. It is clear that maritime transport will keep its leading role in the external trade of the EU. The European ports are adapting their infrastructure to cope with the new and bigger vessels coming into the market. At the same time this trade needs to be accommodated by the hinterland network. To ensure the sustainable development of transport in the EU, it is crucial to adapt the capacity to these new trade flows and increase the quality, interoperability and reliability of the rail and inland waterways' connections to the ports.

One of the EU's strategic partners, China, has taken a leading position in the development of land connections from Asia to Europe which potential is promising. With shortened transit time in comparison with maritime and lower shipping costs in comparison with aviation (although heavily subsidized), rail connections seem to find its niche in the growing international transport market. There are regular train services from China to countries such as Germany and Poland. New rail services, connected to the main EU ports have also been set up. Recently, a decision has been taken to begin a service to Luxembourg which would start from the port of Piraeus in Greece, crossing the Balkans, Austria and Germany.

However, the question of the imbalance of traffic flows⁴¹ remains a key one. Trains are running almost empty on the West-East bound and this seems to be for two main reasons (1) the transport is subsidized by China only on the East-West bound and (2) the type of good that EU could export to China does not correspond to the needs of the regions where the trains go. The type of freight from Europe (for instance if refrigerated cargo) is also – at this stage – an unresolved issue, which does not help West-East traffic to develop.

The current existing connections go through Russia, but there are potential additional routes: through Central Asia, Iran/Caucasus/ Georgia Turkey (or Black Sea) and the Balkans, through Kazakhstan, Russia and Ukraine/Belarus, through Mongolia, Russia to Baltic states/Finland, as well as other combinations. Competition between the transit countries can be expected for the share of the rail market for intercontinental traffic. The Russian Railways are, for example, investing in the Trans-Siberian line and have established cooperation with the European partners in the Coordinating Council on Trans-Siberian Transportation and cooperation is needed to reduce the all costs not related directly to transport operations (border crossing proceedings –interoperability gaps...).

41 Estimations of traffic differ from a source to another one. In 2014, UN-ECE sources provided the figure of approx. 30.000 units carried on the 'Silk Road' from China to Europe, using mainly the Tran-Siberian routes. 2015 figures are 50% higher with a total of more than 43.000 units. Other sources give a total of some 100.000 units for the same period.

4. The advantage of EU approach and ways forward

Better transport connections between our neighbours and the EU will help to bring them closer to the "single market" – thus creating new opportunities for their industry and transport sector. The improvement of the connections within the different regions could also strengthen macro-regional cooperation and trade. This should in the long-term have a positive impact on the overall political stability of these regions which have been or still are affected by political crisis and even armed conflicts.

Such a process is not "money free". The TEN-T development was supported by an ever increasing contribution from the EU budget: starting from € 1.8 billion for the 1995-1999 period, reaching € 24.05 billion for the 2014-2020 period. There is no doubt that, in order to make the extension of the network and EU policies to the neighbouring countries a success, the financial question must be tackled.

At this stage, however, the EU financing resources remain scarce while most of these countries have a limited fiscal space or are already under the strict scrutiny of the IMF. Such a situation limits the capacity of these countries to get loans to the main IFIs for infrastructure development.

In this context, if we do really want to develop the transport infrastructure in the neighbourhood – which could also be beneficial for EU MS – there are not many solutions. Additional financial resources have to be found to support the implementation of projects, and in parallel, the forms of financing have to be adapted to comply with the often complex financial situation of these countries. Increasing the grant component (from Connecting Europe Facility or IPA funding) - resources permitting - is certainly an option to consider (combined with loans or innovative financing mechanisms) to ensure that some key projects in the neighbourhood are implemented in due time, without putting at risk the financial stability of our partners. Obviously, more funding should only be allocated upon the commitment of these countries to implement key transport reforms to align their transport market to EU standards, as a large number of them have committed to do through the Association Agreements with the EU.

Increasing the financial resources to our partners in the neighbourhood would only be efficient if needs and priorities are better identified, compliant with the TEN-T framework (the "core" priorities in particular) and project preparation is improved. This is an aspect to which, the Commission and its partners should pay a special attention in the future. In this context, the Commission should play a key role in coordinating IFIs actions to ensure that financing is allocated in priority to projects / actions which are jointly agreed between the EU and its partners (and identified in the "core" TEN-T maps) and are beneficial to both.

The bigger (including financial) involvement of the EU should bring benefits in terms of ensuring common vision on priority connections (extension of core network) with our neighbours to avoid them to be cut from the EU network. It should also help in making sure that when our neighbours develop their own infrastructure network they follow the EU standards for example in terms of interoperability and safety. Against this background there is a new reality that emerges. New entrants (China for instance) have a large appetite for infrastructure projects and tend – through more flexible rules for financing – to gain some markets at the expenses of the traditional IFIs. The main challenge for the neighbouring countries – as well as for the EU MS - will be to make the right choice when they accept these types of investments.

Both China and the European Union have been developing connections and infrastructure networks on their own territories to ensure the good functioning of their economies through a smooth and seamless transport of goods and persons. After having developed its own Trans-European Transport Network, the EU is now committed to extend the Trans-European transport networks and policy beyond EU borders which also represents a "bridge" towards the neighbours of our neighbours. In parallel, since 2013 China has been promoting its own initiative to build the Silk Road Economic Belt and the 21st-Century Maritime Silk Road which aim to connect Asia to Europe. Europe and Asia stand to benefit from improving their transport and infrastructure overland links. Given that China and the EU are at the beginning and the end of these links and they are both developing transport initiatives with their neighbours, coordination is essential in order to ensure compatibility and complementarity among relevant policies and plans. In particular environment, public procurement rules and technical standards are – when applicable - used when foreign investments are directed to these projects.

Furthermore, we should bear in mind that the cost of the development of such long distance land infrastructure is extremely high.

The cost estimate of building these new routes (un-official figures says around USD 8.000 billion - including the projects in China) would represent about four times the cost-estimate of building the entire TEN-T. At this stage, it is difficult to say who could afford to pay such an amount, but it is also difficult to predict what could be the profitability of such investment compared to the expected traffic flow volumes.

The maintenance costs (due to the length – climate – type of traffic) will also be massive. The EU should therefore seek to ensure (1) that the "appetite" for new infrastructure – shown by some of our neighbours and other key partners - does not hamper the economic stability of these countries and (2) that the transit countries would not only be crossed by this new infrastructure, but could also benefit from it for their own development needs. In this context, the coordination must not only take place between the EU and China but should definitely involve the countries – and a large number of our neighbours are concerned - which will be part of this new connection and which should also benefit from it. It should also take advantage of the work being performed by Organization for Cooperation between Railways (OSJD).

Connectivity between the two regions is not only a question of financing: it is also a transport challenge. The development of these new routes should coincide with the setting up of innovative intermodal and multimodal supply chain solutions that could compete and complement with the traditional transport routes and means to deal with the growing trade volumes between Asia and Europe. One of the key challenges of this approach will be to ensure that our expectations meet China's and transit countries' views.

In addition, the new international multimodal transport corridors and routes need to be efficient, secure and economically and environmentally sustainable. These routes could also serve to promote new "green" transport technologies. In this context, the EU should therefore play a leading role to ensure that there is a common vision regarding not only the future connecting routes, but also that a clear cooperation framework to improve the quality and economic feasibility of these transport operations.

The recently adopted "Connectivity Platform EU-China" represents the first step towards a joint vision of the future connections between the Europe, Central Asia and China. The connectivity platform's aim should not only be restricted to the exchange of view on plans and programmes, but it should also be for the EU a forum to promote "reciprocity" and ensure that EU companies could have access to new markets in China or in projects led by China in the framework of the "One Belt One Road" policy (level playing field).

Moving beyond "hard infrastructure" the EU should cooperate closely with the neighbouring countries on addressing so-called "horizontal" problems, for example maintenance or border crossing facilitation or the quality of services offered. We need to ensure that the overall system works well. There is a lot to do - in all the regions concerned – and the potential for improvement, without investing huge amounts of money in new infrastructure, is already very significant. The priority in the future is therefore to agree on the right mix between the construction of new infrastructure or the upgrading of existing one to increase the capacity where it is absolutely necessary and the other measures which will be aiming at solving other types of bottlenecks. The setting up of such an approach although less "money-intensive" can only be feasible if reforms - which may require some time – are set up.

5. Conclusions

Despite the fact that the level of integration between the TEN-T and the network of our neighbours differs from one country to another one, the challenges our partners and the EU will have to cope with to develop a large, secure, economically and environmentally efficient transport network are almost the same, and they are huge.

The development of these network are certainly motivated by the need to strengthen our economic ties with our neighbours and the neighbours of the neighbours, but it also corresponds to the political willingness to guarantee to all these countries a better access to the EU market.

The EU has matured in the past twenty years a solid experience in the development of the Trans-European Transport Networks, and this experience could also now benefit to our partners in the neighbourhood. For the EU, the success of this policy will depend on the respect of four main principles which are also key challenges:

Inclusiveness. All countries must be in a position to benefit from these new connections for their own trade and economic development objectives. Connections within the EU represent the same level of importance as the connections with these regions or among these regions. In this context, the experience of the EU corridor approach could be extended and promoted to the EU neighbourhood.

Shifting from connections to connectivity A higher priority should be given to the removal of the non-infrastructure barriers to ensure seamless, safe, efficient and cost effective transport operations. This is a key aspect, in view of a stronger integration of these countries into the EU transport market, but it is also a pre-condition to develop an intra-regional connectivity.

Green and innovative transport solutions. Six months after the successful COP-21 we must strive – through various transport policies - towards an effective implementation of agreed objectives of reduction of CO2 emissions. To this end, we should think how to make transport between the EU and non-EU countries more environmentally friendly. Through innovative intermodal and multimodal supply chain solutions, these new connections should promote new "green" transport technologies.

Economically sound. While the development of new transport infrastructure between the EU, our neighbours and beyond is a unique opportunity to develop a larger market, the cost of building new infrastructure must be carefully assessed. The question is not to build new infrastructure connections at all costs, but at the right cost and when it is duly justified in order to avoid that countries, in particular the ones at the periphery of the EU, are affected by a too high financial burden which may have disruptive consequences on their financial stability.



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